



SPLANCHNOLOGY, CARDIOVASCULAR AND IMMUNE SYSTEMS



STUDY GUIDE

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CARDIOVASCULAR AND IMMUNE
SYSTEMS**

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Composite authors:

V. I. Bumeister, Doctor of Biological Sciences, Professor;
L. G. Sulim, Senior Lecturer;
O. O. Prykhodko, Candidate of Medical Sciences, Assistant;
O. S. Yarmolenko, Candidate of Medical Sciences, Assistant

Reviewers:

I. L. Kolisnyk – Associate Professor Ph. D., Kharkiv National Medical University;
M. V. Pogorelov – Doctor of Medical Sciences, Sumy State University

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Посібник рекомендований для студентів вищих медичних навчальних закладів IV рівня акредитації, які вивчають анатомію людини англійською мовою.

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Hippocratic Oath

«Ὅμνυμι Ἀπόλλωνα ἰητρὸν, καὶ Ἀσκληπιὸν, καὶ Ὑγίαν, καὶ Πανάκειαν, καὶ θεοὺς πάντας τε καὶ πάσας, ἴστορας ποιεύμενος, ἐπιτελέα ποιήσῃν κατὰ δύναμιν καὶ κρίσιν ἐμὴν ὄρκον τόνδε καὶ συγγραφὴν τήνδε. Ἠγήσασθαι μὲν τὸν διδάξαντά με τὴν τέχνην ταύτην ἴσα γενέτησιν ἐμοῖσι, καὶ βίου κοινώσασθαι, καὶ χρεῶν χρηρίζοντι μετάδοσιν ποιήσασθαι, καὶ γένος τὸ ἐξ ωυτέου ἀδελφοῖς ἴσον ἐπικρινέειν ἄρῶρεσι, καὶ διδάξειν τὴν τέχνην ταύτην, ἣν χρηρίζωσι μανθάνειν, ἄνευ μισθοῦ καὶ συγγραφῆς, παραγγελίης τε καὶ ἀκροήσιος καὶ τῆς λοιπῆς ἀπάσης μαθήσιος μετάδοσιν ποιήσασθαι υἱοῖσί τε ἐμοῖσι, καὶ τοῖσι τοῦ ἐμὲ διδάξαντος, καὶ μαθηταῖσι συγγεγραμμένοισί τε καὶ ὠρκισμένοις νόμῳ ἰητρικῷ, ἄλλῳ δὲ οὐδενί. Διαιτήμασί τε χρήσομαι ἐπ' ὠφελείῃ καμνόντων κατὰ δύναμιν καὶ κρίσιν ἐμὴν, ἐπὶ δηλήσει δὲ καὶ ἀδικίῃ εἴρξῃν. Οὐ δώσω δὲ οὐδὲ φάρμακον οὐδενὶ αἰτηθεὶς θανάσιμον, οὐδὲ ὑψηγήσομαι ξυμβουλίην τοιήνδε. Ὅμοίως δὲ οὐδὲ γυναικὶ πεσσὸν φθόριον δώσω. Ἀγνῶς δὲ καὶ ὀσίως διατηρήσω βίον τὸν ἐμὸν καὶ τέχνην τὴν ἐμὴν. Οὐ τεμέω δὲ οὐδὲ μὴν λιθιῶντας, ἐκχωρήσω δὲ ἐργάτησιν ἀνδράσι πρήξιος τῆσδε. Ἐς οἰκίας δὲ ὀκόσας ἂν ἐσίω, ἐσελεύσομαι ἐπ' ὠφελείῃ καμνόντων, ἐκτὸς ἐὼν πάσης ἀδικίης ἐκουσίης καὶ φθορίας, τῆς τε ἄλλης καὶ ἀφροδισίων ἔργων ἐπὶ τε γυναικείων σωμάτων καὶ ἀνδρῶν, ἐλευθέρων τε καὶ δούλων. Ἄ δ' ἂν ἐν θεραπείῃ ἢ ἴδω, ἢ ἀκούσω, ἢ καὶ ἄνευ θεραπείης κατὰ βίον ἀνθρώπων, ἃ μὴ χρή ποτε ἐκλαλέεσθαι ἔξω, σιγήσομαι, ἄρῶρητα ἠγεύμενος εἶναι τὰ τοιαῦτα. Ὅρκον μὲν οὖν μοι τόνδε ἐπιτελέα ποιέοντι, καὶ μὴ συγχεόντι, εἴη ἐπαύρασθαι καὶ βίου καὶ τέχνης δοξαζομένῳ παρὰ πᾶσιν ἀνθρώποις ἐς τὸν αἰεὶ χρόνον. παραβαίνοντι δὲ καὶ ἐπιορκοῦντι, τὰναντία τουτέων».

INTRODUCTION

Human anatomy is a scientific study of human body structure taking into consideration all its functions and mechanisms of its development.

Studying the structure of separate organs and systems in close connection with their functions, anatomy considers a person's organism as a unit which develops basing on the regularities under the influence of internal and external factors during the whole process of evolution.

The purpose of this subject is to study the structure of organs and systems of a person, features of body structure in comparison with animals revealing the anatomic frames of the age, sexual and individual variability, to study the adaptation of the form and structure of the organs to varying conditions of function and existence. Such functional and anatomic, evolutionary and causal treatment of the information about morphological features of an organism of a person has huge value for clinical manifestation in the anatomy course as it promotes comprehension of the nature of a healthy and sick person.

This educational and methodical practical work is based on the sample of educational and working programs on human anatomy according to the credit–modular system of the organization of the educational process. It is directed toward the assistance to the students and teachers in the organization and realization of the most effective methods of studying and teaching this subject.

THE GENERAL PART

Position of the viscera in anatomy is considered from 3 main positions – holotopy, syntopy and skeletotopy.

Holotopy is referred to relation of the organ to a certain body area, its surface projection.

Syntopy means relative position of viscera, blood vessels and nerves.

Skeletotopy is referred to relative position of the organ and skeletal bones (as a rule vertebral column and ribs).

To map the relations of the internal organs of the abdomen, the anterior abdominal wall is marked with imaginary lines which divide the abdomen into certain regions.

The horizontal line drawn between the lower ends of the tenth rib separates the upper portion of the abdomen in the middle. The horizontal line drawn between the anterior superior iliac spines separates the middle portion from below. These lines divide the surface of the abdomen into 3 regions: superior *epigastric*, middle *mesogastric* and inferior *hypogastric*.

Two vertical lines which are drawn along the lateral margins of the rectus abdominis muscle divide each region into 3 parts.

As a result the epigastric region is divided into the *proper epigastric region* located between vertical lines, *right and left hypochondrium* regions located under the costal arch.

The mesogastrium is divided into *umbilical region* located in the center, and *right and left lateral regions* located near the umbilical region.

The hypogastrium is divided into *pubic region* and *right and left inguinal regions*.

THE DIGESTIVE SYSTEM

The digestive system is a complex of organs the functions of which are mechanical and chemical treatment of food, absorption of the treated nutrients and excretion of

undigested remnants of the food. It consists of digestive tract and alimentary glands (salivary glands, liver, pancreas).

THE ORAL CAVITY is the initial portion of digestive tract. It is divided into two parts:

- vestibule of the mouth;
- cavity of the mouth proper.

The vestibule of the mouth is bounded by lips and cheeks externally and teeth and gums internally.

The cavity of the mouth proper is bounded by teeth and gums in front and laterally, by palate – superiorly, by oral diaphragm – inferiorly. Posteriorly it communicates with the pharynx via fauces. The vestibule of the mouth and cavity of the mouth proper communicate via the space behind upper third molar teeth.

THE LIPS are fibers of orbicularis oris muscle that are covered by skin from outside and lined with mucous membrane from inside. The opening between upper and lower lips is called the *oral fissure (rima oris)*. It communicates the vestibule of the mouth with the external environment. When the mouth is closed, both lips form a *labial commissure* on both sides of the oral fissure. When the mouth is opened, lips form *the angle of the mouth*.

The lips have following structures:

- *the philtrum*. It is located in the middle of the upper lip;
- *the tuberculum*. It is located directly below the philtrum;
- *the frenulum of upper lip*. It runs upwards from the upper lip to the upper jaw gums.
- *the frenulum of lower lip*. It runs downwards from the lower lip to the lower jaw gums.
- *the labial glands*. They are embedded into the mucous membrane and submucosa of the lips.

The gums are projection of the oral mucosa which cover the alveolar processes, fixing to them.

The cheeks are covered with skin from outside and with mucosa from inside. The buccinator muscle represents the deep layer of the cheek. *The fat pad* is located in the thickness of the cheeks between the masseter and buccinator muscles. The fat pad is developed much better in a child than in an

adult. *The buccal glands* lie under the mucous membrane. *The papilla of parotid duct* is a part of mucosa which covers the opening of parotid duct. It is located at the level of the second upper molar tooth.

THE PALATE forms the upper wall of the oral cavity proper and is divided into the hard palate and soft palate.

The hard palate is based on the bone elements covered with mucous membrane which is fixed to periosteum. It has following structures:

- *the palatine raphe* passes on midline along the mucosa;
- *the incisive papilla*;
- *the transverse palatine folds*;
- *the palatine glands* lie in the depth of mucosa.

The soft palate is a duplication of mucous membrane, in which muscles are located together with a fibrous plate, *palatine aponeurosis* as well as glands. The anterior margin of the soft palate attaches to the posterior edge of the hard palate. Posterior portion of soft palate extends freely downward and to the back and is called *palatine veil*. The *uvula* is a narrow tongue-like projection on the midline of the free edge of the soft palate. Laterally the soft palate continues with folds, or arches.

The anterior *palatoglossal arch* passes to the lateral surface of the tongue. The posterior *palatopharyngeal arch* runs from the soft palate to the lateral wall of the pharynx.

The *tonsillary sinus* is a hollow between two arches, which contains *the palatine tonsil*. Each palatine tonsil is mass of lymphoid tissue oval in shape.

The soft palate is composed of the following muscles:

1. ***The tensor veli palatini muscle***. It arises from the spine of sphenoid bone and cartilaginous part of the auditory tube, loops around pterygoid hamulus and interlaces into the palatine aponeurosis. It strains soft palate and opens the orifice of the auditory tube.
2. ***The levator veli palatini muscle***. It arises from the lower surface of the petrous part

of temporal bone anteriorly to the external opening of carotid canal and the cartilaginous part of the auditory tube and interlaces into palatine aponeurosis. It elevates the palatine veil and opens the orifice of auditory tube.

3. ***The uvulae muscle***. It arises from the posterior nasal spine and terminates in the tip of uvula. It shortens the uvula.

4. ***The palatoglossus muscle***. It runs in the thickness of palatoglossus arch and located on the side of the tongue where it continuous with transversus linguae muscle. It pulls the palatine veil downwards and narrows the pharynx.

5. ***The palatopharyngeal muscle***. It runs within corresponding arch arising from the posterior edge of thyroid cartilage and posterior wall of pharynx and attach to palatine aponeurosis. It strains the arch, pulls the palatine veil downwards and elevates the pharynx.

The inferior wall or floor of the oral cavity is formed by the suprahyoid muscles of the neck. Its mucosa contains the following structures:

- *the frenulum of tongue*;
- *the sublingual fold*. It is paired and lies laterally to the frenulum;
- *the sublingual caruncle*. It is a paired eminence on each side of the frenulum of tongue where the major sublingual and submandibular ducts open.

The fauces are bounded by the soft palate above, root of tongue below, palatoglossal arches and palatine tonsils laterally.

THE TEETH are divided into deciduous teeth and permanent teeth.

Each tooth has:

- ***the root*** embedded into dental alveoli;
- ***the neck*** – narrow part between the root and the crown;
- ***the crown*** – the exposed part of tooth.

The pulp cavity is located inside the tooth and consists of *crown cavity* and *root canal* which terminates on the top of the root as apical foramen which transmits vessels and nerves to the pulp cavity. The pulp cavity is filled with the dental pulp consisting of the connective tissue, blood vessels and nerves.

The substance of the tooth consists of *dentine, enamel and cement*. Dentin is the base of the tooth. It is covered by enamel in the region of the crown and by cement in the region of the root.

Each crown has the following surfaces: vestibular, lingual, approximal, occlusal. *Vestibular surface* faces the oral vestibule. *Lingual surface* faces the tongue. *Approximal surfaces* adjoin to the same surfaces of the neighbouring teeth. *Occlusal surface* adjoins to the same surface of the opposite arch.

Adult human has 32 permanent teeth. Each jaw has a set of 16 teeth. Each half of the jaw has:

- 2 *incisor* teeth;
- 1 *canine* tooth;
- 2 *premolar* teeth;
- 3 *molar* teeth.

Deciduous teeth start eruption from the 6–7th month of age and end by the second year of life. The dentition counts 20 teeth and each half of the jaw has

- 2 *incisor* teeth;
- 1 *canine* tooth;
- 2 *molar* teeth.

The permanent teeth start eruption after the 6th year of life and replace the deciduous ones. The process of dentition replacement normally ends before puberty (at the age of 12–14 years).

THE TONGUE is a muscular organ which takes part in the act of mastication and speech. Also it is the organ of taste. The tongue is covered with mucous membrane. The parts of the tongue are: *the body, the tip, the root*. Convex superior surface of the tongue is called the *back* (dorsum). The inferior surface is free in the anterior portion only. It is fixed to the gingival mucosa with the frenulum of the

tongue. The median groove of the tongue runs in the middle of the dorsum. *The terminal sulcus* is located between the root and the body of the tongue. *The lingual tonsil* lies behind the terminal sulcus. *The foramen caecum linguae* is located in the middle of the terminal sulcus.

Three folds of the mucous membrane – *glossoepiglottic fold* and two *pharyngoepiglottic folds* stretch from the posterior part of the tongue to the epiglottis. Two cavities *valleculae epiglotticae* are seen between the median and lateral folds.

The mucous membrane of the anterior part of the tongue is supplied with numerous papillae which are subdivided into 4 types: filiform, fungiform, vallate, foliate.

The filiform papillae are the smallest. They give a velvety look to the mucosa. These papillae serve for reception of tactile and pain sensations.

The fungiform papillae are larger than the previous ones. They are well visible with the naked eye. These hold taste buds with gustatory receptors.

The vallate papillae are the largest. They are located in front of the terminal sulcus and contain taste buds.

The foliate papillae are located on the edges of the tongue and also contain taste buds.

THE MUSCLES OF THE TONGUE

are divided into 2 groups – proper and skeletal.

The proper muscles are embedded within the tongue and during contraction change the shape of the tongue. They run in 3 perpendicular directions and interlace. They are: superior longitudinal muscle, inferior longitudinal muscle, transverse muscle, the vertical muscle.

The superior longitudinal muscle shortens the tongue and curves the tip of the tongue upwards. The inferior longitudinal muscle shortens the tongue and curves the tip of the tongue downwards. The transverse muscle narrows and thickens the tongue. The vertical muscle flattens and broadens the tongue.

The skeletal muscles change the position of the tongue. They are: genioglossus muscle, hyoglossus muscle, styloglossus muscle. The genioglossus muscle pulls the

tongue back and downwards. The hyoglossus muscle pulls the tongue back and downwards. The styloglossus muscle, contracting from two sides, pulls the tongue back and upwards, the contraction from one side results in pulling the tongue towards the same side.

GLANDS OF THE ORAL CAVITY are divided into large and small. Numerous small glands are located in the mucous membrane of the mouth. According to the character of the secretion, the glands are serous, mucous or mixed.

3 pairs of large salivary glands are located behind the mucous membrane and retain connection with the oral cavity by their ducts.

1. THE PAROTID GLAND is the largest one. It is located in the retromandibular fossa and covered with parotid fascia. It contains alveolar gland. It produces serous secretion. The parotid duct crosses the masseter muscle, penetrates into buccinator muscle and opens into the oral vestibule opposite to the upper second molar tooth. At the place of duct opening there is a small papilla of parotid duct.

2. THE SUBMANDIBULAR GLAND belongs to the compound tubuloacinar glands which produce mixed secretion. It lies in submandibular triangle under the mylohyoid muscle. The submandibular duct opens on the caruncula sublingualis.

3. THE SUBLINGUAL GLAND produces the mucous secretion and belongs to the compound tubuloacinar glands. It is located under the mucosa of oral cavity floor which forms the sublingual fold. It has *the major sublingual duct* that joins submandibular duct and opens on caruncula sublingualis and *the minor sublingual duct* that opens with small orifices on mucosa around the sublingual fold.

THE PHARYNX is a part of alimentary canal and respiratory tract which is a connecting link between the cavities of nose and mouth and between the oesophagus and trachea. The superior portion of the pharynx is attached to the base of the skull. The lower portion continues with oesophagus at the level of the 6–7th cervical vertebrae. The space within the pharynx is the *pharyngeal cavity*. According to the structures which are located in

front of the pharynx, the latter is divided into 3 parts:

- the nasopharynx;
- the oropharynx;
- the laryngopharynx.

The superior wall of the pharynx adjoins the base of the skull and called the vault of pharynx.

The nasal part of the pharynx (nasopharynx) is purely respiratory part. Its walls are not destroyed because they are immobile. Nasopharynx expands from the base of the skull to horizontal soft palate. Its anterior wall is occupied by choanae. There is a pharyngeal opening of auditory tube on each lateral wall. The auditory tube connects pharynx with the tympanic cavity. Posteriorly and superiorly the opening is bounded by torus tubarius which is a protuberance of the cartilaginous part of auditory tube on the mucosa. Between the opening of auditory tube and soft palate on each side there are aggregations of lymphoid tissue – the tubal tonsils. The pharyngeal tonsil is the aggregation of lymphoid tissue on the border of the vault and the posterior wall of pharynx. As a result a ring of lymphoid structures is found at the entry into the pharynx: one lingual tonsil, two palatine tonsils, two tube tonsils and one pharyngeal tonsil (Pyrogov – Waldeyer's ring).

The oral part (oropharynx) is the middle portion of pharynx. It communicates the oral cavity through the fauces. Its posterior wall corresponds to the third cervical vertebra. The oral part is mixed in function because the alimentary and respiratory tracts intersect here.

The laryngeal part (laryngopharynx) begins from epiglottis to the oesophagus behind the trachea. It has following structures:

- *the laryngeal inlet* leading to the laryngeal cavity;
- *the oesophageal inlet* connecting the pharynx and oesophagus;
- *the piriform fossa* – a paired recessus lying laterally to the larynx.

The pharyngeal wall consists of following membranes:

1. Mucosa.
2. The pharyngobasilar fascia. It is the base of pharynx lying under the mucosa of nasopharynx.

3. The muscular layer. It consists of oblique and transverse muscles (constrictors) and longitudinal muscles (levators). The circular layer is much stronger and consists of 3 constrictors:

- *the superior constrictor* which arises from the medial plate of pterygoid process, the mylohyoid line and the root of tongue;
- *the middle constrictor* arises from the horns of hyoid bone;
- *the inferior constrictor* arises from the thyroid and cricoid laryngeal cartilages.

All bundles join the bundles from the opposite side to form the seam on midline of posterior wall of the pharynx called the *pharyngeal raphe*.

The longitudinal muscles are:

- *the stylopharyngeus muscle*;
- *the palatopharyngeus muscle*.

4. The adventitia. It covers muscles of the pharynx from outside.

When the act of swallowing starts, the tongue is pressed to the palate and separates the nasopharynx from oropharynx. At the same time the suprahyoid muscles pull the pharynx upward while the root of the tongue is pulled downward by contraction of the hyoglossus muscle. The root of the tongue pulls the epiglottis down and closes the opening into the larynx. Then the pharyngeal constrictors contract in succession and push the bolus toward the oesophagus. They pull pharynx to meet the bolus.

The *peripharyngeal space* is divided into the *lateral pharyngeal space* lying between the pharyngeal wall and buccopharyngeal fascia, and *retropharyngeal space* lying between the posterior wall of pharynx and prevertebral layer of the cervical fascia. This space is filled with loose connective tissue expanding freely from the neck to the thoracic cavity. As a result during purulent inflammations pus may spread from the retropharyngeal space to the thoracic cavity.

THE OESOPHAGUS is a tube which connects pharynx with stomach. It begins at the level of C6 – C7 and ends at the level of Th11. The oesophagus has cervical, thoracic and abdominal parts.

The cervical part is located behind the trachea and adheres to its membranous wall.

The prevertebral fascia lies behind the oesophagus.

The thoracic part is located in the superior and posterior mediastinum. In the beginning the oesophagus lies behind the trachea and then behind the left main bronchus. The pericardium is located in front of the oesophagus. Behind the oesophagus is a vertebral column, azygos and hemiazygos veins. In the upper portion of posterior mediastinum the aorta passes to the left from oesophagus and in the lower portion – behind it. The pleural sac the oesophagus laterally. Alongside the oesophagus runs the vagus nerve.

The oesophagus passes through oesophageal hiatus of the diaphragm from thoracic cavity to the abdominal cavity. The abdominal part is bounded by the left lobe of liver anteriorly and the abdominal aorta posteriorly.

The wall of oesophagus consists of following layers:

1. Mucosa.
2. Submucosa. It is well expressed and forms the folds.
3. Muscular layer. It consists of external longitudinal and internal circular layers. The upper third of the oesophagus contains striated muscle fibers and the lower two thirds contain mostly smooth muscular tissue.
4. Adventitia. It covers the oesophagus in cervical and thoracic part, the abdominal part is covered with serosa.

The oesophagus has a number of constrictions and dilatations.

Three anatomical constrictions are clearly seen in a cadaver. They are:

- 1) *pharyngeal constriction* (at the origin of the oesophagus);
- 2) *bronchial constriction* (at the level of trachea bifurcation – Th4);
- 3) *diaphragmatic constriction* (in segment passing the hiatus oesophageus).

Besides that constrictions a living person has 2 physiological constrictions:

- 1) *aortic constriction* (where the arch of aorta presses the oesophagus to the fourth thoracic vertebra)
- 2) *cardial constriction* (where the oesophagus passes into the stomach at the level of Th11).

THE STOMACH is an expanded part of the digestive tube located between the oesophagus and small intestine. It lies in the left hypochondrium (3/4) and in the epigastric region (1/4). Inlet is located at the level of Th10 – Th11, the outlet – at the level of Th12 – L1.

The anterior wall of the stomach is bounded by the liver transverse colon, diaphragm and anterior abdominal wall. The posterior wall of the stomach is bounded by the spleen pancreas and left kidney. The concave border of the stomach curved upward and to the right is called the lesser curvature. The convex border curved downward and to the left is the greater curvature.

The stomach has the following **parts**:

– the *cardial part* (it contains the cardiac orifice, it is a passage from oesophagus to stomach);

– the *fundus* of stomach (or fornix);

– the *body* of stomach;

– the *pyloric part*.

The pyloric part is a narrow portion near the outlet. It is subdivided into pyloric antrum (wider portion) and a pyloric canal (narrower portion). It contains the pyloric orifice which leads to the duodenum. The pyloric part has pyloric sphincter and pyloric cusp. These structures regulate passage of the gastric contents to the duodenum.

THE WALL OF THE STOMACH consists of the following layers:

1. The mucosa which forms folds of different directions. Folds of lesser curvature are longitudinal and form a "gastric pathway" which gives passage for fluid food to duodenum. Also mucosa forms gastric areas and gastric pits. The gastric glands are opened on the bottom of gastric pits. The gastric glands secrete the gastric juice.

2. The submucosa. It is well developed.

3. The muscular layer. It consists of smooth muscle tissue which forms 3 layers: longitudinal, circular and oblique.

4. The peritoneum. It fully covers the stomach from outside. The peritoneum passes onto other organs forming following ligaments:
– the hepatogastric ligament. It runs between the lesser curvature and porta hepatis;

– the gastrocolic ligament. It extends between the greater curvature and the transverse colon;
– the gastrosplenic ligament. It is located between the greater curvature and the splenic hilum;
– the gastrophrenic ligament. It runs from the cardiac part of stomach and diaphragm.

THE SMALL INTESTINE begins from the pylorus and ends at the beginning of the large intestine.

Three parts are distinguished in the small intestine:

– the duodenum;

– the jejunum;

– the ileum.

THE DUODENUM runs around the head of pancreas like a horseshoe. Four main parts are distinguished in it. The *superior part* passes at the level of Th12 – L1, forming the superior duodenal flexure. It continues with the *descending part*, which runs downwards from L1 to L3 where it forms the inferior duodenal flexure and passes to the left forming the *horizontal part* which runs from right to left crossing the inferior vena cava and the abdominal aorta at the level of L3. The *ascending part* runs to the L2 on the left and continues with the jejunum.

The superior part of duodenum is bounded by the quadrate lobe of the liver. The descending part lies between the right kidney and the ureter from behind and the root of mesentery in front. The horizontal part crosses the inferior vena cava and the abdominal aorta. All parts of the duodenum are fixed to the head of pancreas with the internal surfaces. Between the descending part and the head of pancreas the terminal part of the common hepatic duct runs.

The duodenum lies extraperitoneally except a small portion, which is covered with peritoneum from all sides and is fixed to the porta hepatica with the hepatoduodenal ligament. The hepatoduodenal ligament passes the common hepatic duct, hepatic artery proper and hepatic portal vein.

The mucosa of duodenum produces a circular folds. Single longitudinal fold is located on the medial wall of the descending part. It appears in the result of invagination of the bile duct running along the duodenal wall.

The *major duodenal papilla* is located at the lower end of the longitudinal fold. On the top of papilla there is an opening for bile and pancreatic ducts. The *minor duodenal papilla* is located above the major one. It contains the opening of the accessory pancreatic duct.

THE JEJUNUM begins from the duodenojejunal flexure and terminates at the caecum. There is no distinct the ileum demarcation line between these 2 parts. The loops of jejunum and ileum lie in the umbilical region and are surrounded by the large intestine and covered with peritoneum from all sides. The mesentery fixes intestine to the posterior abdominal wall. The mucosa contains the circular folds and intestinal villi which increase the area of mucosa providing better absorption of nutrients. The intestinal glands are simple tubular glands. They are located in the mucosa and secrete the intestinal juice. The solitary lymphoid nodules are located on the mucosa of the entire intestine. The aggregated lymphoid nodules lie only in the ileum.

The muscular layer of small intestine consists of longitudinal and circular layers of smooth muscles. The contractions of the muscular layer are called peristalsis. Contraction waves moving in the opposite direction are called antiperistalsis.

The small intestine is covered with peritoneum from all sides (lies intraperitoneally). The mesentery of small intestine is represented with two peritoneal layers. The root of mesentery is fixed to the posterior abdominal wall.

THE LARGE INTESTINE is the terminal part of digestive tube. It runs from the ileocaecal junction to anus. It is divided into the caecum, colon, rectum, anal canal, anus.

THE CAECUM is the initial expanded segment. It is located in the right inguinal region. Its biggest part lies below the ileocaecal junction. It joins the intestine forming the angle, opening downward and to the left. This angle is called the ileocaecal angle. On the posteromedial wall of the caecum there is a vermiform process (appendix). Anterior wall of the caecum is bounded by the anterior abdominal wall, lateral – the iliac crest, medial

– loops of ileum, inferior wall faces the pelvic cavity and posterior wall lies near iliopsoas muscle. The caecum is covered with peritoneum from all sides but does not have mesentery. Passing from adjacent organs the peritoneum forms such folds:

- the caecal folds which were formed between the lateral wall of the caecum and parietal peritoneum;
- the superior ileocaecal recess lying superior to the ileocaecal junction;
- the inferior ileocaecal recess lies inferior to the caecum;
- the retrocaecal recess which is located posterior to the caecum.

On the internal surface of the caecum wall is an ileal papilla with the ileal orifice on the top. It is a passage between the ileum and caecum. The ileal papilla consists of the ileocolic lip (superior) and ileocaecal lip (inferior). The lips join to form the frenulum of the ileal orifice. The ileocaecal sphincter is located in the depth of lips. The ileal papilla has the function of the valve passing the ileal contents to the caecum. When the caecal pressure rises, the lips close blocking passage between intestines. The orifice of vermiform process is located 2–3 cm below ileal orifice. The vermiform appendix arises from the medioposterior surface of the caecum. It greatly varies in length and position. It is covered with peritoneum from all sides and has a mesentery. Its mucosa and submucosa contain much lymphoid tissue which form aggregated lymphoid nodules.

THE COLON has significantly different look than the small intestine due to the following structures:

- *gastrae coli* – the colic wall sacculations;
- *omental appendices* containing the adipose tissue;
- *taeniae coli*, 3 in number, substitute the longitudinal muscular layer of the colon which does not form a separate layer but is located into 3 bands: *mesocolic taenia*, *omental taenia*, *free taenia*. The mesocolic taenia stretches along the line of attachment of the mesentery. The omental taenia runs along the line of attachment of the greater omentum. The free taenia runs along the anterior surface of ascending and descending colon, and in the

transverse colon it runs along the posterior surface.

THE ASCENDING COLON is referred to the right lateral region. Anteriorly and laterally it is bounded by the abdominal wall, medially – small intestine, posteriorly – right kidney, transversus abdominis muscle and quadratus lumborum muscle. It is covered with peritoneum from 3 sides (lies mesoperitoneally). When it reaches the liver, it forms the *right colic flexure*.

THE TRANSVERSE COLON begins from the right colic flexure reaching the spleen where it forms the left colic flexure. It runs along the right hypochondrium, the epigastric, umbilical and left hypochondrium regions. Superiorly it is bounded by the liver, gallbladder, stomach and spleen; inferiorly – small intestine; posteriorly – pancreas, duodenum and kidneys; anteriorly – with greater omentum and adjoins the anterior abdominal wall. Transverse colon lies intraperitoneally and has a long mesentery.

THE DESCENDING COLON begins from the left colic flexure and runs downwards to the left iliac fossa. The iliac crest serves as landmark between descending and sigmoid colon. The descending colon is referred to the left lateral region. It is bounded by left kidney, transversus abdominis and quadratus lumborum muscles posteriorly, greater omentum and small intestine anteriorly, anterior abdominal wall laterally. It is covered with peritoneum from 3 sides (lies mesoperitoneally).

THE SIGMOID COLON is a continuation of descending colon. It lies in the left iliac fossa and descends to the lesser pelvis. At the level of protrusion it continues with the rectum. The sigmoid colon is covered with peritoneum from all sides and has a long mesentery.

The mucosa of the colon has semilunar folds between haustrae, intestinal glands producing mucus and solitary lymphoid nodules. The muscular layer consists of longitudinal layer which splits into 3 taeniae and completes circular layer.

THE RECTUM is the lower part of the large intestine which serves for the accumulation and evacuation of the faecal material. It begins at the level of protrusion and descends into lesser pelvis in front of the sacrum to form 2 flexures: upper *sacral* and lower *perineal*. The wider upper portion of rectum is called *rectal ampulla*. The narrower terminal part is called *anal canal*. It ends with the *anus*. The imaginary border between these parts is at the level of the coccyx apex. The posterior wall of the rectum is adjacent to the sacrum and the coccyx. Anterior to the rectum in female are uterus and vagina, in male – the urinary bladder, seminal vesicles and prostate. The upper portion of rectum is covered with peritoneum from all sides, the middle portion lies mesoperitoneally and lower portion lies extraperitoneally and is covered with adventitia. The rectal mucosa has transverse folds of rectum which correspond to the rectal flexures and intestinal glands that produce mucus. The mucosa of anal canal contains the *anal columns*, *anal sinuses* – invaginations between the columns that are closed with small anal valves. The anal transitional zone is the annular smooth portion of the rectal mucosa next after anal sinuses, which passes into the anal skin. Around this portion there is a rectal venous plexus. The anocutaneous line is a boundary line between mucosa and anal skin located at the level of lower margin of the internal anal sphincter. Anus is the intestine outlet. It is covered with skin and surrounded by the external anal sphincter. The muscular coat of rectum consists of 2 layers – external longitudinal and internal circular. Below rectal ampulla circular layer thickens and runs down to the anus forming the internal involuntary anal sphincter consisting of smooth muscle fibers and external anal sphincter – the subcutaneous voluntary sphincter which regulates the act of defecation. The rectum is surrounded by well visible fat tissue that is called *paraproctus*.

THE LIVER is the largest digestive gland which takes part in all types of metabolism. It is located directly under the diaphragm in the right hypochondric region and particularly in epigastric and left hypochondric regions.

The upper boundary of the liver runs from its highest point at the level of the right 4th intercostal space with the right midclavicular line. Running rightwards from this point, the boundary line continues to intersection of the 10th intercostal space with the right midaxillary line. Running to the left from the highest point, this line passes to the 5th intercostal space with the left parasternal line. The lower boundary begins from the 10th intercostal space with the right midaxillary line, runs along the right costal arch, transects the 9th right costal cartilage to the left in the region of the epigastrium, transects the costal arch at the level of the 7th left costal cartilage and joins the upper boundary in the fifth intercostal space.

The liver has diaphragmatic (or upper) surface and visceral (or lower) surface which bears some cavities producing by the adjacent organs: renal, suprarenal, duodenal, colic (on the right lobe), gastric and oesophageal (on the left lobe) cavities. The pericardial cavity is located on the diaphragmatic surface on the left part of the liver.

The liver is covered with peritoneum from all sides except the *bare area* on the posterior border, the fossa for gallbladder and porta hepatis.

Falciform ligament is a duplication of the peritoneum that runs in saggital direction from diaphragm to the liver and separates diaphragmatic surface of the liver into larger right lobe and smaller left lobe. The *coronary ligament* runs along the posterior border of the liver in frontal plane. Both right and left edges of the coronary ligament end with the right and left triangular ligament. The left and right saggital grooves join in the middle of the visceral surface with transverse excavation which is called the **porta hepatis**. The anterior portion of the left saggital groove is represented by *fissure of the round ligament of the liver*. The round ligament of the liver is the obliterated remains of the umbilical vein. The posterior part of the left saggital groove contains *the venous ligament* which is formed after obliteration of the venous duct that connects the umbilical vein and inferior vena cava in embryo and lies in the corresponding fissure. *The fossa of gallbladder* is located in the anterior portion of the right saggital groove.

It contains the gallbladder. *The groove of vena cava* is located in the posterior portion of the right saggital groove. The inferior vena cava runs here.

The portal vein and proper hepatic artery enter the liver, the bile duct and lymphoid vessels leave the liver through porta hepatis.

Two saggital and transverse grooves separate two lobes:

– ***quadrate lobe*** lies anterior to the porta hepatis and is demarcated with the fissure for round ligament at the left and with the fossa for gallbladder at the right;

– ***caudate lobe*** lies posterior to the porta hepatis and is demarcated with the fissure of venous ligament at the left and with the groove for vena cava at the right.

The caudate lobe has 2 processes – *papillary process* which is directed to the porta hepatis and *caudate process*, which separates the porta hepatis from the groove for vena cava.

The liver is covered with serosa and subserous layer under which lies the fibrous capsula. The fibrous capsula enters the liver parenchyma through the porta hepatis and separates the *lobules of the liver*. The branches of the portal hepatic vein, proper hepatic artery and bile ducts are located between the lobules forming the hepatic triads. Therefore, the ***hepatic lobule*** is a morphofunctional unit of the liver. Hepatic lobule consists of hepatocytes. Unlike other organs, liver receives arterial blood from the proper hepatic artery and venous blood from the portal hepatic vein. There is mixed blood which passes through the sinusoids capillaries to the center of hepatic lobule. Inside the lobules the blood detoxicates here and then flows to the central vein. On leaving the lobules the central veins drain into collecting veins which merge to form the hepatic veins. 3–4 hepatic veins leave the liver on its lower surface and drain into the inferior vena cava. This type of circulation is called the ***rete mirabile venosum***.

Hepatocytes produce bile which passes into bile capillaries between the rows of hepatocytes. The bile from capillars drain into the *interlobular bile ducts* that join to form the *right hepatic duct* and *left hepatic duct*. By union of right and left hepatic ducts the *common hepatic duct* is formed. It leaves the

liver through the porta hepatis and runs downwards between the plates of the hepatoduodenal ligament to join the cystic duct forming the bile duct.

THE GALLBLADDER stores and concentrates the bile. It is located in the corresponding fossa. It lies mesoperitoneally and has the *body*, *fundus* and the *neck*. The neck continues into the *cystic duct*.

THE PANCREAS has exocrine and endocrine portions. Exocrine portion secretes pancreatic juice. Pancreatic juice flows to the duodenum through the pancreatic duct. Endocrine portion secretes hormones – insulin and glucagon into the blood. Pancreas is located extraperitoneally in epigastric and left hypochondric regions. It has the following parts:

- the *head of pancreas* that is fixed to duodenum;
- the *body of pancreas* that is bounded by the right kidney, right suprarenal gland and stomach;
- the *tail* which is directed to splenic hilum and is bounded by the left kidney and left suprarenal gland.

The exocrine portion of the pancreas is the compound tubuloacinar gland. It is covered with connective tissue capsule which enters parenchyma of the pancreas and is separated into lobules. The pancreatic duct runs in the depth of pancreas from the tail to head and merges with the bile duct to form the **hepatopancreatic ampulla** which opens on the tip of major duodenal papilla. Above the pancreatic duct is the **accessory pancreatic duct** which opens on the top of minor duodenal papilla.

The endocrine portion is represented with small light islets lying mainly in the tail and body.

PERITONEUM – is the serous coat that covers walls and organs of the abdominal cavity. Thus, it is divided into parietal and visceral layers. Peritoneum forms folds passing from the walls to organs, bounding close **peritoneal cavity** and forming ligaments, mesenteries and omentums. **Mesentery** is a fold consisted of 2 peritoneal layers between which

pass vessels and nerves. Mesentery fixes organs to the posterior abdominal wall. Jejunum, ileum, vermiform process, transverse colon, sigmoid colon and upper portion of rectum have mesentery. The root of small mesentery of intestine runs obliquely from the duodeno-jejunal flexure to the ileocaecal angle and is fixed to the posterior abdominal wall.

Peritoneal cavity contains a small amount of serous fluid which protects from frictions and gives free movements to adjacent organs. Organs of the abdominal cavity covered with peritoneum from all sides are called **intraperitoneal**. They are stomach, jejunum, ileum, caecum, transverse colon, sigmoid colon, upper portion of rectum, liver and spleen, and also uterine tubes in female.

Organs covered with peritoneum from 3 sides are called **mesoperitoneal**. They are ascending colon, descending colon, middle portion of rectum, uterus and full urinary bladder.

Organs covered with peritoneum from one side are called **extraperitoneal**. They are duodenum, lower portion of rectum, pancreas, kidneys, suprarenal glands, ureters, empty urinary bladder, prostate, seminal glands and ejaculatory ducts in male.

Unlike abdominal cavity, the peritoneal cavity is a slit-like space between parietal and visceral layers of peritoneum. **Peritoneal cavity** is subdivided into 3 levels: superior, middle and inferior.

The **superior level** is located between diaphragm and transverse colon with its mesentery. It contains stomach, upper part of duodenum, liver, gallbladder, spleen and pancreas. In this level 3 bursae are distinguished:

- **hepatic bursa**. It is located to the right from falciform ligament and embraces the right lobe of liver, gallbladder, the upper pole of the right kidney and right suprarenal gland;

- **pregastric bursa**. It is separated from hepatic bursa by falciform ligament and embraces left lobe of the liver, spleen and anterior wall of stomach;

- **omental bursa**. It is located behind the stomach and embraces posterior wall of stomach.

HEPATIC BURSA communicates with omental bursa via epiploic (omental) foramen which is bounded by caudate lobe of the liver above, superior part of duodenum below, hepatoduodenal ligament in front and parietal fold of peritoneum behind.

LESSER OMENTUM consists of hepatogastric and hepatoduodenal ligaments. It is represented with 2 peritoneal layers and is composed of bile duct, portal vein and proper hepatic artery which pass in such order from right to left.

GREATER OMENTUM is represented by a continuation of the gastrocolic ligament, which begins from greater curve where 2 peritoneal plates cover stomach coalesce. Two peritoneal plates run downwards in front of transverse colon and reach the pelvic inlet where they curve and run upwards to the posterior abdominal wall. Thus, the greater omentum consists of 4 plates, inferior to the transverse colon between which the adipose tissue is located.

The *middle level* of peritoneal cavity is located between transverse colon with its mesentery above and inlet of the lesser pelvis below. It contains the following cavities:

1) *right paracolic gutter*. It is located between ascending colon and parietal peritoneum. It communicates with hepatic bursa;

2) *left paracolic gutter*. It is limited with descending colon and parietal peritoneum;

3) *right mesenteric sinus*. It is located to the right of the root of mesentery;

4) *left mesenteric sinus*. It is located to the left of the root of mesentery doesn't, have the inferior wall and communicates with the pelvic cavity;

5) *superior and inferior duodenal fossae*. They are located near duodenojejunal flexure;

6) *superior and inferior ileocaecal recesses*. They are located in the ileocaecal angle;

7) *retrocaecal recess*. It is located behind caecum;

8) *intersigmoidal recess*. It is located to the left of sigmoid mesocolon root.

The inferior level (the pelvic cavity) contains urinary bladder, rectum and internal sex organs. On passing from the anterior surface of the rectum to the posterior surface of urinary bladder in male, peritoneum forms the **rectovesical pouch**. In female between the urinary bladder and the rectum is the uterus which is also covered by peritoneum. As a result, there are 2 peritoneal pouches in female pelvis, namely **rectouterine pouch** and **utero-vesical pouch**.

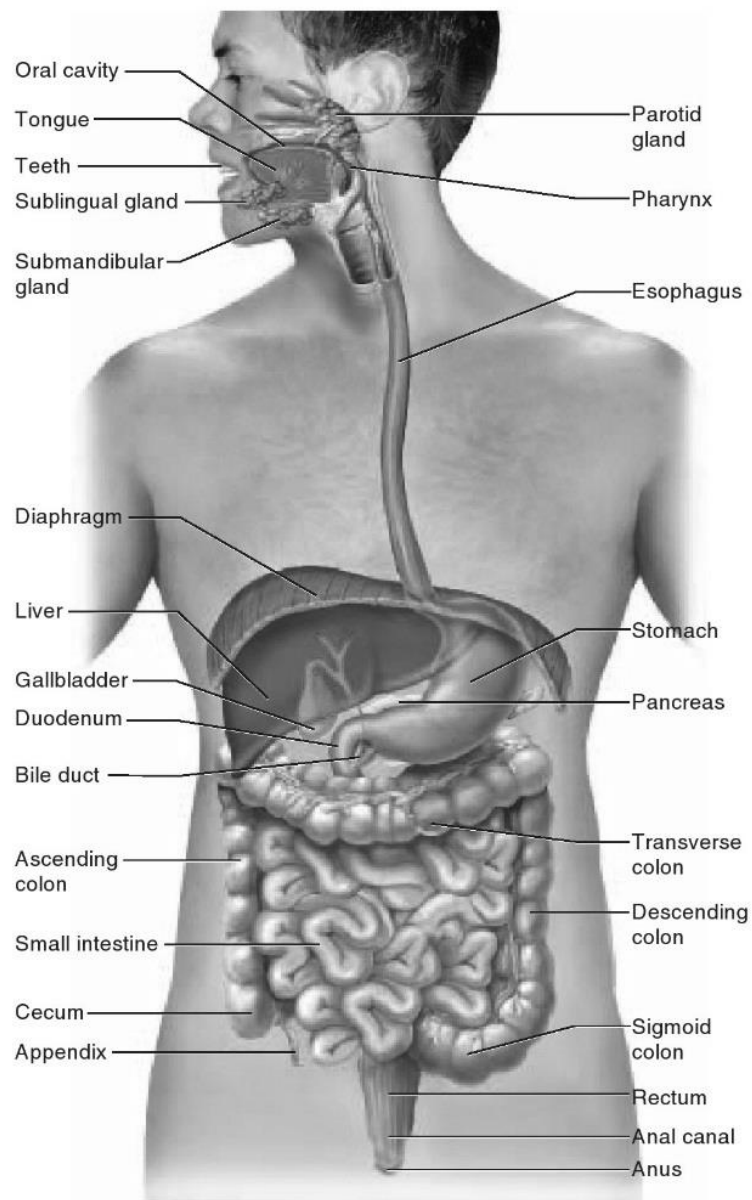


Figure 1-The Digestive System

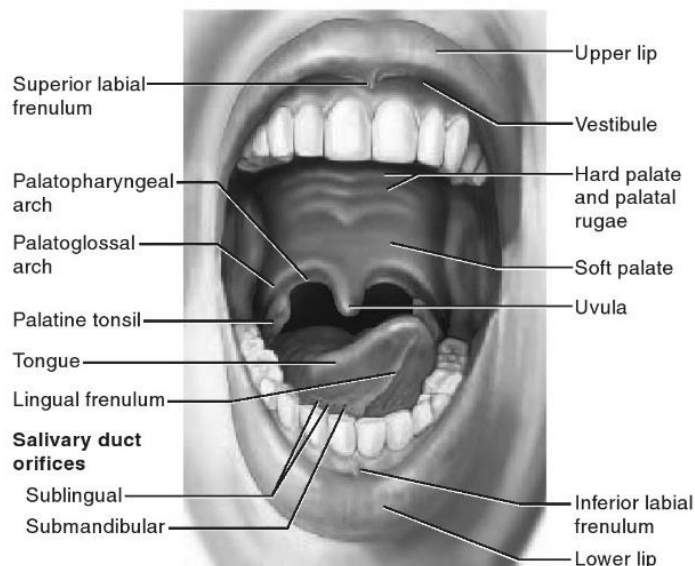


Figure 2-The Oral Cavity

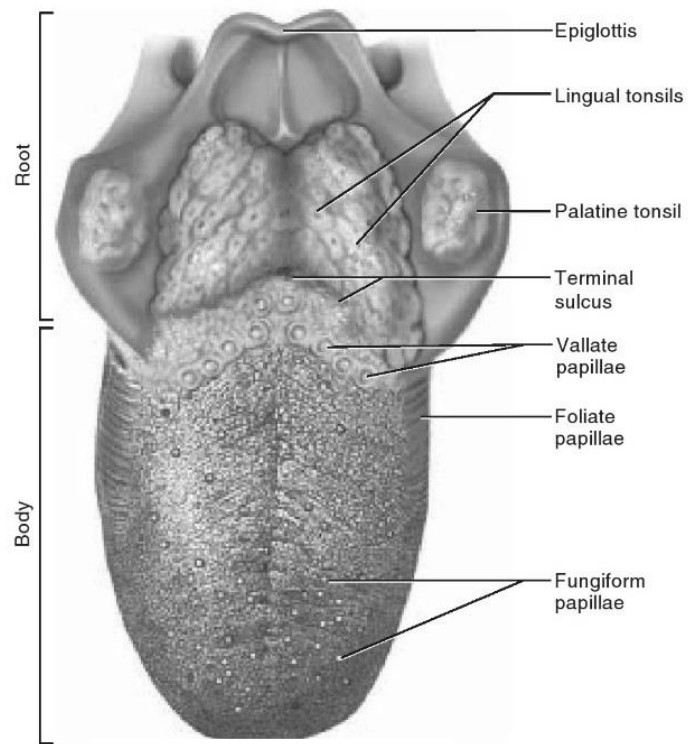


Figure 3-The Tongue

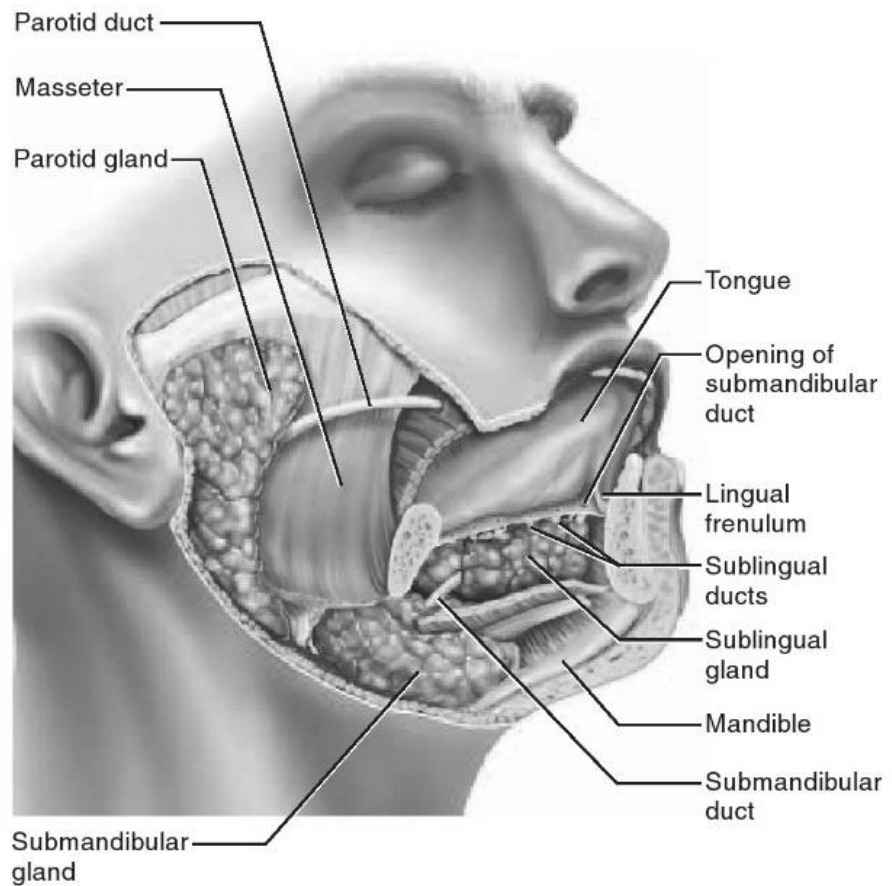


Figure 4-The Extrinsic Salivary Glands

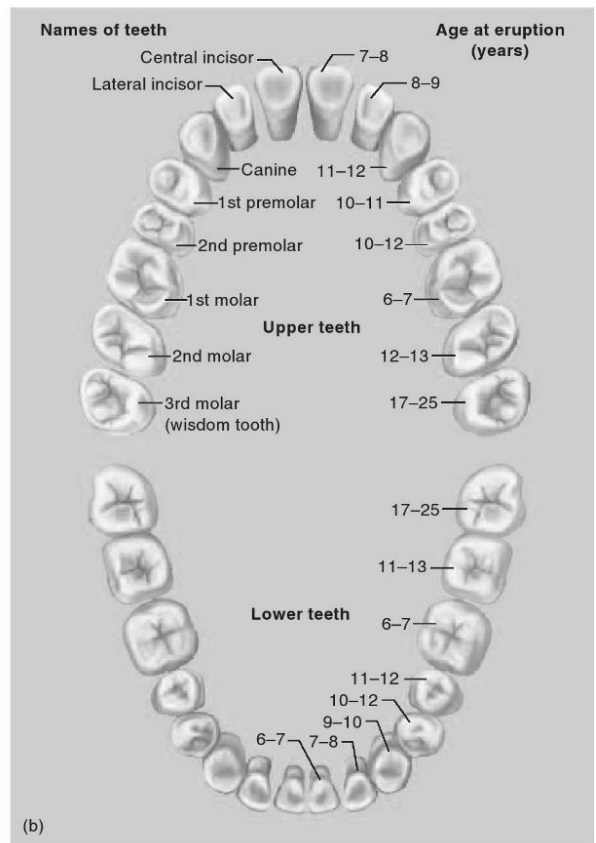
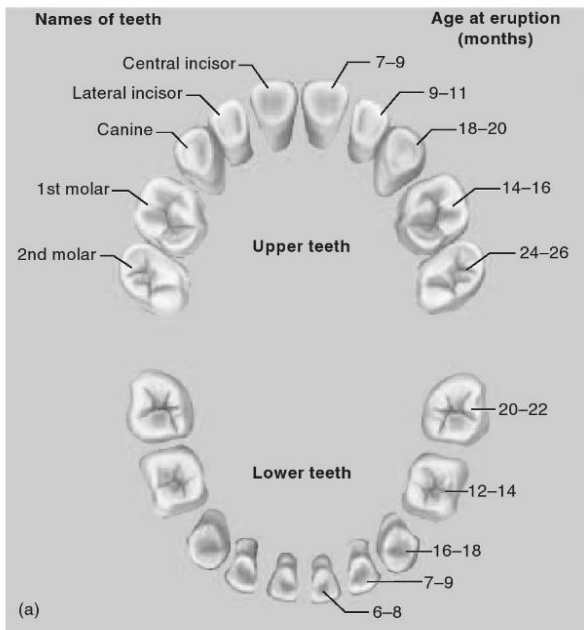


Figure 5-The Dentition and Ages at Which the Teeth Erupt. (a) Deciduous (baby) teeth. (b) Permanent teeth

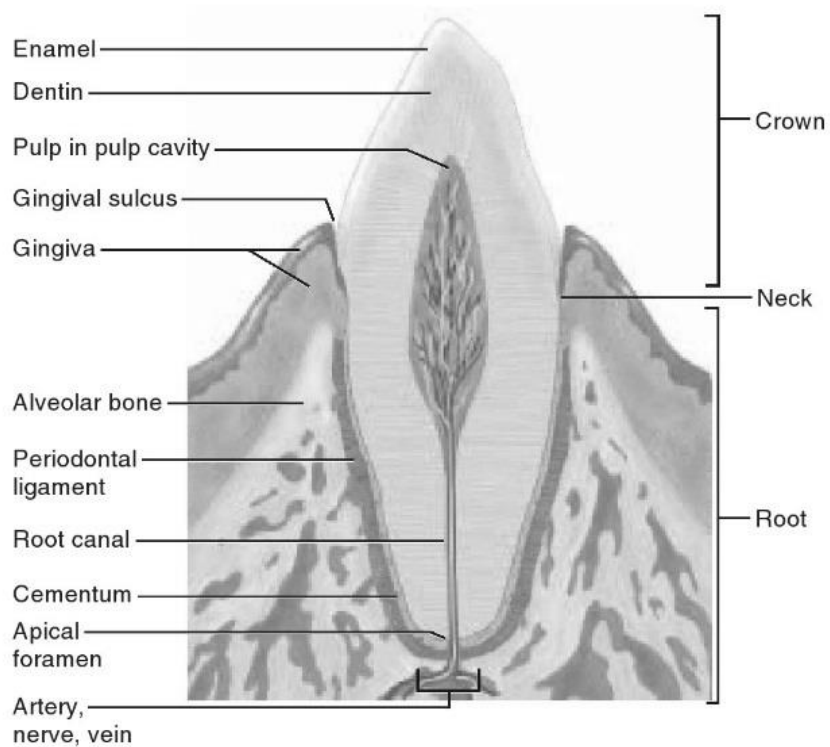


Figure 6-The Structure of the Teeth

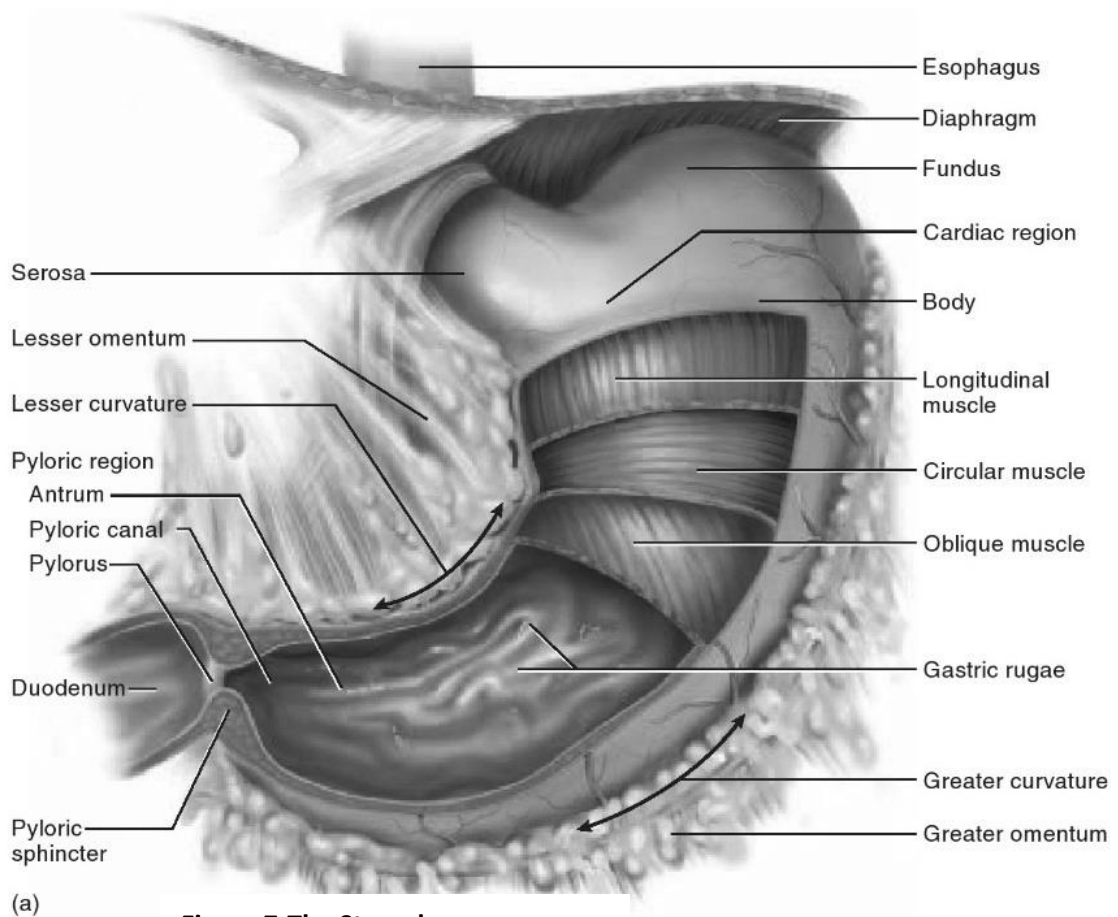


Figure 7-The Stomah

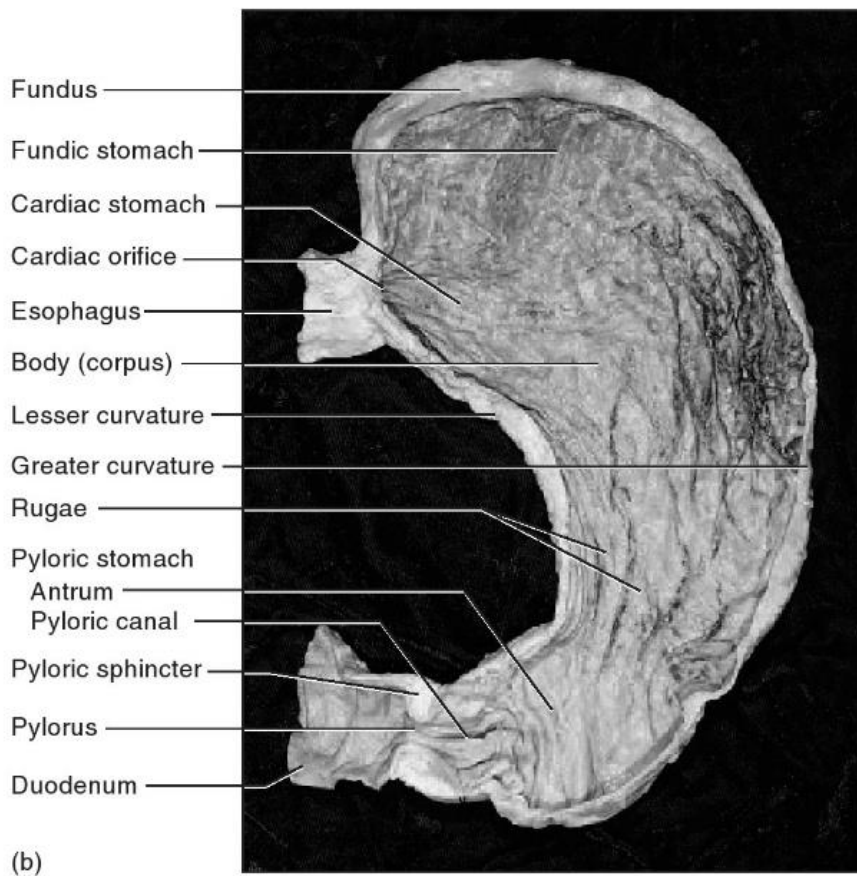


Figure 8-The Stomah

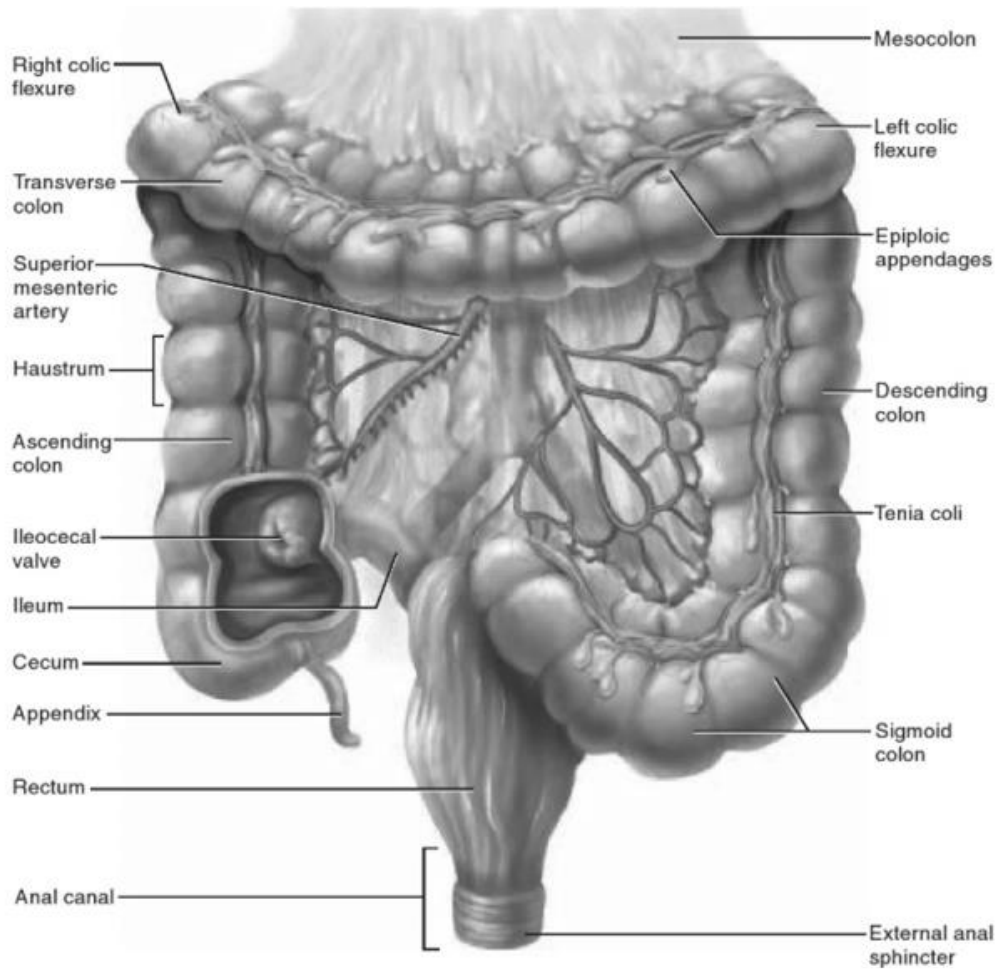
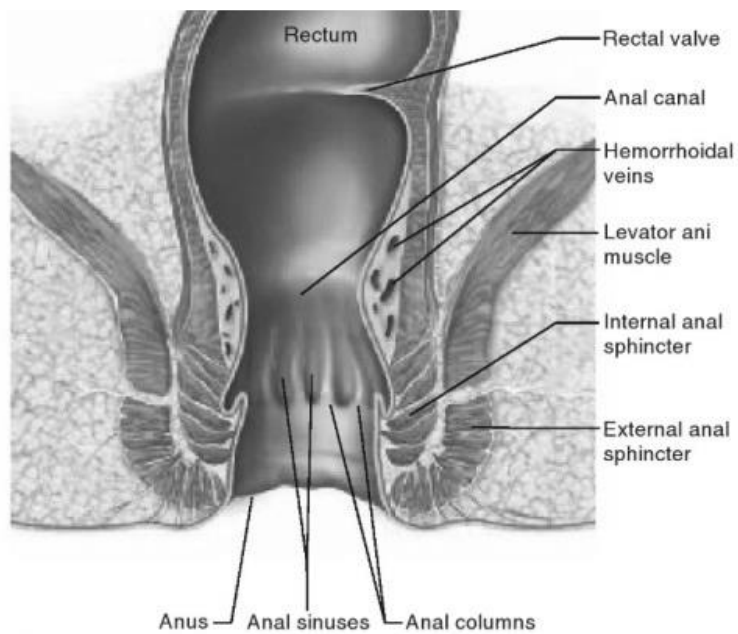


Figure 9-The Large Intestine. (a) Gross Anatomy; (b) Detail of the anal Canal



(b)

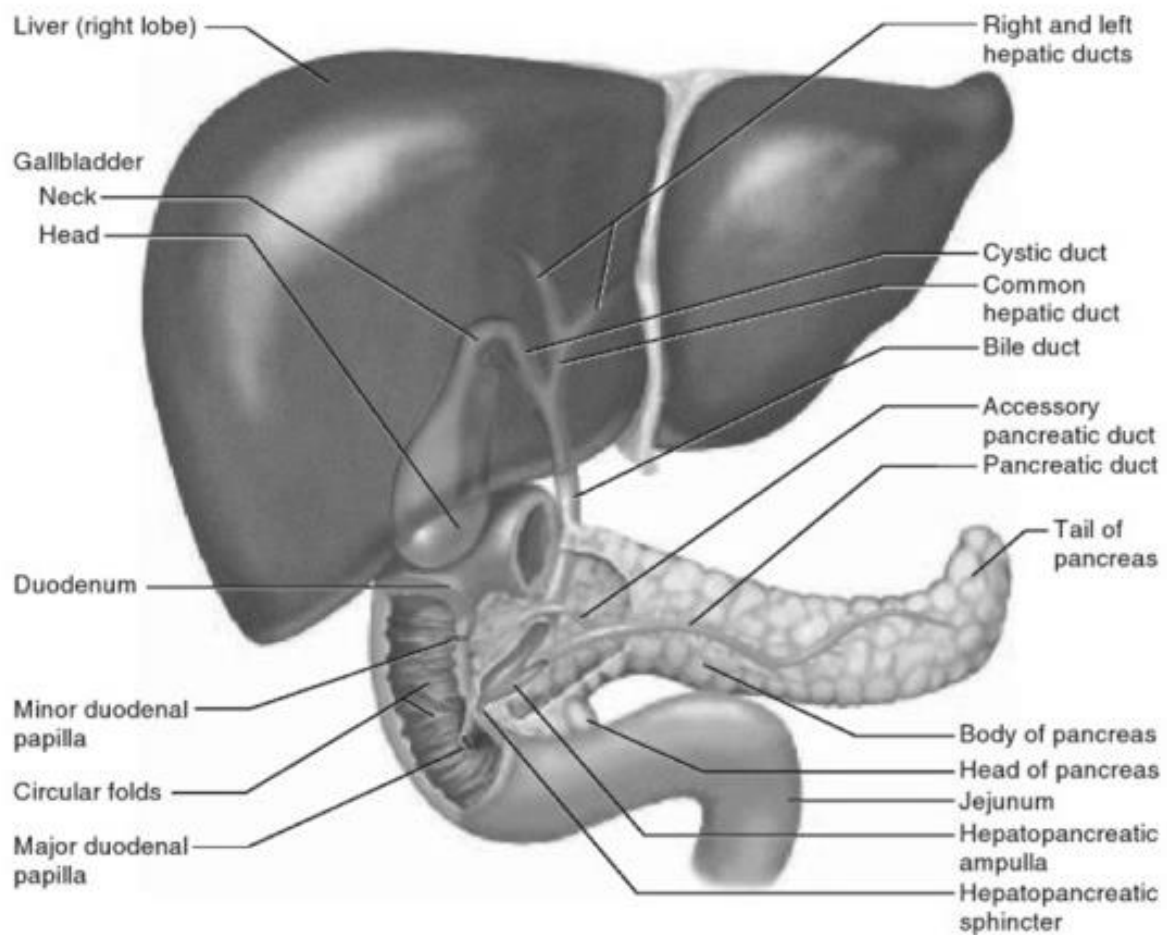


Figure 10-Gross Anatomy of the Gallbladder, Pancreas, and Bile Passages

RESPIRATORY SYSTEM

RESPIRATORY SYSTEM consists of respiratory tract and paired respiratory organs – lungs. According to its relation in the body, respiratory tract is subdivided into superior and inferior. Nasal cavity, nasopharynx and oropharynx belong to superior respiratory tract. Larynx, trachea and bronchi – to inferior respiratory tract.

THE NOSE consists of the *root*, *dorsum*, *apex* and *wings*. It has bony and cartilaginous skeleton. The root of the nose, superior portion of dorsum and lateral walls of the nose are formed with bones of visceral cranium.

Anterior portion of the nose is formed by cartilages. The major alar cartilage forms apex of the nose. Its middle and lateral crurae are bounded by nostrils. The minor alar cartilage is located behind major one. The septal nasal cartilage forms anterior portion of nasal septum.

THE NASAL CAVITY is separated by nasal septum into two halves which are opened with nostrils outwards and with choanae to the nasopharynx. Each half of the nasal cavity has a nasal vestibule which is limited by limen nasi. There are 3 nasal meatuses (*superior*, *middle* and *inferior*) which are located under the corresponding concha. Space between the medial surfaces of nasal conchae and nasal septum is called the *common nasal meatus*. Sphenoid sinus and posterior ethmoid cells are opened into superior nasal meatus. Frontal and maxillary sinuses are opened into middle nasal meatus. Nasolacrimal canal is opened into inferior nasal meatus.

According to function, olfactory and respiratory regions are distinguished in nasal cavity mucosa. The olfactory region is a portion of superior nasal meatus mucosa and respective area of nasal septum. The respiratory region consists of the rest of the nasal cavity mucosa.

LARYNX is a part of respiratory tract which is adapted to voice production. It is located in the anterior cervical region at the

level of C4 – C6. Infrahyoid muscles are located in front of the larynx. On both sides of the larynx vascular nervous bundles and lobes of the thyroid gland are located. Laryngopharynx is located behind the larynx.

Skeleton of the larynx consists of **paired and unpaired cartilages**. Unpaired cartilages are:

- *thyroid cartilage* which consists of right and left laminae forming laryngeal prominence, and superior and inferior horns. It forms anterolateral laryngeal walls;

- *cricoid cartilage* which has arch in front and lamina behind. It is located in the inferior part of larynx;

- *epiglottic cartilage* which closes inlet to larynx in front.

Paired cartilages are:

- *arytenoid cartilages* which have the base, apex and two processes – vocal process which projects anteromedially and muscular process which runs posterolaterally;

- *corniculate cartilages* are located place in the thickness of aryepiglottic folds on the apex of arythenoid cartilage;

- *cuneiform cartilages* lie in the thickness of aryepiglottic folds in front of corniculate cartilages. Cartilages of larynx are connected with each other and hyoid bone by means of joints and ligaments.

The joints of larynx are:

- *cricothyroid joint*. It is located between inferior horns of thyroid cartilage and cricoid cartilage;

- *cricoarythenoid joint*. It is located between bases of arythenoid cartilages and laminae of arythenoid cartilages.

The ligaments of larynx are: *thyrohyoid membrane*, *hyoepiglottic ligament*, *cricothyroid ligament*, *cricotracheal ligament*.

The fibroelastic membrane of larynx is the elastic tissue lying under the laryngeal mucosa. It consists of the elastic cone and *quadrangular membrane*.

The elastic cone is a continuation of cricothyroid ligament which is located under mucosa in the inferior part of the larynx. Upper free margin of elastic cone forms **vocal ligaments** which extend between vocal processes of arythenoid cartilage and inner surface of thyroid prominence. Quadrangular membrane lies under mucosa of upper part of

the larynx. Its free inferior margin forms **vestibular ligaments**. Fibro elastic membrane together with cartilages form the **skeleton of larynx**.

MUSCLES OF THE LARYNX are paired and divided into 3 groups:

1) muscles that widen rima glottidis (*posterior cricoarytenoid muscle*);

2) muscles that narrow the rima glottidis (*lateral cricoarytenoid, thyroarytenoid, transverse arytenoid and oblique arytenoid muscles*);

3) muscles that change tension of vocal ligaments (*cricothyroid muscle* which tenses the vocal ligaments, *vocal muscle* which lies in the depth of vocal ligaments and during contraction relaxes them).

THE CAVITY OF THE LARYNX begins from the inlet of the larynx which is bounded anteriorly by free margin of the epiglottis, posteriorly by the apexes of arytenoid cartilages. The laryngeal cavity looks like an hourglass in shape. It is narrowed in the middle but expanded upwards and downwards. The upper part is called the *vestibule of larynx*. It extends from laryngeal inlet to vestibular folds.

The middle *interventricular part* is the narrowest portion of the larynx. It is located between vestibular folds above and vocal folds below. The laryngeal ventricles are located between these two folds. They are filled with air. Right and left vocal folds are bounded by the **rima glottidis** (or **rima vocalis**).

The *infraglottic cavity* is located below the vocal folds and continues with the trachea.

TRACHEA is unpaired tubular organ which allows air to pass to lungs and from lungs. Its wall consists of 16–20 incomplete cartilaginous rings that are joined by means of fibrous *annular ligaments*. The posterior, *membranous wall of trachea* is bounded by oesophagus. Trachea is located at the level of C6 – Th5 where it is divided into right and left bronchi. The place where trachea terminates is called the **bifurcation of trachea**. Trachea has *cervical* and *thoracic segments*.

The *cervical part* is bounded by isthmus of thyroid gland anteriorly and neurovascular

bundle of neck laterally. The *thoracic part* is located in the superior mediastinum. It is bounded by great vessels, thymus and manubrium of sternum anteriorly, oesophagus posteriorly and mediastinal part of parietal pleura laterally.

THE MAIN BRONCHI arise from tracheal bifurcation. The structure of their wall is similar to the tracheal wall. The **right main bronchus** is shorter but wider than the left one. It runs almost vertically as a continuation of trachea. As a result, foreign bodies spread to the trachea are most often found in the right main bronchus. The **left main bronchus** is longer and narrower than the right one.

THE LUNGS are paired organs that are located in the thoracic cavity laterally to the heart and large vessels. Lungs have a *base* directed downward and *apex* directed upward. Each lung has **diaphragmatic, costal, mediastinal surfaces**. *Anterior margin* separates costal surface from mediastinal. There is cardiac notch on the anterior margin of left lung. The notch is closed inferiorly with the *lingula of left lung*. *Inferior margin* separates costal and mediastinal surfaces from diaphragmatic surface. The **hilum of the lung** is located on the mediastinal surface. The main bronchus and pulmonary artery enter the lung through its hilum and two pulmonary veins and lymphatic vessels leave the lung through the hilum too. The whole complex forms the root of the lung. In the right root main bronchus is located superiorly, pulmonary artery – in the middle of the root, pulmonary veins occupy inferior position (top down acronym **BAV**). In the left lung superior position belongs to the left pulmonary artery, the main bronchus is located medially and veins lie inferiorly (top down acronym **ABV**). The right lung has 3 lobes – superior, middle and inferior, which separate each other with *oblique* and *horizontal fissures*.

The left lung has only *oblique fissure*, that separates 2 lobes – superior and inferior. The main bronchus branches in the hilum to form *lobal bronchi* (*secondary bronchi*) which ventilate respective lobe. The lobal bronchi branch to form third order bronchi that are called *segmental bronchi*. They ventilate pulmonary areas that are called **segments**. Each

lung has 10 segments. The superior lobe of the right lung consists of 3 segments. The middle lobe has two segments – medial and lateral. The superior and inferior lobes of the left lung have five segments. Bronchi branch to form the bronchial tree inside the lungs. Within segment bronchi give off the bronchi of next order and such generation consists of bronchi of the 9th– 10th orders each of which is approximately 1 mm of diameter and retains cartilaginous tissue in its wall. Such bronchi are called lobular bronchi. They ventilate **lobules** – the smallest structural units of the lung. The lobular bronchus branches further to form 12–18 *terminal bronchioles*. All bronchi form the principal bronchus till the terminal bronchioles constitute a single **bronchial tree** which serve as passages for conducting air.

The terminal bronchioles in turn branch dichotomously to give origin to the *respiratory bronchioles*. *Alveolar ducts* arise radially from each respiratory bronchiole and terminate as blind air saccules (*alveolae*). The wall of each saccula is surrounded by a thick network of blood capillaries. The exchange of gases takes place through the alveolar walls. The respiratory bronchioles, alveolar ducts and air saccules with the alveoli compose a single **alveolar tree**, or the respiratory parenchyma of the lung. Derivatives of each terminal bronchiole form **acinus**, functional and anatomical unit of the lung.

The serous coating that covers walls of the thoracic cavity and lungs is called **the pleura**. It consists of 2 layers – parietal and visceral. Passing from walls to lungs, pleura forms the *pulmonary ligament* in the region of the hilum.

Parietal pleura covers thoracic cavity from inside and has following parts:

- *costal pleura*;
- *mediastinal pleura*;
- *diaphragmatic pleura*.

The cupula of pleura is formed by merging mediastinal and costal pleura. It covers apex of the lung and connects with its parenchyma. The slit-like space between visceral and parietal pleural layers is called **the pleural cavity**. The pleural cavity contains a small amount of serous fluid which protects frictions between pleural layers during inspiration and expiration. In places where

costal part of pleura joins mediastinal and diaphragmatic parts, the following recesses are formed:

- the *costodiaphragmatic recess* (the deepest one);
- the *phrenicomedial recess*;
- the *costomediastinal recess*.

They are the reserve spaces which allow lungs to expand during inspiration.

THE BOUNDARIES OF PLEURAL SACS AND LUNGS

The upper boundary of lungs and pleura (cupula pleurae) lies 2–3 cm higher the clavicle.

Posterior boundary of lungs and pleura run at the paravertebral line from the 1st to 11–12th thoracic vertebrae.

Anterior boundary of lungs and pleura coincide only to the level of the 4th rib. It runs from the apex to the sternoclavicular joint. Then on the right side it passes at sternal line, further, it slightly runs to the level of the 6th rib to the right at the parasternal line where the inferior boundary begins. Anterior boundary of the left lung (pleura) passes to parasternal line at the level of the 4th rib to the left where it descends vertically to the 6th rib where inferior boundary begins.

Inferior boundaries of lungs and pleura are different. On the right side it crosses the 6th rib at the midclavicular line, the 7th rib at the anterior axillary line, the 8th rib at the midaxillary line, the 9th rib at the posterior axillary line, the 10th rib at the scapular line and ends at the level of the neck of the 11th rib at the paravertebral line to join posterior boundary. The inferior boundary of the left lung runs similarly to that one of the right lung yet 1–2 cm lower.

The inferior boundary of the pleura runs on one rib lower than the boundary of the lung. The upper and lower segments of the anterior boundaries of pleura run apart thus giving space to neighbouring organs. These areas are called the *superior and inferior interpleural areas*. The superior interpleural area is located behind the manubrium of sternum. Its apex is faced downwards. It contains thymus in children and is called the *thymic area*. The

inferior interpleural area is called *pericardial area*. Its apex is faced upwards.

The complex of organs occupying the space between the mediastinal pleura is called **the mediastinum**. It is bounded by sternum in front, thoracic division of vertebral column behind, right and left mediastinal pleura on both sides, superior aperture of thoracic cage above and diaphragm below. Mediastinum is divided into two parts: *superior* and *inferior*.

Superior mediastinum is bounded by superior aperture of thoracic cavity above and imaginary plane that was drawn between the angle of sternum and the 4th thoracic vertebra. It contains thymus, left and right brachiocephalic veins, superior vena cava, aortic arch with its branches, trachea, oesophagus, thoracic duct, vagus nerves and diaphragmatic nerves.

The *inferior mediastinum* is located below the imaginary horizontal plane and divided into anterior, middle and superior compartments.

Anterior mediastinum is located between the body of sternum and anterior wall of pericardium. It contains internal thoracic arteries and veins, parasternal and pericardial nodes and fat.

Middle mediastinum is bounded by anterior and posterior walls of pericardium. The heart and large vessels, main bronchi, pulmonary arteries, and veins, diaphragmatic nerves, tracheobronchial and pericardial lymph nodes are located in the middle mediastinum .

Posterior mediastinum is located between the posterior wall of pericardium in front and vertebral column behind. It contains thoracic aorta, azygos, hemiazygos veins, sympathetic trunks, oesophagus, thoracic duct, posterior mediastinal and paravertebral lymph nodes.

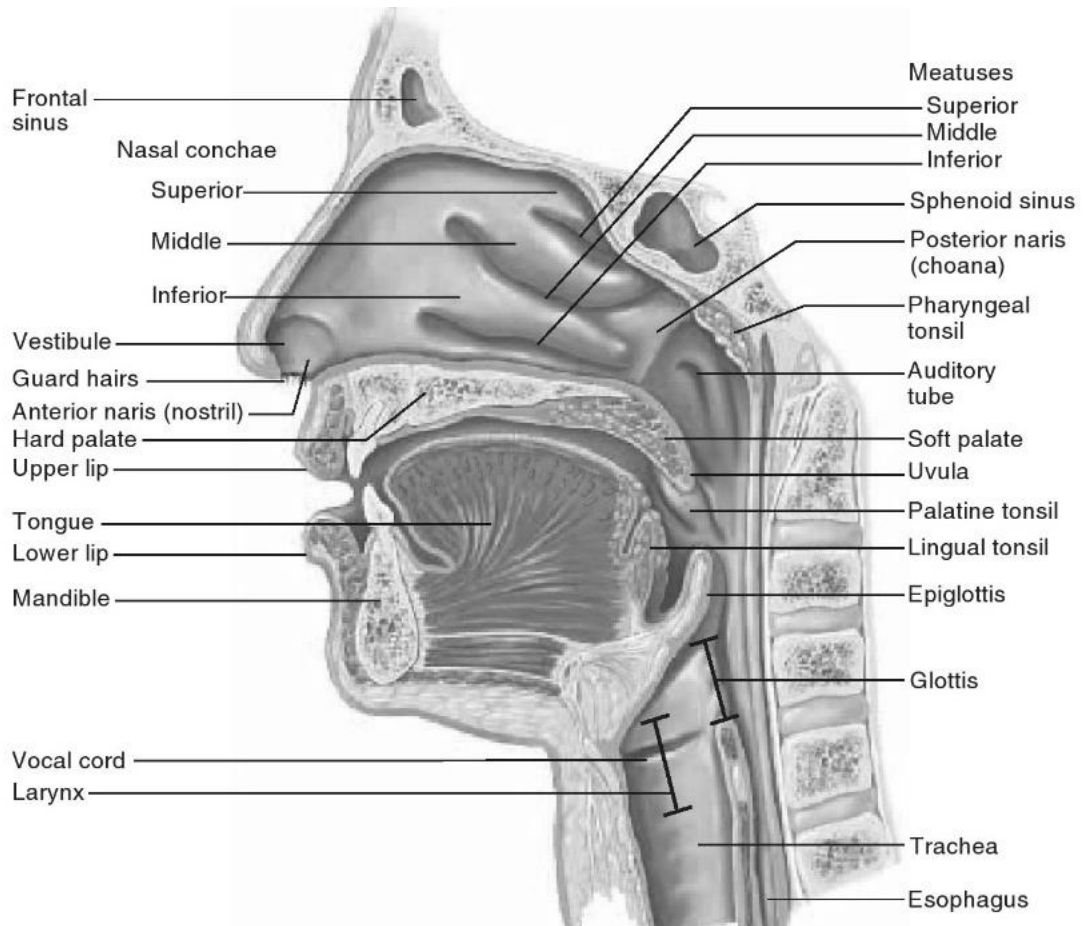


Figure 11-Internal Anatomy of Nasal Cavity, Pharynx, and Larynx

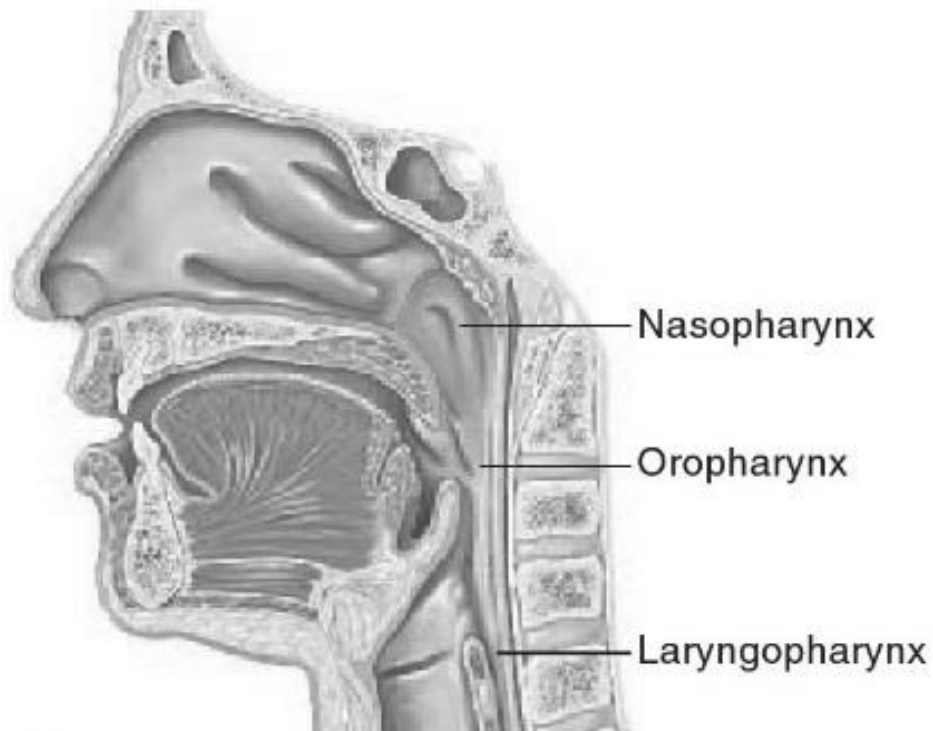


Figure 12-Regions of the Pharynx

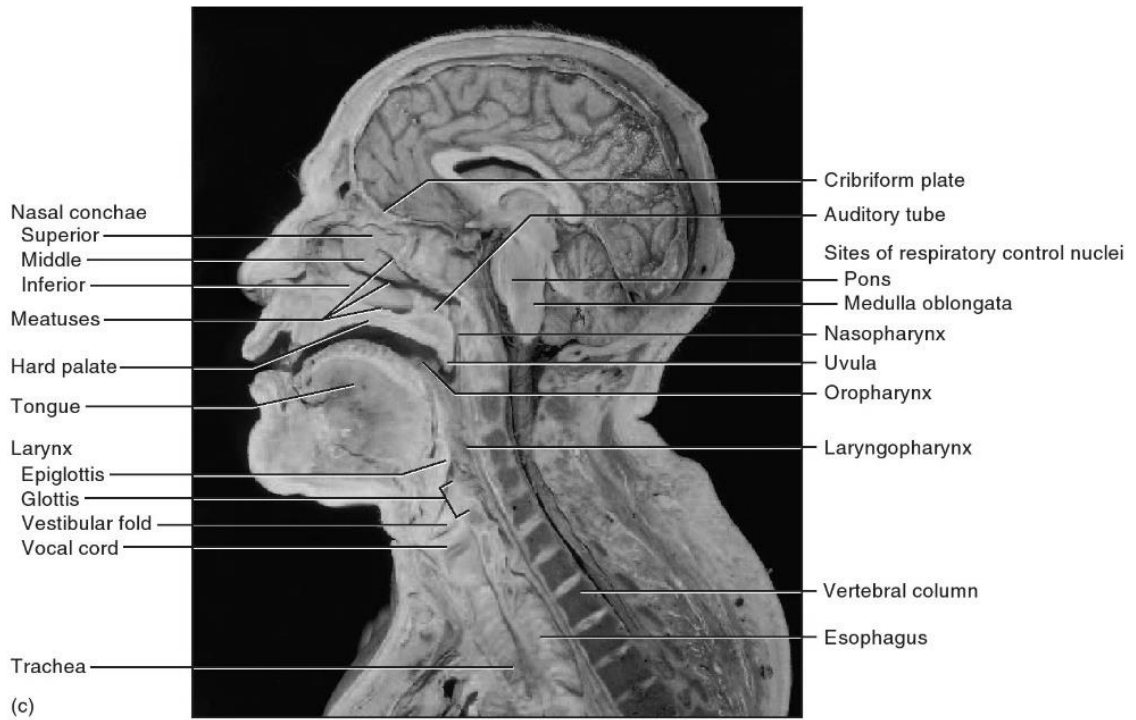


Figure 13-Median section of the head of a cadaver

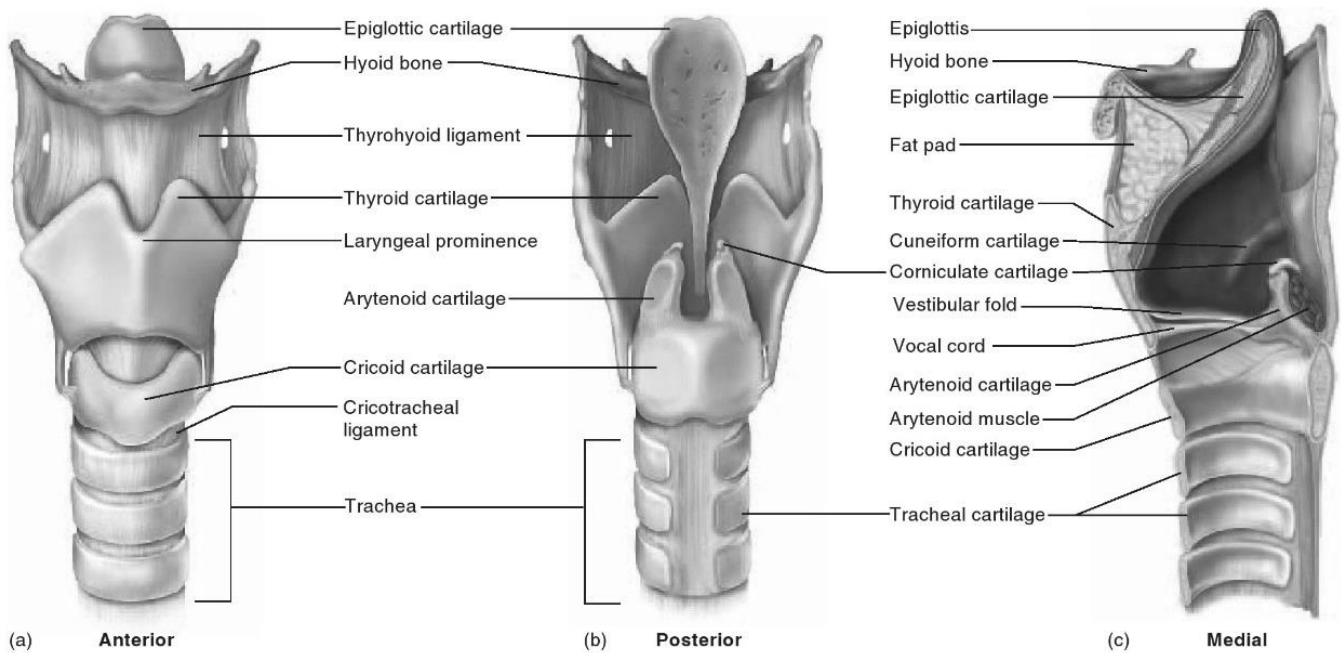
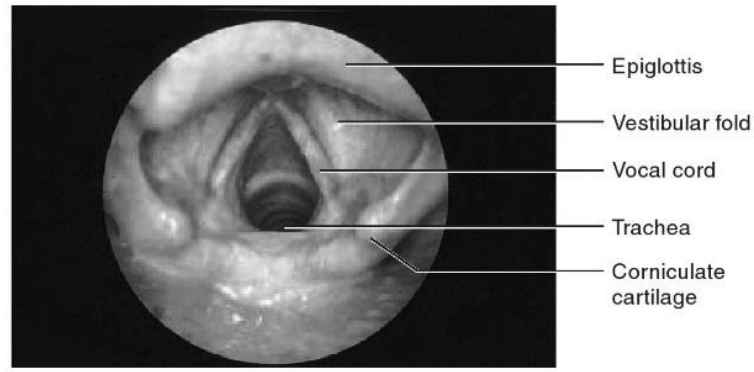
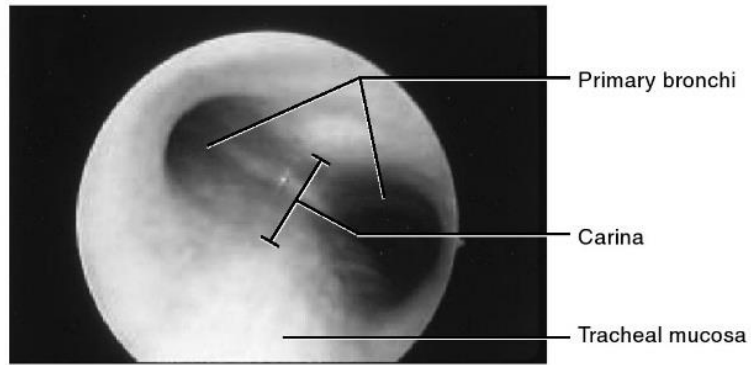


Figure 14-Anatomy of the Larynx. (a) Anterior Aspect. (b) Posterior Aspect. (c) Medial Section, Anterior Aspect Facing Left



(a)



(b)

Figure 15-Endoscopic Views of the Respiratory Tract. (a) Superior View of the Larynx, Seen with a Laryngoscope. (b) Lower End of the Trachea Where It Branches into Two Primary Bronchi Seen with a Bronchoscope

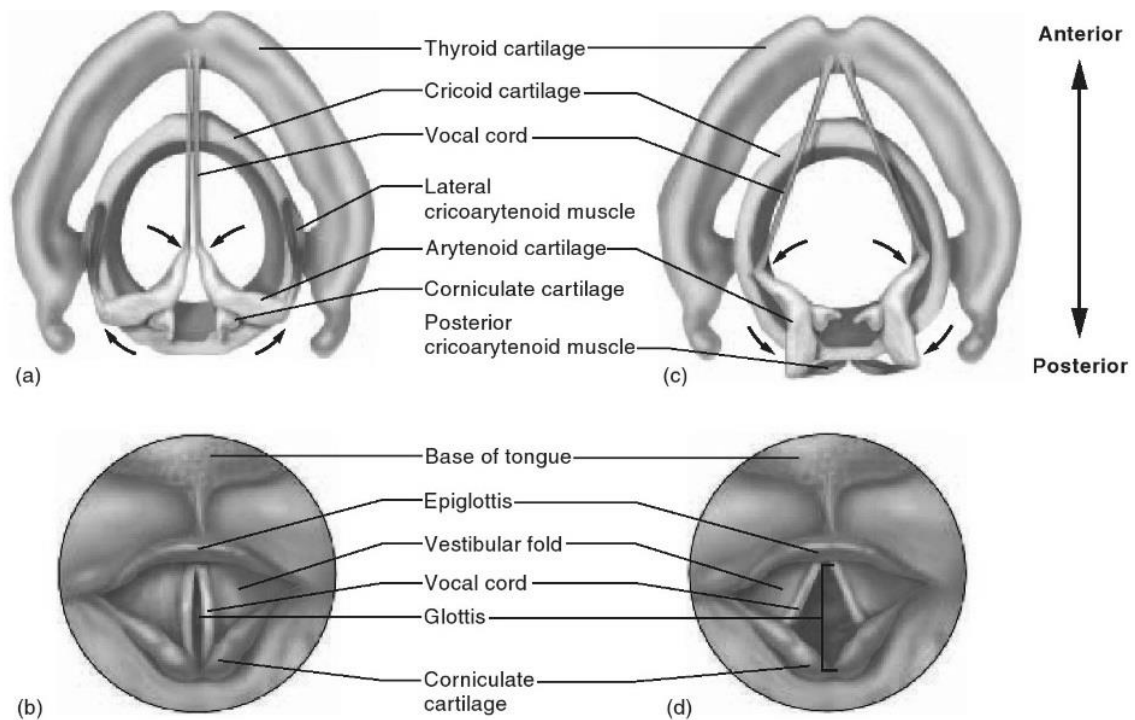


Figure 16-Action of Some of the Intrinsic Laryngeal Muscles on the Vocal Cords. (a) Adduction of the Vocal Cords by the Lateral Cricothyroid Muscles. (b) Adducted Vocal Cords Seen with the Laryngoscope. (c) Abduction of the Vocal Cords by the Posterior Cricothyroid Muscles. (d) Abducted Vocal Cords Seen with the Laryngoscope

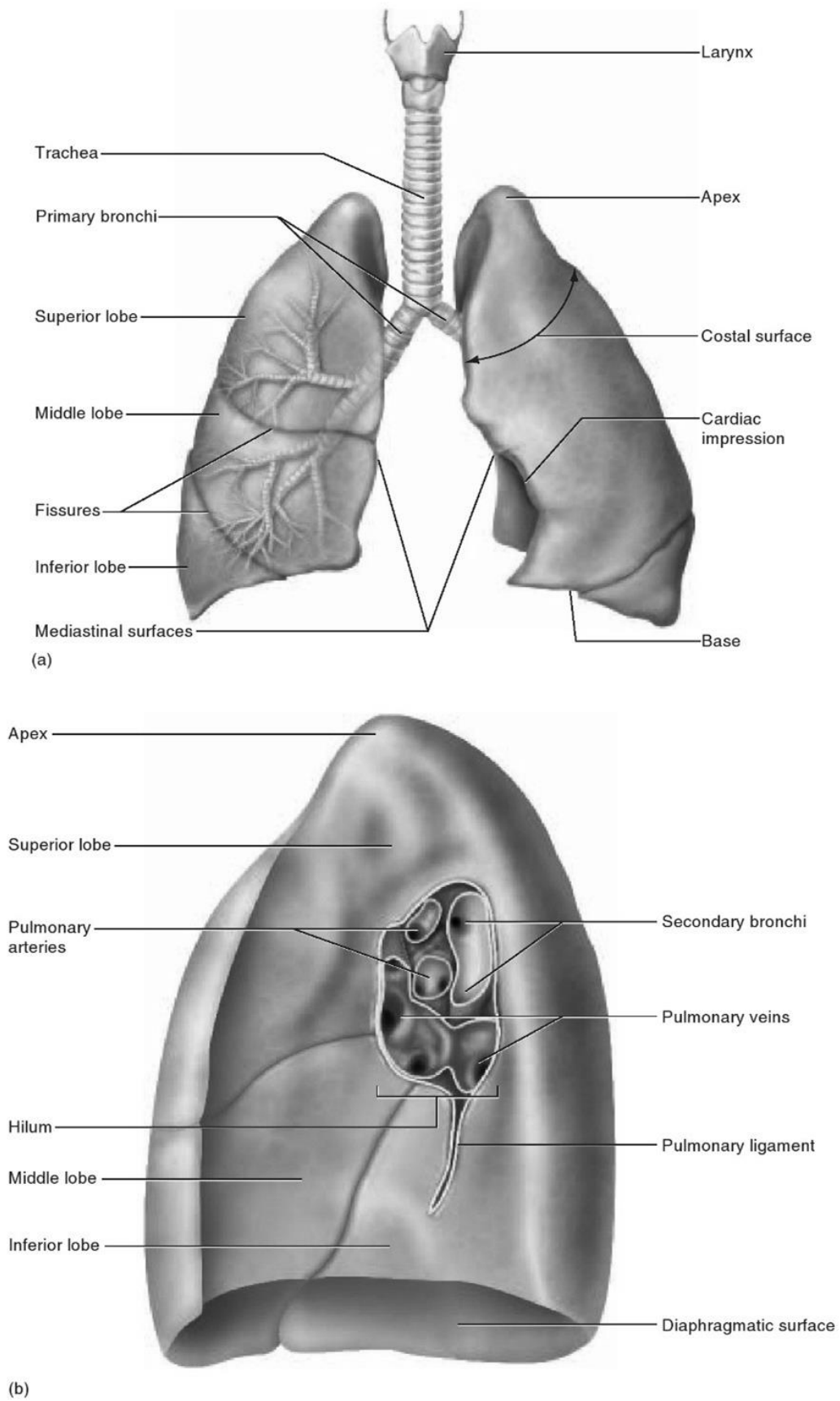
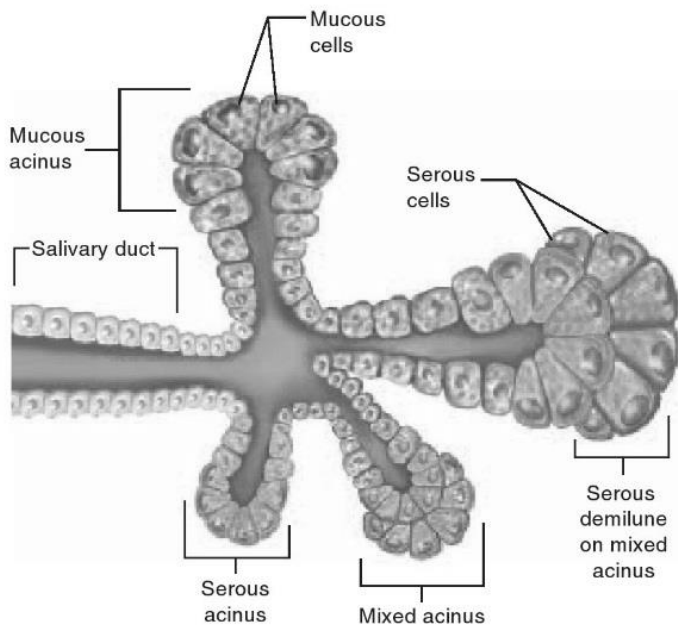
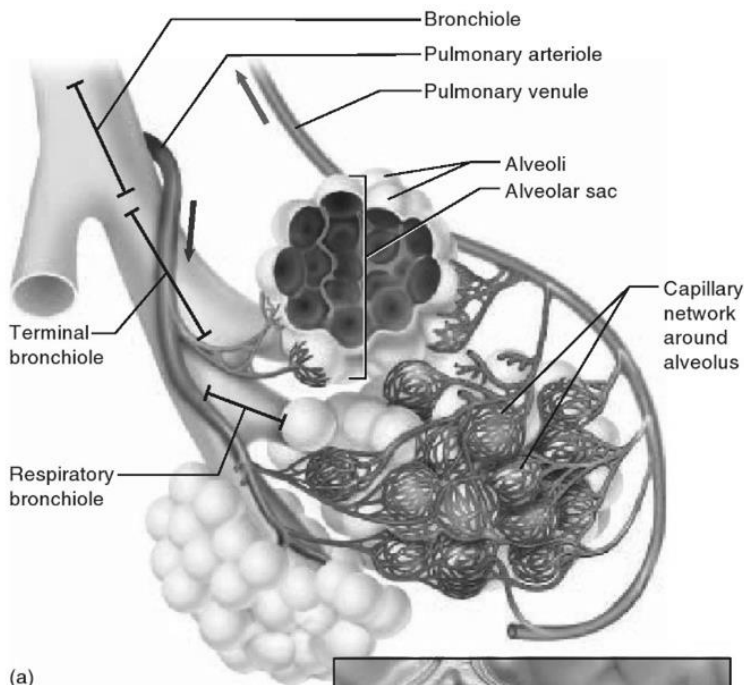


Figure 17-Gross Anatomy of the Lungs. (a) Anterior View. (b) Mediastinal Surface of the Right Lung

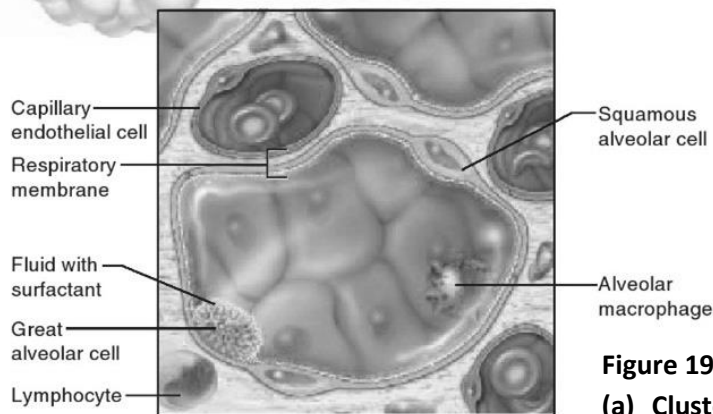


(a)

Figure 18-Microscopic Anatomy of the Salivary Glands. (a) Duct and Acini of a Generalized Salivary Gland with a Mixture of Mucous and Serous Cells. Serous Cells Often Form Crescent-shaped Caps Called Serous Demilunes over the Ends of Mucous Acini. The Salivary Gland doesn't have all the Features Shown Here. (b) Histology of the Sublingual Salivary Gland



(a)



(b)

Figure 19-Pulmonary Alveoli. (a) Clusters of Alveoli and Their Blood Supply. (b) Structure of an Alveolus

ORGANS OF URINARY SYSTEM

KIDNEY is a paired excretory organ producing the urine. Kidneys are located retroperitoneally in right and left lumbar regions. The right kidney is located at the level of Th12 to L3, and left kidney – at the level of Th11 to L2.

Kidney has anterior and posterior surfaces, upper and lower ends (poles), lateral and medial margins. The middle concave part of the medial margin forms the **hilum of the kidney**. The hilum of kidney passes renal artery and nerves inside and renal vein and the ureter outside. Renal artery, renal vein and ureter form a **renal stalk**. The hilum leads to the **renal sinus** which contains the **renal calices**, **renal pelvis** and **fat**.

Posterior surfaces of each kidney adjoin the **renal bed** which is formed with diaphragm, psoas major, quadratus abdominis and transversus abdominis muscles.

Anterior surface of the right kidney is bounded by the liver above, right colic flexure below and duodenum medially. Anterior surface of the left kidney is bounded by stomach in upper third, pancreas in middle third and loops of jejunum and ileum in lower third. The lateral margin of the left kidney adjoins the lien and the left colic flexure.

The following structures are responsible for **fixation of the kidney in place**:

- renal bed;
- renal stalk;
- renal coats.
- intraabdominal pressure.

The kidney's coats are:

- 1) fibrous capsule that covers kidney from outside;
- 2) perinephric fat (its medial and posterior portions are well developed);
- 3) renal fascia with prerenal and postrenal layers which are connected above the suprarenal gland and along lateral border and pass from one kidney to another covering renal stalk, abdominal aorta and inferior vena cava;
- 4) parietal peritoneum that covers kidneys anteriorly.

THE SUBSTANCE OF KIDNEY consists of renal **cortex** and **medulla**. The

cortex occupies the peripheral layer of organ. Medulla is formed with **renal pyramids**. The apices of pyramids are directed towards the sinus. The cortex penetrates between the pyramids and separates one from another. Such parts of cortex are known as **renal columns**. Medulla, in turn, continues into the cortex as **medullary rays** forming the radiate part of cortex. Portions of darker substance between rays are called the cortex.

The kidney is a compound tubular gland consisting of numerous renal tubules which open into the urine tracts (calyces and pelvis), and begin as the blind ends which form a double-walled capsules called a **glomerular capsule** or **Shumlyansky – Bowman capsule**. These capsules cover the bundles of capillary blood vessels called **glomerulus**. The glomerulus and capsule together form the **renal corpuscle** or **Malpighian corpuscle**. The renal corpuscles are in the convoluted part of the cortex. The glomerular capsule has 2 layers – the internal layer which adheres to the capillary endothelium and free external layer. The layers form a slit-like cavity which collects the glomerular filtrate. The capsular cavity continues with the convoluted tubules which pass in the radiate part of the cortex. The tubules then descend to the pyramid, forming the **nephron loop (Henle's loop)** and returns into the cortex. Here it terminates with convoluted part which continues with the **collecting duct**. The collecting ducts join with each other to form **papillary ducts** which open into the **minor calices** on the apices of renal papillae. The renal corpuscle and renal tubules form a morpho functional unit of kidney parenchyma called **nephron**.

BLOOD FLOW IN THE KIDNEYS

The **renal artery** arises from the abdominal aorta and entering the renal hilum, divides into 5 **segmental arteries**. The segmental arteries give off the **interlobar arteries** which run between pyramids. Between cortex and medulla they form **arcuate arteries**, which, in turn, give rise to the **interlobular arteries** piercing the cortex. Each interlobular artery gives origin to **afferent glomerular arterioles** which branch to form a tuft of convoluted capillaries, glomerulus, which is located in the initial part of the renal tubule,

Shumlyansky – Bowman capsule. The capillaries are collected into the *efferent glomerular arteriola* which splits again into capillary network around renal tubules and continues with vein. As a result, kidney has two capillary nets – *glomerular* and *peritubular*.

The primary urine is collected in the capsule cavity during filtration of the blood through the internal wall of the renal corpuscle, because the diameter of afferent arterioles is smaller than efferent ones. The primary urine is a blood without proteins. During reabsorption useful substances and water return into blood. The reabsorption takes place between the wall of renal tubules and peritubular capillary net. As a result, the secondary urine is produced. It flows from renal papilla on the apex of renal pyramids into the minor calices. The minor calices surround the renal papilla and merge to form major calices. The major calices in turn form the renal pelvis which leaves the kidney through the hilum behind the renal vessels and continues with the ureter. Walls of the calices and pelvis contain nonstriated circular muscular fibers which look like sphincters. The sphincters help in excretion of urine through the calices and pelvis and prevent urine backflow.

THE URETER is a paired tubular organ which connects the renal pelvis with the urinary bladder. It lies retroperitoneally and consists of 3 parts:

- *abdominal part*;
- *pelvic part*;
- *intramural part*.

Ureter has 4 constrictions:

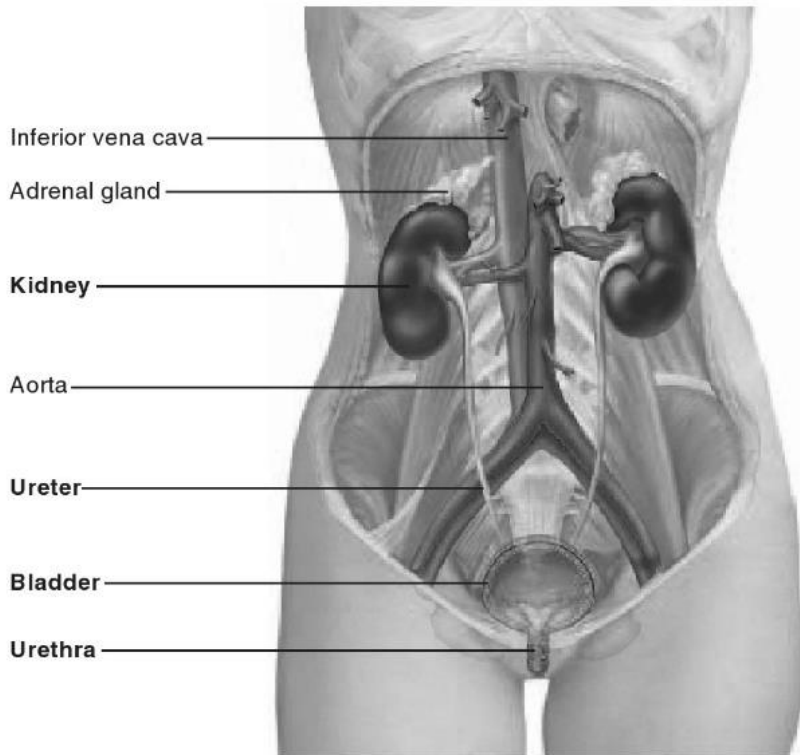
- 1) at the junction of ureter and renal pelvis;
- 2) where ureter enters lesser pelvis;
- 3) in pelvic part;
- 4) within the wall of urinary bladder.

The wall of ureter has 3 layers: adventitia (external layer); muscular layer (middle) consisting of external longitudinal and internal circular fibers in upper 2/3 and external and internal longitudinal fibers and circular middle fibers in lower 1/3 of ureter; mucosa (internal layer) which forms small longitudinal folds.

THE URINARY BLADDER is a hollow organ serving as a temporary urine storage container. It is located in the cavity of lesser pelvis behind pubic symphysis. It has *apex* that is directed upward, *body, fundus* that are directed downward, and *neck* which continues into urethra. Empty bladder lies extraperitoneally. Serosa covers only posterosuperior wall of empty urinary bladder. Full bladder lies mesoperitoneally.

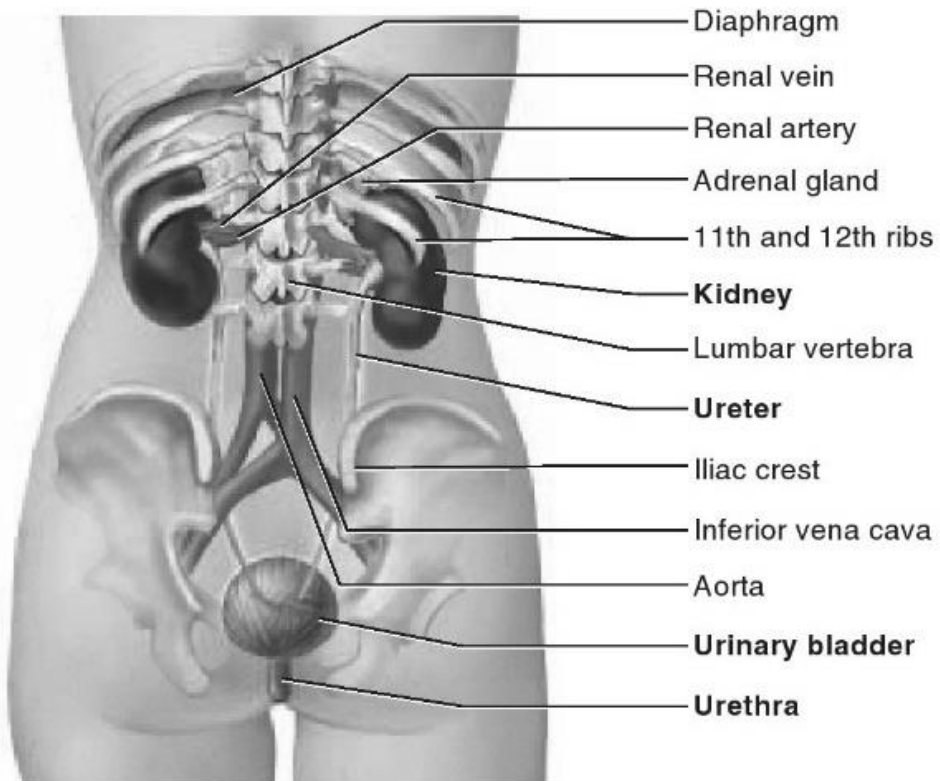
The fundus in male is attached to the prostate and located above the seminal vesicles and ampulla of ductus deferens and in front of the rectum. The muscular layer is represented with non-striated muscular fibers which form 3 layers – external and internal longitudinal and middle circular. The middle circular layer forms involuntary sphincter around the internal urethral orifice. The submucosa of urinary bladder is well developed. As a result, mucosa forms a lot of folds. But folds are absent between ureteric orifices and internal urethral orifice. This place is called the trigone of bladder.

THE FEMALE URETHRA arises from the urinary bladder by means of internal orifice and ends as external urethral orifice which opens into vaginal vestibule. This orifice is surrounded with circular striated muscle which forms external voluntary urethral sphincter and belongs to perineal muscles.



(a)

Figure 20-The Urinary System. (a) Ventral View, with Peritoneum and Other Tissues Removed to Expose the Retroperitoneal Urinary Organs. Organs of the Urinary system are indicated in Boldface font. (b) Dorsal View Showing Relationship of the Urinary Organs to Skeletal Landmarks



(b)

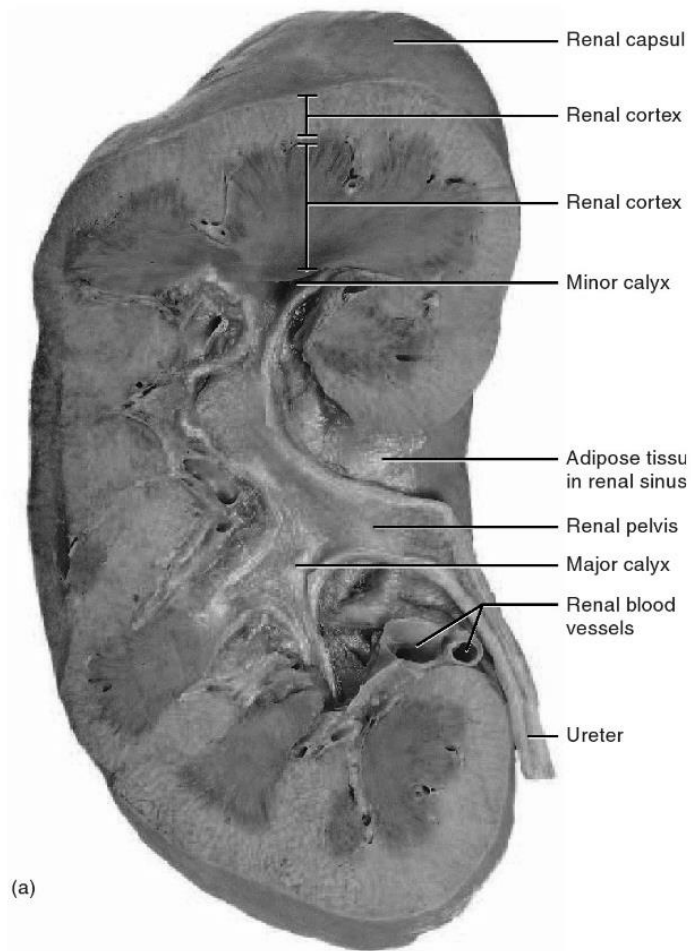
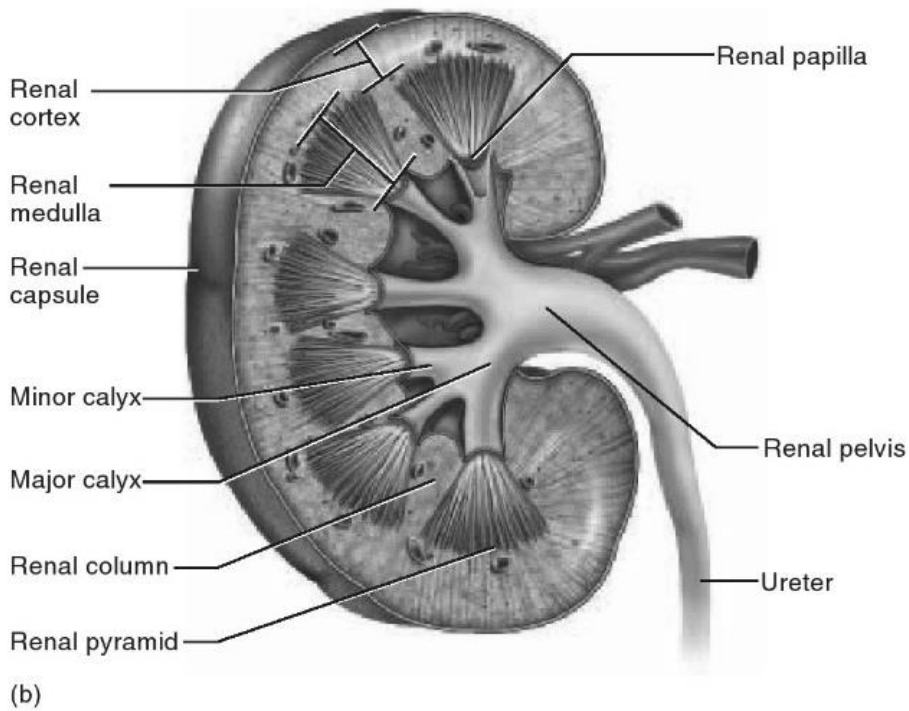


Figure 21-Gross Anatomy of the Kidney. (a) Photograph of Frontal Section. (b) View of Frontal Section



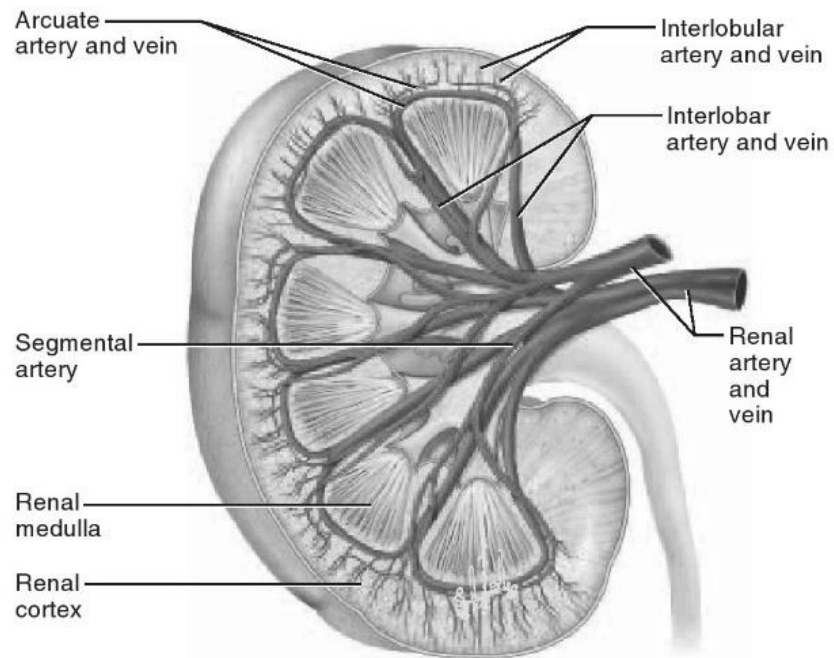


Figure 22-Renal Circulation. The Large Blood Vessels of the Kidney

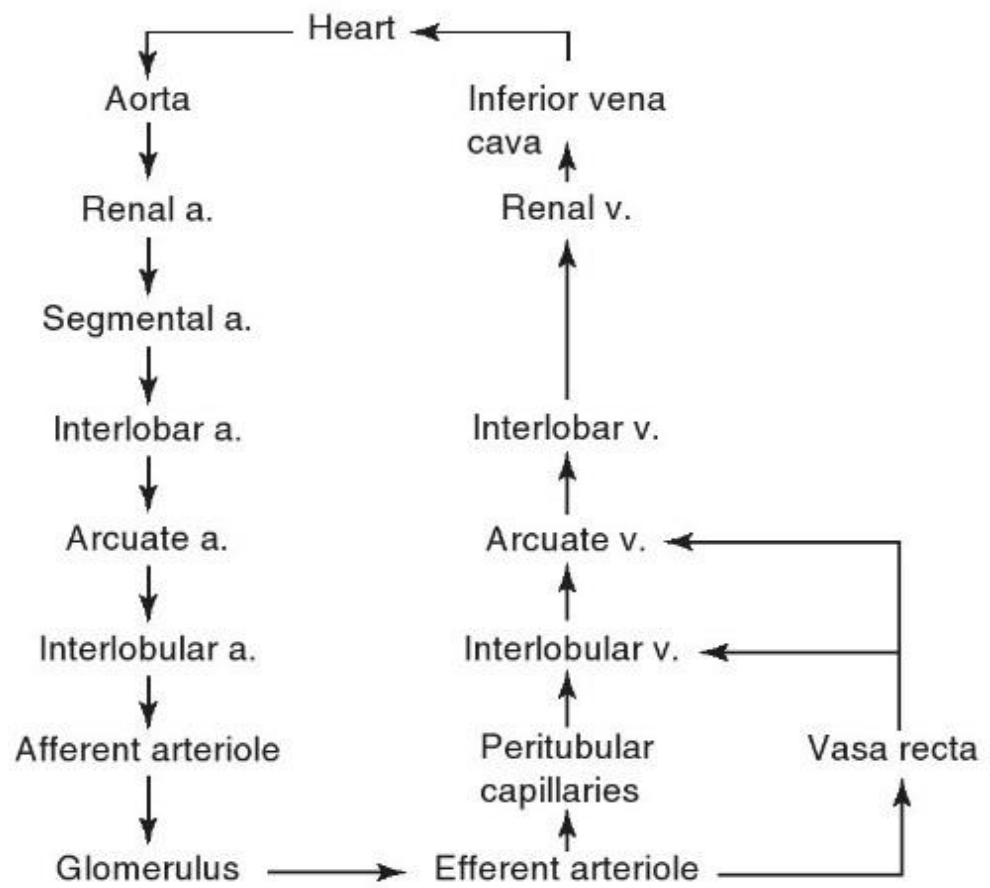


Figure 23-Scheme of Renal Circulation

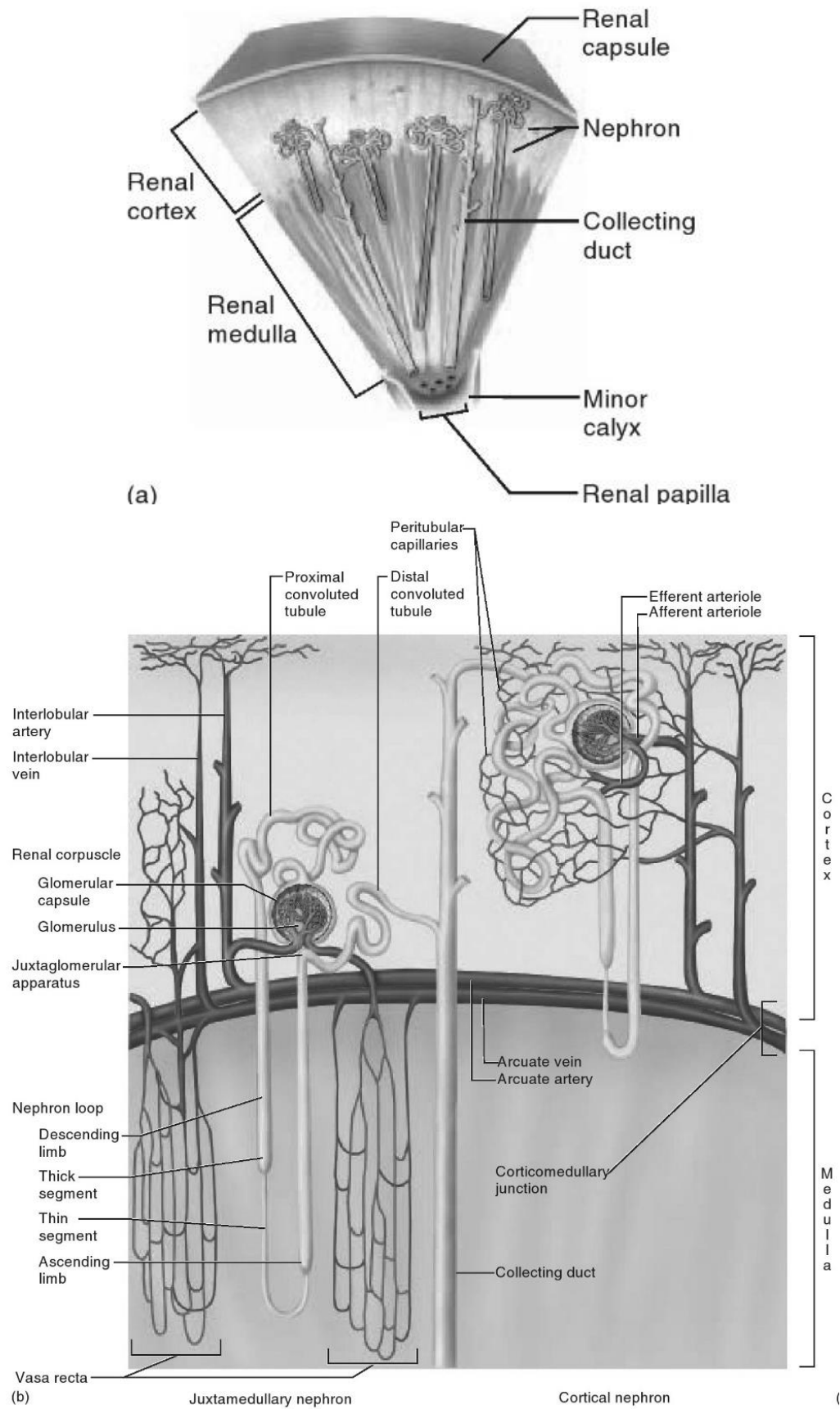


Figure 24-(a) The Location of the Urinary Tubules. (b) Various Versions of Nephrons

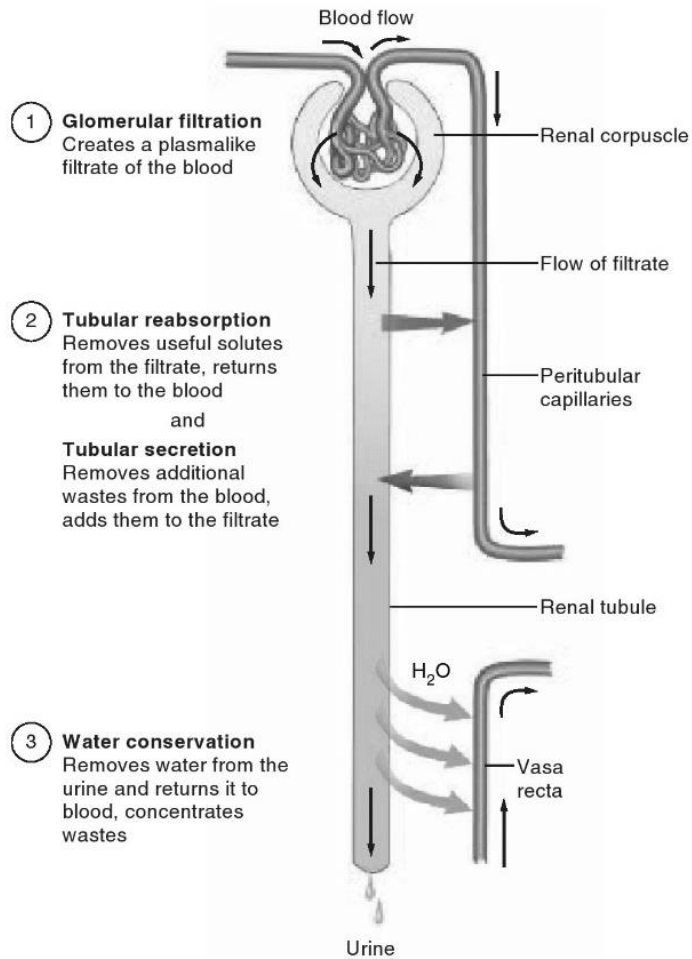


Figure 25-Basic Steps in the Formation of Urine

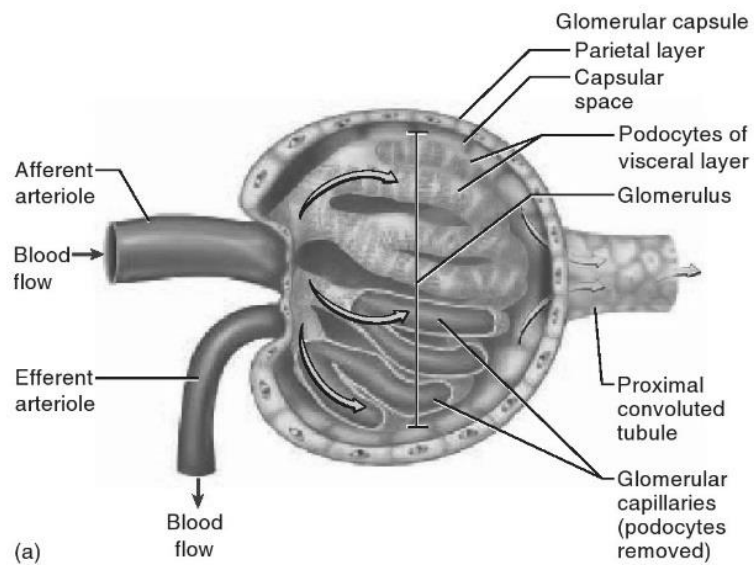


Figure 26-The Renal Corpuscle. (a) Anatomy of the Corpuscle

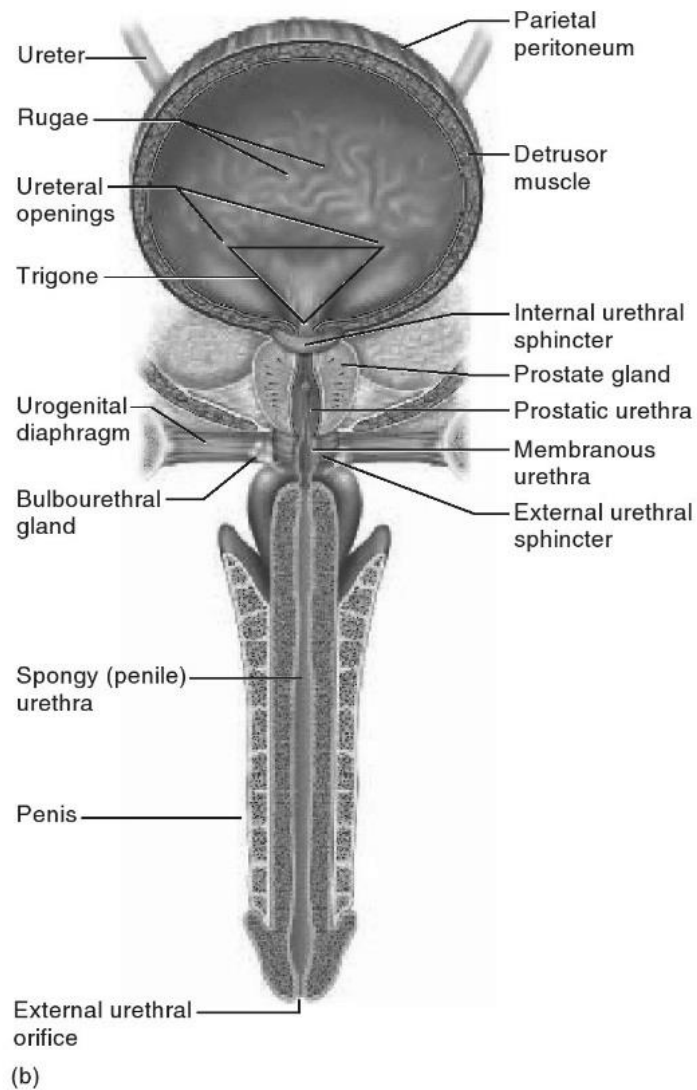
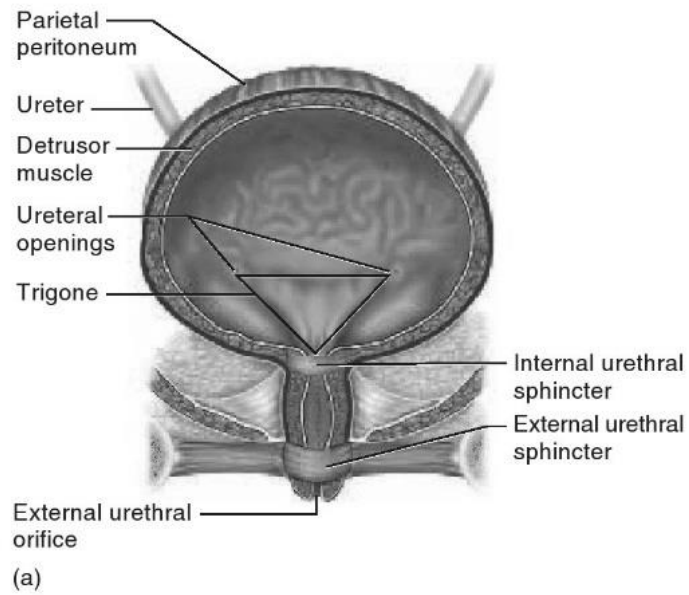


Figure 27-Anatomy of the Urinary Bladder and Urethra. (a) Female. (b) Male

THE GENITAL ORGANS

THE FEMALE GENITAL ORGANS

are divided into internal and external.

The **internal female genital organs** are: ovaries, uterine tubes, uterus and vagina.

The **external female genital organs** include structures that surround pudendal fissure: labia pudenda majora and labia pudenda minora, vestibule of vagina, clitoris and mons pubis.

The **UTERUS** is an unpaired hollow muscular organ which is located in the cavity of lesser pelvis between urinary bladder in front and rectum behind. It has the following parts: **fundus, body, cervix**. The cervix of uterus is divided into *supravaginal* and *vaginal portion* and opens into vagina by *uterine opening* which is bounded by *anterior and posterior lips*. A small narrow portion between the body and cervix is called *isthmus of uterus*. The uterine body has *vesical* (anterior) and *intestinal* (posterior) *surface*.

When urinary bladder is empty, the vesical surface is directed forward and downward. This forward inclination is known as *anteversion*. When urinary bladder is filled, uterus is inclined backward – *retroversion*. Normally the body of uterus forms with cervix an angle which is opened forward. Such position is called *anteflexio*. Backward flexion of uterine body, *retroflexio*, is a pathological condition.

The *uterine cavity* has the triangular shape and communicates with the uterine tubes at the top and with the vagina below. The uterine wall is composed of 3 layers:

- 1) **endometrium** or mucous coat. It does not form folds;
- 2) **myometrium** or muscular coat. It consists of smooth muscular fibers. Three layers are distinguished in it – internal and external longitudinal layers and the thickest, middle circular layer;
- 3) **perimetrium** or serous coat. It covers all uterus except cervix and forms a rectouterine pouch which is located behind the uterus, and vesico uterine pouch which is located in front of uterus.

The ligaments of the uterus:

1. The **broad ligament** is a peritoneum duplication, which expands between the uterine borders and lateral pelvic walls. It serves as a mesentery for uterus (mesometrium), for ovary (mesovarium), and for uterine tube (mesosalpinx).

2. The **round ligament** of uterus passes within the broad ligament from vesical surface of uterus to the uterine tube, leaves the pelvis via the inguinal canal to terminate in the subcutaneous fat of the mons pubis and labia majora.

3. The **cardinal ligament** fixes the uterus to the walls of lesser pelvis. It is located within the base of the broad ligament.

The space between the peritoneal plates of the broad ligament, mostly in its inferior portion, is filled with fat and called the **parametrium**. The fat around the cervix is called **paracervix**.

THE OVARY is a paired organ. It is a female sex gland which produces oocytes and hormones. It is located in the cavity of lesser pelvis behind the broad ligament. It lies on the lateral wall of pelvis in the ovarian fossa which is bounded by internal and external iliac arteries and veins. The ovary has lateral and medial surfaces; upper *tubal extremity* and lower *uterine extremity*; *free posterior border* and anterior *mesovarian border*. The mesovarian border contains the **hilum of ovary** which passes via vessels and nerves. The ovary is fixed to uterus by means of *ligament of ovary* and to walls of pelvis by means of *suspensory ligament of ovary* which runs from the linea terminalis to the tubal extremity. The ovary is covered with germinal epithelium but not with peritoneum. The mesovarium continues with the broad ligament of uterus.

The principal substance of ovary is divided into ovarian cortex and ovarian medulla. The ovarian medulla is the central portion of organ, it contains blood and lymph vessels and nerves. The ovarian cortex is the outer portion which contains a follicles where oocytes develop.

THE UTERINE TUBE is a paired organ. It serves for conduction of oocytes to uterus. It is covered with peritoneum from all sides and located in the upper portion of the broad

ligament. The portion of latter is related to the tube and called **mesosalpinx**.

The uterine tube has 4 parts: uterine part, isthmus, ampulla, infundibulum. The **uterine part** is located within the wall of uterus. It opens into the uterine cavity with uterine ostium. The **isthmus** is the narrowest part of uterine tube. The **ampulla** is wide and the longest part of the uterine tube. The **infundibulum** is the terminal, most dilated portion ending with the abdominal ostium and numerous processes (fimbriae). The longest fimbria reaches ovary and terminates in the **ovarian fimbria**.

The tubal wall consists of the following layers:

1. Mucosa which is lined with ciliated epithelium. Cilia drive the content of tube to the uterus. The mucosa forms a lot of folds, therefore submucosa is well developed.

2. The muscular layer. It consists of two layers of non-striated muscles: external longitudinal and internal circular.

3. Serosa. It is the external layer.

THE VAGINA connects the uterine cavity with external genital organs. Upper portion of vagina surrounds the cervix of uterus forming anterior and posterior fornices. Vaginal wall consists of 3 layers:

- external or adventitia which is fixed to adjacent organs;

- middle, muscular layer, represented with external longitudinal and internal circular layers;

- internal layer, mucosa, lacks submucosa but forms a transverse vaginal rugae which are located between anterior and posterior vaginal walls.

THE EXTERNAL FEMALE GENITAL ORGANS:

- **mons pubis**;

- **labia majora**. They enclose pudendal cleft;

- **labia minora**. They enclose the vestibule of vagina;

- **the clitoris**. It is similar to male corpora cavernosa of penis but much smaller;

- **the vestibule of vagina**. It contains clitoris and external urethral orifice;

- **the greater vestibular glands**; they are located within the base of labia minora and produce secretion which moistens vaginal inlet.

THE MALE GENITAL ORGANS

The male genitalia are divided into external and internal.

The male internal genitalia comprise the testes, epididymis, prostate and bulbourethral gland.

The male external genitalia comprise the penis and scrotum.

The **male urethra** serves not only for passage of urine but also for the passage of sperm. Therefore it belongs both to urinary and genital system.

THE TESTES are paired organs which produce male genital cytes and hormones. They are located in the scrotum. Each testis has upper and lower poles, medial and lateral surfaces, anterior and posterior borders.

The epididymis adjoins to the posterior testicle margin. They consist of the head, body and tail. The *sinus of epididymis* is located between the testes and the body of epididymis. Testes are covered with *tunica albuginea*. On the posterior border the tunica penetrates the testicular parenchyma forming the *mediastinum of testes*. The fibrous septa of mediastinum run radially and separate the testicular parenchyma into the *lobules of testis*. The *tubuli seminiferi contorti* are located in each lobule (2–3). The semen is produced here. Tubuli seminiferi contorti reaching the apex of lobule merge to pass into the *tubuli seminiferi recti* (straight). The last ones run into *rete testis* in mediastinum. The rete testis gives rise to *efferent ducts* passing to the head of epididymis. On leaving the testis efferent ducts become convoluted and form lobules of epididymis. The efferent ducts drain into a *duct of epididymis* which descends to the tail where are located loops and continues into ductus deferens.

THE DUCTUS DEFERENS has *scrotal, funicular, inguinal* and *pelvic parts*. Its wall consists of serosa, muscular tunic and adventitia. The ductus deferens passes through the inguinal canal to internal ring entering the

content of spermatic cord. The pelvic part joins the duct of seminal vesicle forming *ampulla of ductus deferens*.

THE SPERMATIC CORD is a complex of structures. It was formed in embryo when testes descend into the scrotum from the abdominal cavity. It expands from upper pole of testes to deep inguinal ring. The spermatic cord comprises structures as follows:

- ductus deferens;
- testicular artery;
- artery of ductus deferens;
- pampiniform plexus;
- vaginal process.

THE SEMINAL VESICLES are paired organs. They are located in lesser pelvis between rectum and fundus of urinary bladder laterally to the ampullae of ductus deferens. They produce sperm component. The *excretory duct of seminal vesicle* merges with ampulla of ductus deferens forming the *ejaculatory duct*. The latter penetrates into prostatic parenchyma and opens into prostatic part of urethra laterally to the seminal colliculus.

THE PROSTATE is an unpaired musculo secretory organ. The prostate has the *base* and the *apex, anterior and posterior surfaces, right and left lobes* and *isthmus*. The base of prostate adjoins to urinary bladder. Its apex contacts with urogenital diaphragm. The isthmus of prostate is located between both ejaculatory ducts and posterior surface of urethra. Often it is enlarged at hypertrophy of prostate and may cause serious disorders of urination. Glandular part of prostate is represented with alveolar tubular glands which secrete prostatic juice and are opened by prostatic ducts on the posterior wall of the prostatic part of urethra on sides of seminal colliculus. The muscular part of prostate is an involuntary sphincter of urethra that prevents urine flowing during ejaculation. As a result the urine and semen are not mixed.

THE BULBOURETHRAL GLANDS are paired alveolar tubular glands which are located in the thickness of urogenital diaphragm. Their ducts open into membranous part of urethra. The bulbourethral glands

produce a viscous secretion which protects the urethral walls from irritation by urine.

THE MALE EXTERNAL GENITAL ORGANS

THE SCROTUM is sac-like outgrowth of the anterior abdominal wall. Testes with their tunics are located in the scrotum. The scrotal cavity is subdivided into two compartments by the septum of scrotum. The scrotum has 7 coats. They are represented with corresponding layers of the anterior abdominal wall:

1. Skin.

2. Tunica dartos. It is a continuation of inguinal and perineal connective tissue without fat. It forms a septum of scrotum.

3. External spermatic fascia. It is a continuation of superficial fascia of abdomen.

4. Cremasteric fascia. It is a continuation of the fascia of the abdominal external oblique muscle. It covers cremasteric muscle.

5. Cremasteric muscle. It is a continuation of the transversus abdominis muscle and internal oblique muscle.

6. Internal spermatic fascia. It is a continuation of transverse fascia.

7. Tunica vaginalis testis. It was formed from the peritoneal vaginal process and consists of parietal and visceral plates. The visceral layer is tightly connected with the tunica albuginea of testis and also covers epididymis. The slit-like space between both plates is a vaginal cavity. Vaginal cavity is filled with serous fluid.

THE PENIS serves for passage of urine and semen. It has a root, body, glans penis. Penis is formed by paired corpus cavernosum penis and unpaired corpus spongiosum penis.

THE MALE URETHRA is a tube which penetrates into a prostate (*prostatic part*), urogenital diaphragm (*membranous part*) and corpus spongiosum penis (*spongiosus part*). Prostatic and membranous parts form posterior (fixed) portion of urethra and spongiosus part forms anterior, free portion.

The *seminal colliculus* is located on the prostatic part of urethra, on the top of which the *prostatic utricle* is located. Ejaculatory ducts are opened laterally to the seminal colliculus.

Male urethra has 3 sphincters:

- internal (involuntary); it is located in place of the internal urethral orifice within the urinary bladder;

- prostatic sphincter (involuntary); it is formed with non-striated muscle fibers of prostate;

- external (voluntary) sphincter which is formed with striated muscle fibers of urogenital diaphragm.

The urethra has the following parts: internal urethral orifice, membranous part, external urethral orifice on glans penis. Also male urethra has such dilations: prostatic part, expansion of corpus spongiosum penis in the root of penis, navicular fossa in the glans penis.

THE PERINEUM

The perineum is a complex of soft tissues that close the pelvic outlet. It is rhomboid in shape and bounded by inferior border of pubic symphysis in front; apex of coccyx behind; inferior pubic rami, sciatic rami and ischial tuberosities laterally. Transverse imaginary line connecting ischial tuberosities, divides perineum into two triangles: anterior urogenital and posterior pelvic. The space between anus and external genital organs is known as perineum in narrow aspect. Ruptures of this area during delivery require surgical treatment.

Muscles of perineum are divided into 2 groups: superficial and deep.

Superficial muscles of urogenital triangle are *superficial transverse perineal muscle, ischiocavernosus muscle, bulbospongiosus muscle*.

Superficial muscle of pelvic triangle is *external anal sphincter*.

The deep muscles of perineum and fascia, covering them, form *urogenital and pelvic diaphragm*.

The deep muscles of urogenital diaphragm are: *deep transverse perineal muscle, external urethral sphincter*.

Deep muscles of pelvic diaphragm are: *levator ani muscle, coccygeus muscle*.

Fascia of the pelvic triangle:

- superficial fascia of perineum (it is a continuation of the superficial fascia of the body); it terminates in the skin of the anus;

- the inferior fascia of pelvic diaphragm (it covers deep muscles from outside; it is a continuation of gluteal fascia);

- the superior fascia of pelvic diaphragm (it is a continuation of parietal plate of pelvic fascia that covers superior surface of levator ani muscle).

The **ischio-anal fossa** is located laterally to levator ani muscle and anus. It contains fat, vessels and nerves.

Fasciae of the urogenital triangle. The proper fascia of perineum runs here and splits into 3 plates:

- deep plate that surrounds pelvic surface of deep transverse perineal muscle and external urethral sphincter and is called the superior fascia of urogenital membrane;

- middle plate that surrounds the inferior surface of deep muscles and called the inferior fascia of urogenital membrane;

- superficial plate of proper perineal fascia covers superficial muscles of urogenital triangle from outside and continues as a fascia of penis or clitoris.

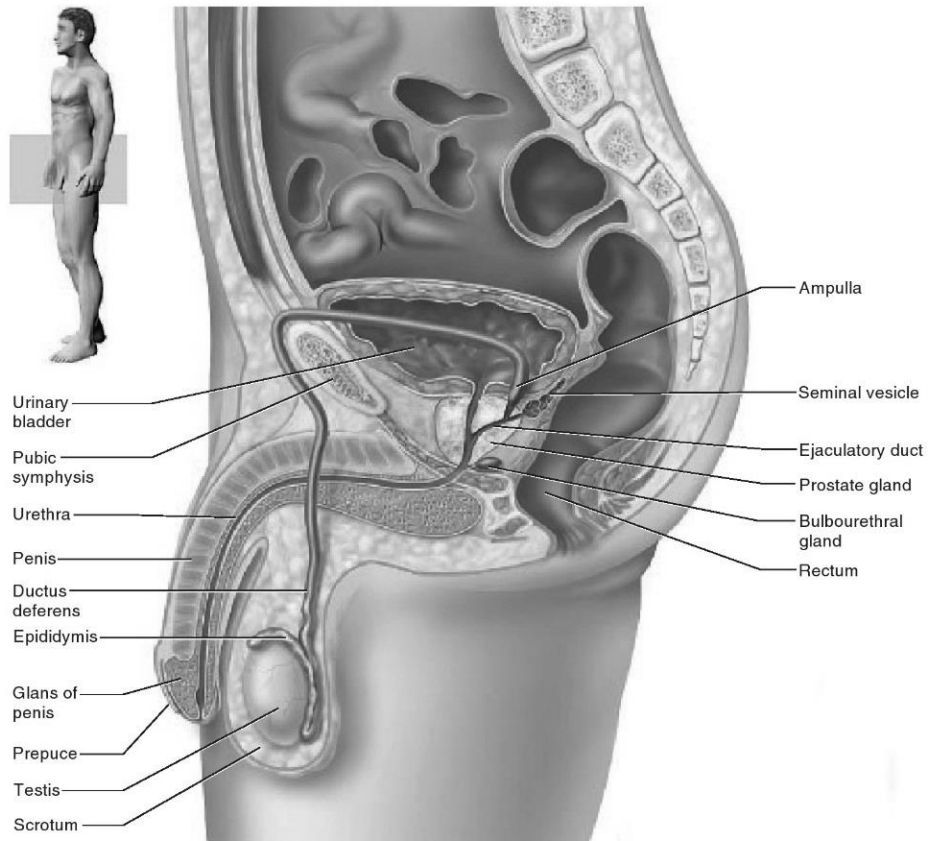


Figure 28-The Male Reproductive System (Saggital section)

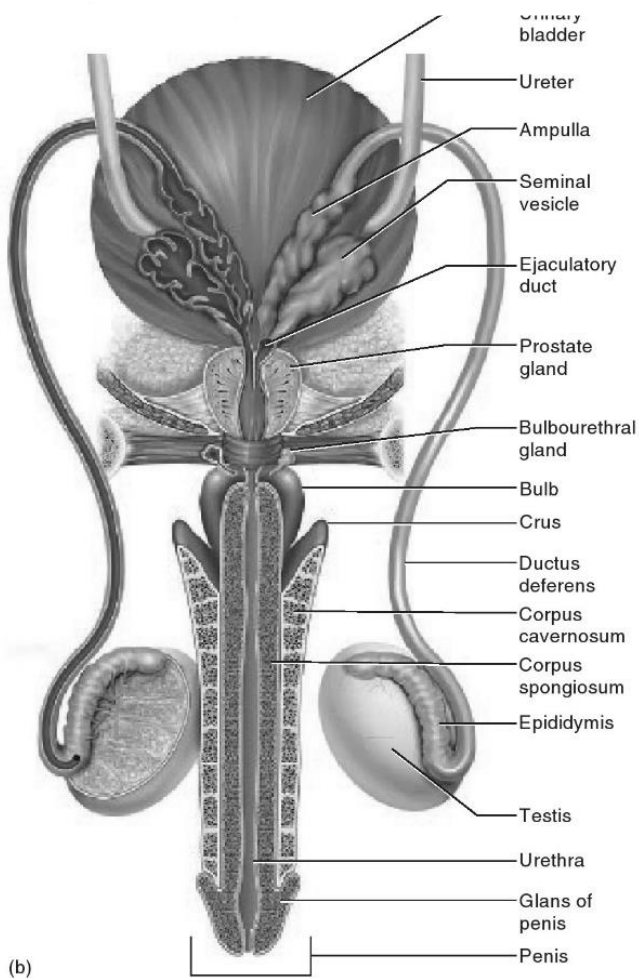


Figure 29-The Male Reproductive System (Frontal Section, Anterior View)

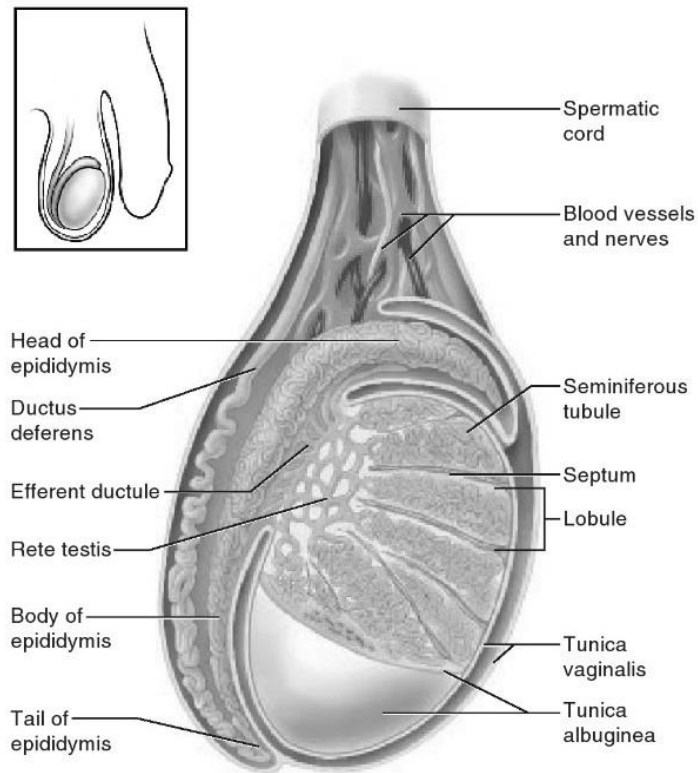


Figure 30-The Testis and Associated Structures. Anatomy of the Testis, Epididymis, and Spermatic Cord

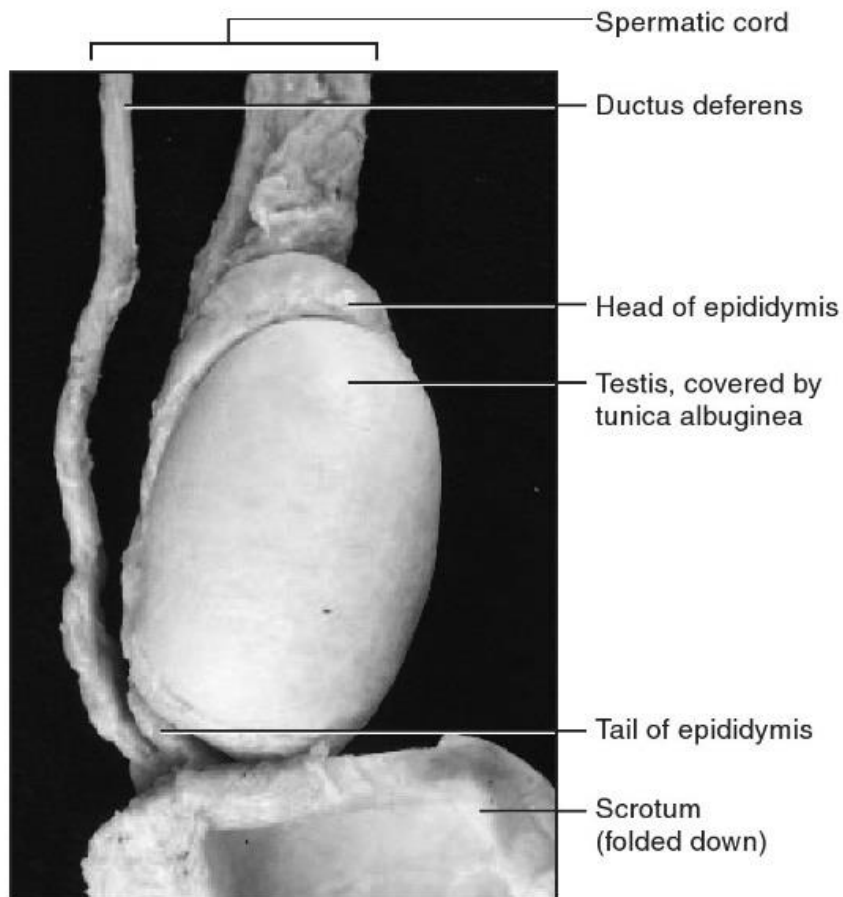


Figure 31-Photography of the Testis, Epididymis, and Spermatic Cord

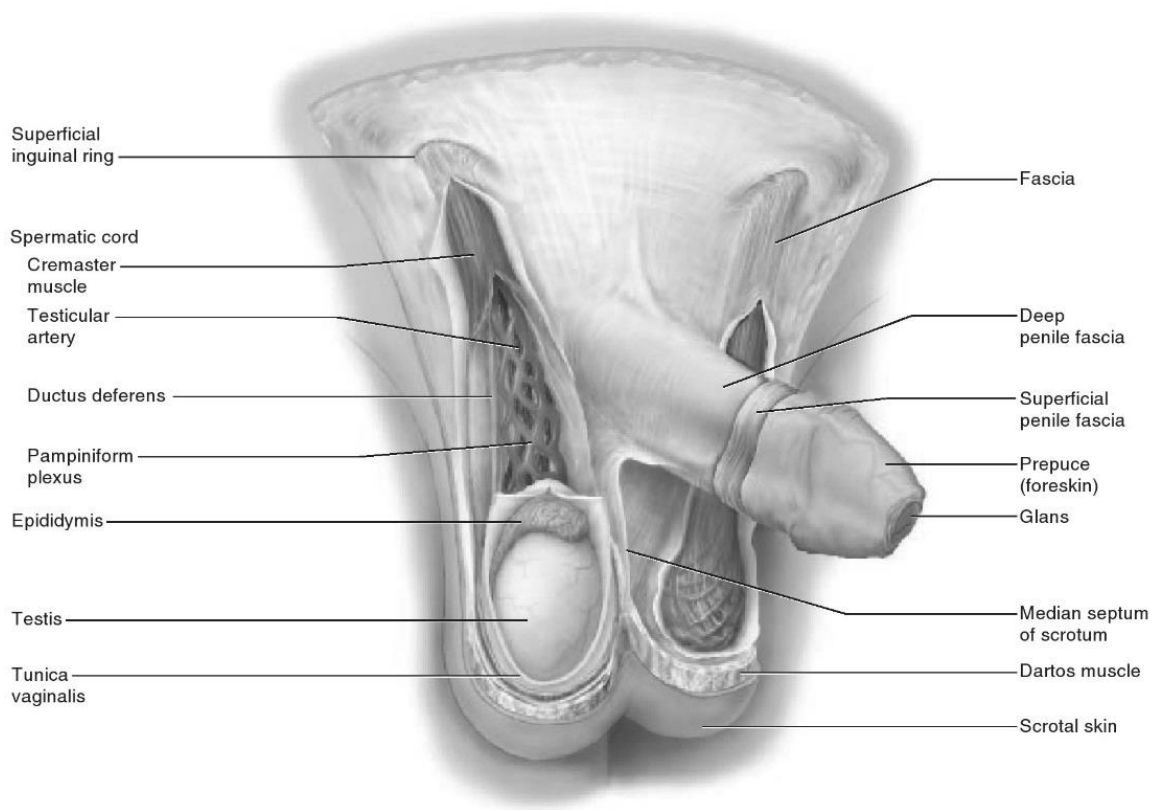


Figure 32-Anatomy of the Male Inguinal Region and External Genitalia

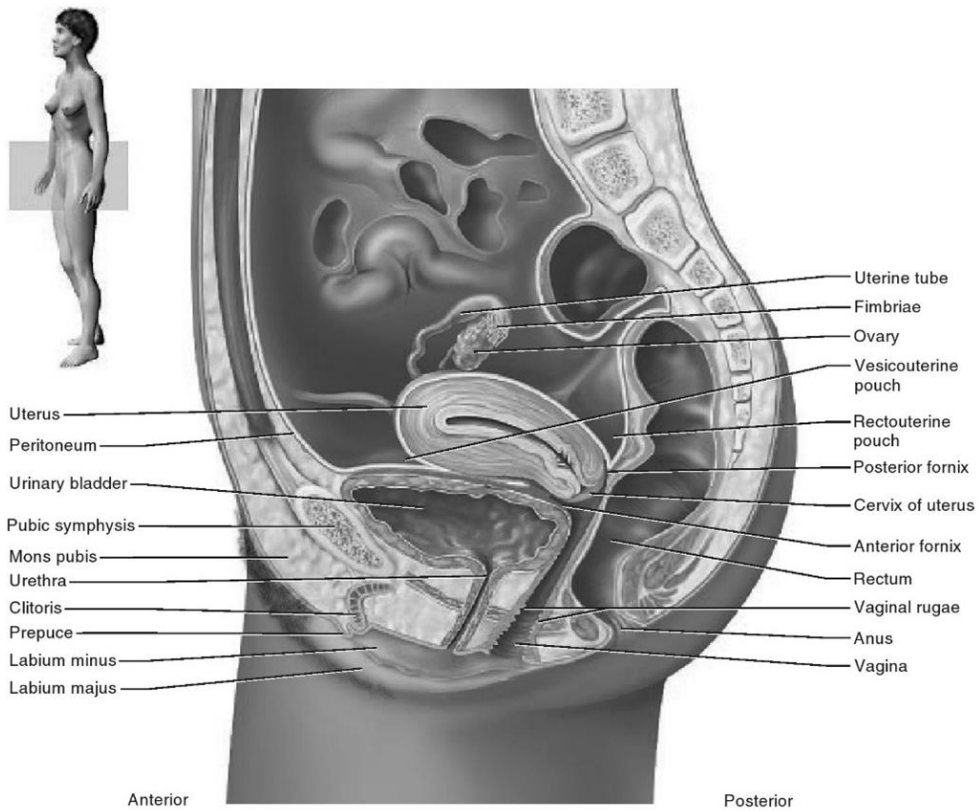


Figure 33-The Female Reproductive System

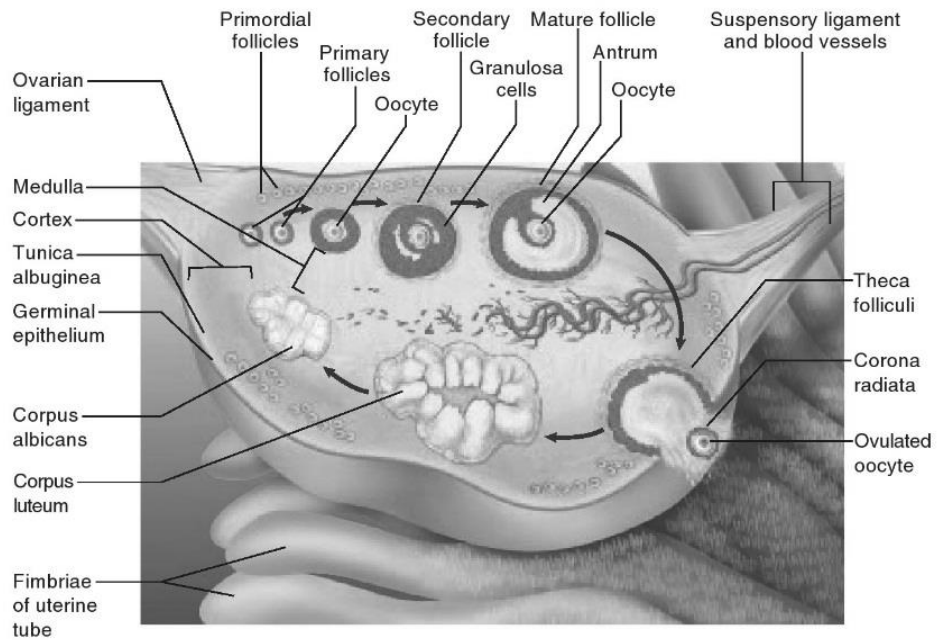


Figure 34-Structure of the Ovary and the Developmental Sequence of the Ovarian Follicles

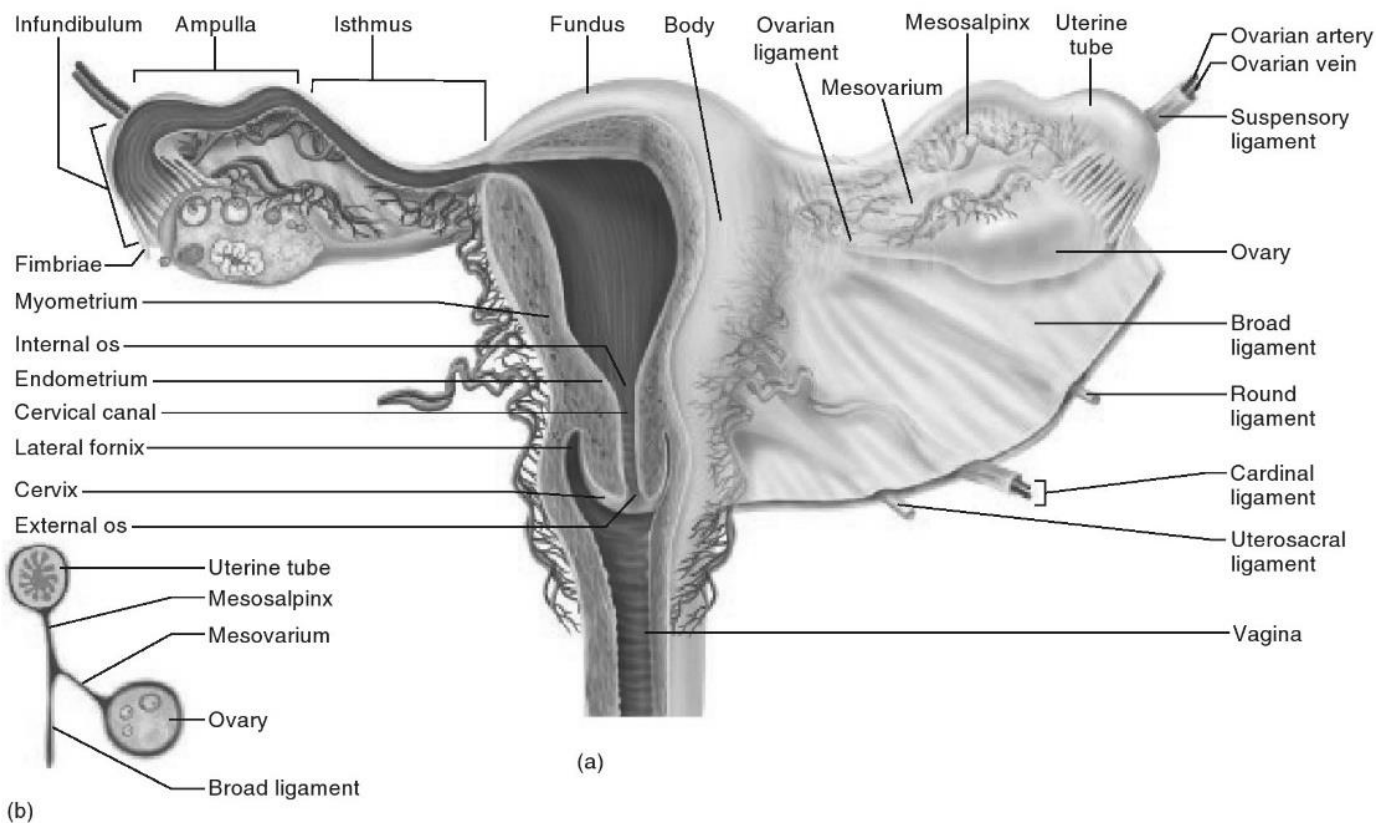


Figure 35-The Female Reproductive Tract and Supportive Ligaments. (a) Drawing of the Reproductive Tract, Dorsal View. (b) Relationship of the Ligaments to the Uterine Tube and Ovary

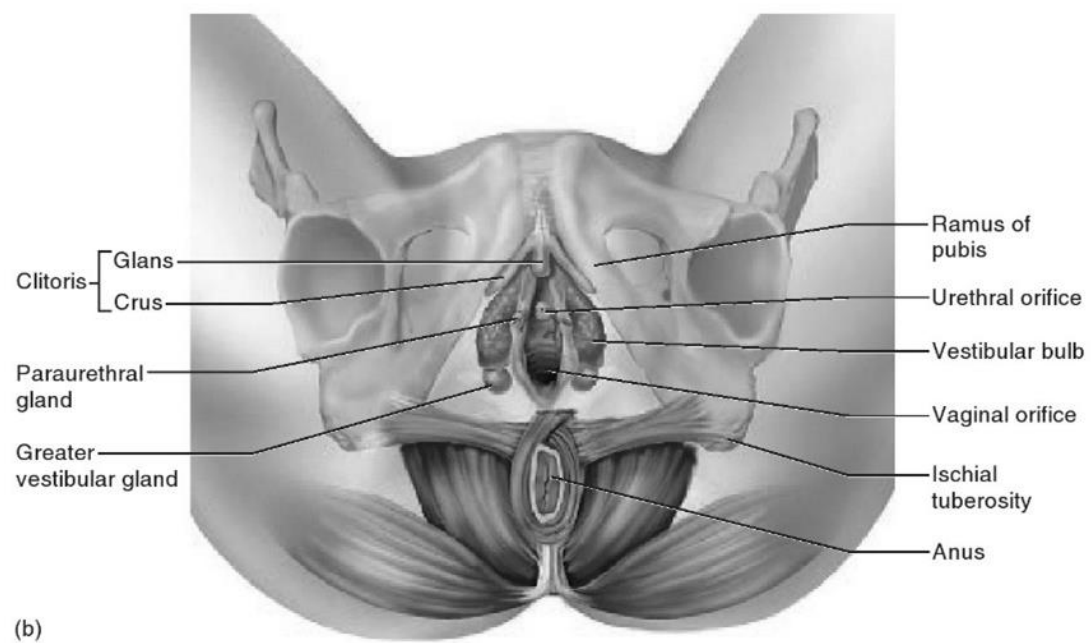
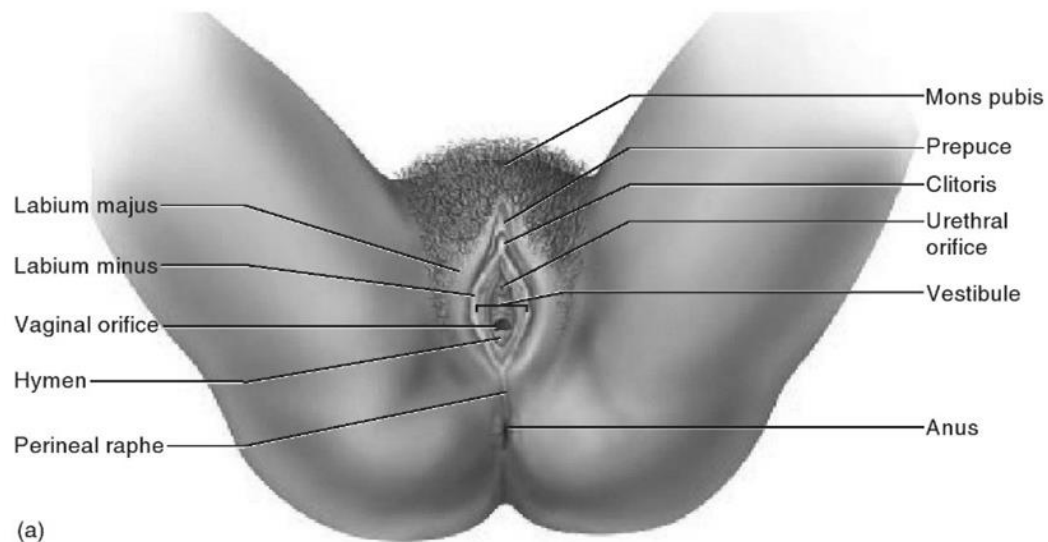


Figure 36-The Female Perineum. (a) Surface Anatomy. (b) Subcutaneous Structures

ENDOCRINE GLANDS

Although the nervous and endocrine systems act together to coordinate functions of all body systems, their means of control are different. The nervous system acts through nerve impulses conducted along axons of neurons. The endocrine system also controls body activities by releasing hormones.

Exocrine glands secrete their products into ducts that carry the secretions into body cavities, into the lumen of the organs, or to the outer surface of the body. Exocrine glands include sudoriferous (sweat), sebaceous (fat), mucous, and digestive glands.

Endocrine glands, by contrast, lack ducts and secrete their products (hormones) into the bloodstream. **Hormones** are chemical messengers that are secreted into the bloodstream and stimulate physiological responses in distant organs.

Consequently, endocrine glands have an unusually high density of blood capillaries, and their capillaries are often of especially porous type called fenestrated capillaries facilitating the entry of hormones into the bloodstream. Hormones go everywhere the blood goes; they cannot be sent selectively to a particular organ. However, the only cells that respond to a hormone are those that have receptors for it. We call them the target cells.

Endocrine glands include the pituitary, thyroid, parathyroid, adrenal, and pineal glands. In addition, several organs and tissues are not endocrine glands exclusively but contain cells that secrete hormones. These include the hypothalamus, pancreas, ovaries, testes, kidneys, stomach, liver, small intestine, skin, heart, adipose tissue, and placenta. Taken together, all endocrine glands and hormone-secreting cells constitute the **endocrine system**. The science which studies the structure and function of the endocrine glands and the diagnosis and treatment of disorders of the endocrine system is called endocrinology.

THE PITUITARY GLAND (hypophysis) is located in the sella turcica of the sphenoid bone. A sheet of dura mater covers the sella turcica and separates the pituitary gland from the brain, except for a stalk

that penetrates into the dura mater and connects the pituitary gland to the hypothalamus. The pituitary gland is an ovoid gland about 1.3 cm in diameter, but becomes about 50 % larger in pregnancy. It is actually composed of two structures—the adenohypophysis and neurohypophysis which arise independently in the embryo and have entirely separate functions.

THE ADENOHYPHYSIS is the anterior three quarter of the pituitary gland. It has two parts: a large **anterior lobe**, also called the *pars distalis* (“distal part”) because it is most distal to the pituitary stalk, and the **pars tuberalis**, a small mass of cells adhering to the anterior side of the stalk. A strip of tissue between the anterior lobe and neurohypophysis is a **pars intermedia**.

The anterior lobe of the pituitary gland synthesizes and secretes six principal hormones: follicle-stimulating hormone (FSH), luteinizing hormone (LH), thyroid-stimulating hormone (TSH), adrenocorticotrophic hormone (ACTH), prolactin (PRL), and growth hormone (GH). The first four hormones are **tropic**, or **trophic** ones pituitary hormones the target organs of which are other endocrine glands. The first two are called **gonadotropins** because their target organs are the gonads.

The pars intermedia secretes *melanocyte-stimulating hormone (MSH)* which influences on pigmentation of the skin, hair.

THE NEUROHYPHYSIS is the posterior one quarter of the pituitary. It has three parts: the **posterior lobe** (*pars nervosa*), the **stalk** (*infundibulum*) that connects it with the hypothalamus, and the **median eminence**, an extension of the hypothalamic floor. The neurohypophysis is not a true gland but a mass of neuroglia and axons arising from certain hypothalamic neurons. The axons form a bundle called the **hypothalamo – hypophyseal tract**, which runs down through the stalk and ends in the posterior lobe. Hormones (**oxytocin (OT)** and **antidiuretic hormone (ADH)**) are synthesized by the neurons in the hypothalamus, transported down the axons, and stored in the posterior pituitary until a nerve signal triggers their release.

THE PINEAL GLAND (epiphysis cerebri) is a pineal growth attached to the roof of the third ventricle, beneath the posterior end of the corpus callosum. Pineal secretion peaks between the ages of 1 and 5 years; by the end of puberty it reduces up to 75 %.

It produces two hormones – **serotonin and melatonin**. Melatonin secretion rises in the dark and occurs at a low level in daylight. Melatonin may suppress gonadotropin secretion; removal of the pineal gland in animals causes premature sexual maturation. The pineal may be involved in mood disorders in humans.

THE THYROID GLAND is the largest endocrine gland in adults, weighing from 20 to 25 g. It is composed of two lobes that lie adjacently to the trachea, immediately below the larynx. It is called so due to adjacent thyroid cartilage of the larynx. Each lobe of the thyroid gland is bulbous at the inferior end and reduces superiorly. Near the inferior end, two lobes are joined by a narrow bridge of tissue, the isthmus. About 50 % of people have an accessory pyramidal lobe, usually small, growing upward from the isthmus.

The main histological feature of the thyroid is that it is composed mostly of sacs called **thyroid follicles**. Follicular cells secrete two hormones - **thyroxine**, also known as **T4** or **tetraiodothyronine**, and **T3**, or **triiodothyronine**.

THE PARATHYROID GLANDS are small ovoid glands in the neck about 3 to 8 mm in length and from 2 to 5 mm in width. People usually have four of them but about 5 % of people have more. They most often adhere to the posterior side of the thyroid gland in the approximate positions. They have a thin fibrous capsule separating them from the thyroid tissue. The parathyroid glands secrete **parathyroid hormone (PTH)**. PTH is the major regulator of the levels of calcium, magnesium, and phosphate ions in the blood.

THE ADRENAL GLAND is attached to the superior side of each kidney. The right adrenal gland is more or less triangular and located on the superior pole of the kidney. The left adrenal gland is more crescent shaped and

extends from the medial indentation (hilum) of the kidney to its superior pole.

Like the pituitary gland, the adrenal gland is formed by the merge of two fetal glands with different origins and functions. Its inner core, the adrenal medulla occupies from 10 % to 20 % of the gland. The adrenal cortex surrounding it is much thicker.

The adrenal medulla secrete two hormones – epinephrine and norepinephrine. Their secretion occurs sharply in conditions of fear, pain, and other kinds of stress.

The adrenal cortex synthesizes more than 25 steroid hormones known collectively as the corticosteroids, or corticoids. The adrenal cortex consists of three tissue layers:

1. The **zona glomerulosa**, the most superficial layer, called so due to its round clusters of secretory cells.
2. The **zona fasciculata** is a thick middle layer. Here the cells are arranged into parallel cords perpendicular to the adrenal surface.
3. The **zona reticularis** is a narrow layer adjacent to the adrenal medulla. Its cells form a branching network due to which the zone was called so.

The corticosteroids fall into three categories:

1. **Mineralocorticoids**. These steroids secreted by the zona glomerulosa, control electrolyte balance. The principal mineralocorticoid is **aldosterone**.
2. **Glucocorticoids**. These steroids are secreted mainly by the zona fasciculata in response to ACTH. They stimulate fat and protein catabolism. They help the body to adapt to stress and repair damaged tissues. The glucocorticoids include **cortisol (hydrocortisone)**, **corticosterone**, and **cortisone**.

3. **Sex steroids**. These are weak androgens and smaller amounts of estrogens secreted by the zona reticularis. Androgens are present in both sexes but best known for controlling many aspects of male development and reproductive physiology. Androgens stimulate the libido (sex drive) and growth of pubic and axillary hair in both sexes.

THE PANCRATIC ISLETS is an elongated, spongy gland located below and behind the stomach, mostly superficial by to

the peritoneum. The major part of it is the exocrine digestive gland, but there are about 1 million endocrine cell clusters scattered among the acini gland. They are called the pancreatic islets (islets of Langerhans). Although they compose less than 2 % of the mass of pancreas, the islets secrete hormones of vital importance to metabolism, especially **insulin** and **glucagon**. The main function of these hormones is to regulate glycemia, the concentration of glucose in the blood.

THE GONADS like the pancreas are both endocrine and exocrine glands. Their exocrine products are testes and sperm, and their endocrine products are the gonadal hormones, most of which are steroids.

Each follicle of the ovary is lined by a wall of granulosa cells. They produce an **estrogen** called **estradiol** in the first half of the menstrual cycle. The corpus luteum that remains after ovulation secretes **progesterone** for the next 12 days or so, or for several weeks in case of pregnancy. They contribute to the development of the reproductive system and feminine physique, regulate the menstrual cycle, sustain pregnancy, and prepare the mammary glands for lactation.

The testis consists mainly of microscopic tubules that produce sperm. The clusters of interstitial cells are located between these tubules. These endocrine cells produce testosterone. Testosterone stimulates development of the male reproductive system in fetus and adolescent, the development of the masculine physique in adolescence, and sex drive. It sustains sperm production and sexual instinct throughout adult life.

THE THYMUS plays a role in three systems: endocrine, lymphatic, and immune. It is a bilobed gland in the mediastinum superior to the heart, behind the sternal manubrium. In fetus and infant it is enormous in comparison to adjacent organs, sometimes protruding between the lungs as far as the diaphragm, and extending upward into the neck. It grows until the age of 5 or 6 years, although not as fast as other thoracic organs, so its relative size decreases. After the age of 14, it undergoes rapid involution (shrinkage). It weighs barely 10 g in most adults, and in the elderly, it is a

small fibrous and fatty remnant barely distinguishable from the surrounding mediastinal tissues.

The thymus is a site of maturation for certain white blood cells that are critically important for immune defense (T-lymphocytes). It secretes several hormones (thymopoietin, thymosin, and thymulin) that stimulate the development of other lymphatic organs and regulate the development and activity of the T-lymphocytes.

Table №1 Endocrine Glands – Hormones and the Function

| Hormone | Target Organ | Main Function |
|--|--------------------------------|---|
| Anterior Pituitary | | |
| FSH: follicle stimulating hormone | Ovaries, testes | Female: growth of ovarian follicles and secretion of estrogen Male: sperm production |
| LH: luteinizing hormone | Ovaries, testes | Female: ovulation, maintenance of corpus luteum Male: testosterone secretion |
| TSH: thyroid stimulating hormone | Thyroid gland | Growth of thyroid, secretion of thyroid hormone |
| ACTH: adrenocorticotropic hormone | Adrenal cortex | Growth of adrenal cortex, secretion of glucocorticoids |
| PRL: prolactin | Mammary glands, testes | Female: milk synthesis Male: increased LH sensitivity and testosterone secretion |
| GH: growth hormone | Many organs | Widespread tissue growth, especially in cartilage, bone, muscle, and fat |
| Posterior Pituitary | | |
| ADH: antidiuretic hormone | Kidneys | Water retention |
| OT: oxytocin | Uterus, mammary glands | Labor contractions, milk release; may be involved in ejaculation, sperm transport, and sexual affection |
| Pineal Gland | | |
| Melatonin and serotonin | Brain | Influence mood; may regulate the timing of puberty |
| Thymus | | |
| Thymopoietin, thymosin, thymulin | T lymphocytes | Stimulate T-lymphocyte development and activity |
| Thyroid | | |
| Triiodothyronine (T3) and thyroxine (T4) | Most tissues | Elevate metabolic rate and heat production; promote alertness, protein synthesis, fetal and childhood growth, and CNS development |
| Calcitonin | Bone | Promotes Ca ²⁺ deposition and ossification; reduces blood Ca ²⁺ level |
| Parathyroids | | |
| Parathyroid hormone (PTH) | Bone, kidneys, small intestine | Increases blood Ca ²⁺ level by stimulating bone resorption, calcitriol synthesis, and intestinal Ca ²⁺ absorption, and reduces urinary Ca ²⁺ excretion |
| Adrenal Medulla | | |
| Epinephrine, norepinephrine, dopamine | Most tissues | Adaptive responses to arousal and stress |
| Adrenal Cortex | | |
| Aldosterone | Kidney | Promotes Na ⁺ retention and K ⁺ excretion, maintains blood pressure and volume |
| Cortisol and corticosterone | Most tissues | Stimulate fat and protein catabolism, gluconeogenesis, stress resistance, and tissue |

| | | |
|------------------------------|--|--|
| | | repair; inhibit inflammation and immunity |
| Androgen (DHEA) and estrogen | Bone, muscle, integument, many other tissues | Growth of pubic and axillary hair, bone growth, sex drive, male prenatal development |
| Pancreatic Islets | | |
| Glucagon | Primarily liver | Stimulates gluconeogenesis, glycogen and fat splitting release of glucose and fatty acids into circulation |
| Insulin | Most tissues | Stimulates glucose and amino acid uptake; lowers blood glucose level; promotes glycogen, fat, and protein synthesis |
| Ovaries | | |
| Estradiol | Many tissues | Stimulates female reproductive development and adolescent growth, regulates menstrual cycle and pregnancy, prepares mammary glands for lactation |
| Progesterone | Uterus, mammary glands | Regulates menstrual cycle and pregnancy, prepares mammary glands for lactation |
| Testes | | |
| Testosterone | Many tissues | Stimulates reproductive development, skeletomuscular growth, sperm production, and sex drive |

Table № 2 Disorders of the Endocrine System

| | |
|---------------------------|--|
| Acromegaly | A result of adult growth hormone hypersecretion, resulting in thickening of the bones and soft tissues, especially noticeable on face, hands, and feet |
| Addison Disease | Hyposecretion of adrenal glucocorticoids or mineralocorticoids, causing hypoglycemia, hypotension, weight loss, weakness, loss of stress resistance, darkening or bronzing (metallic discoloration) of the skin, and potentially fatal dehydration and electrolyte imbalances |
| Adrenogenital Syndrome | Hypersecretion of adrenal androgens. Prenatal hypersecretion can cause masculinized genitalia in girls and they are misidentified as boys. In children it often causes the enlargement of penis or clitoris and premature puberty. In women it causes masculinizing effects such as increased body hair, beard growth, and deepening of the voice. |
| Congenital Hypothyroidism | Thyroid hyposecretion present from birth, resulting in stunted physical development, thickened facial features, low body temperature, lethargy, and irreversible brain damage in infancy |
| Myxedema | A result of severe or prolonged adult hypothyroidism, characterized by low metabolic rate, sluggishness and sleepiness, weight gain, constipation, hypertension, dry skin and hair, abnormal sensitivity to cold, and tissue swelling |
| Pituitary Dwarfism | Abnormally short stature with a normal proportion of limbs to trunk, resulting from growth hormone hyposecretion in childhood |
| Pituitary Gigantism | Abnormally tall stature with a normal proportion of limbs to trunk, resulting from growth hormone hypersecretion in childhood |

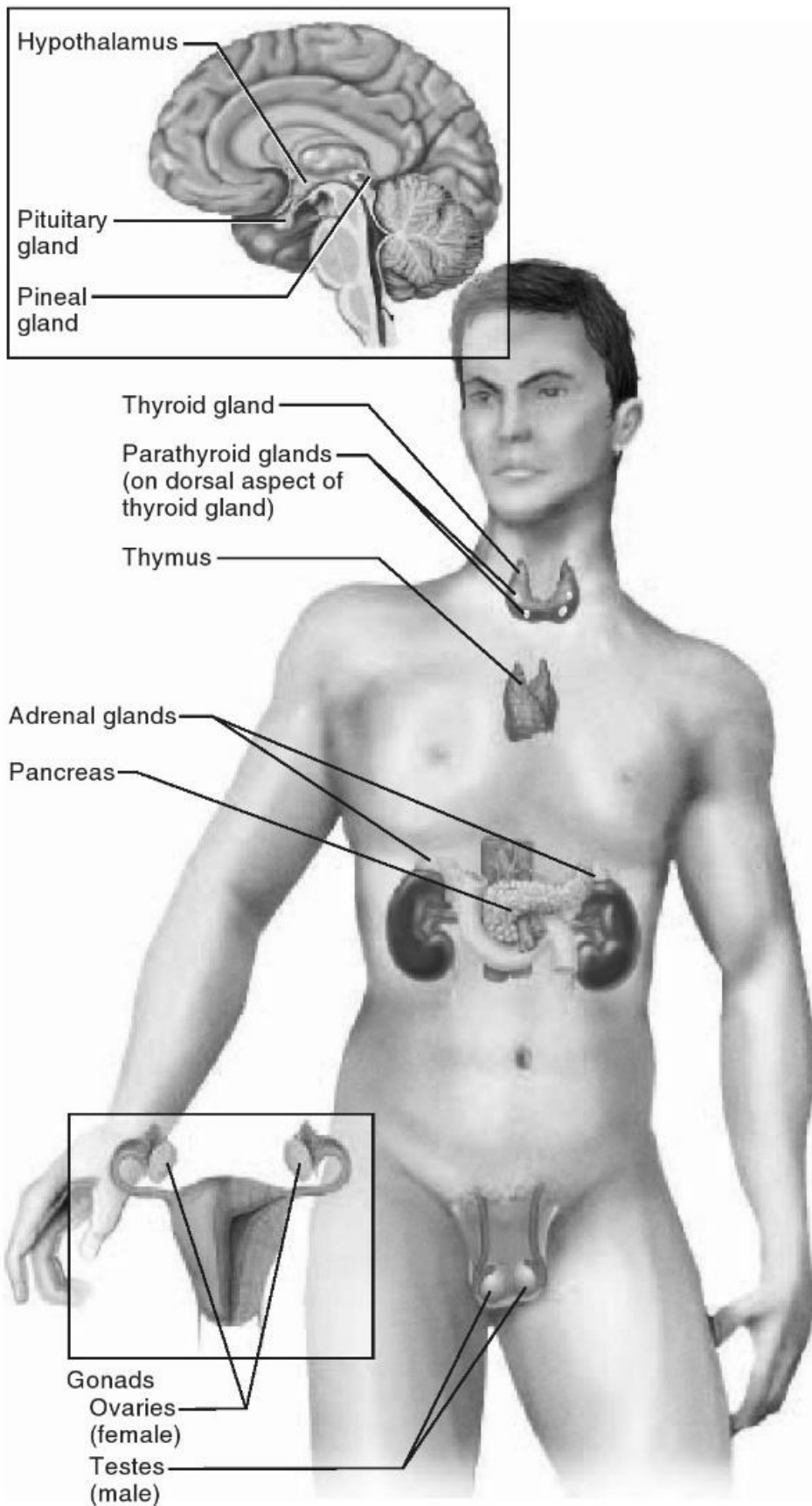


Figure 37-Major Parts of the Endocrine System

THE CARDIOVASCULAR SYSTEM

The **vascular system** consists of a network of tubules through which the body fluids, blood and lymph circulate. The vascular system supplies the cells and tissues of the body with nutrients, removes and transports waste products to the excretory organs.

The vascular system of a man can be classified into two systems according to the character of the circulating fluid:

- (1) the **blood vascular system** composed of the arteries, veins, and heart;
- (2) the **lymphatic system** composed of tubules along which lymph flows.

THE BLOOD VASCULAR SYSTEM consists of a central organ *heart* and tubules of different size connected to it which are called *blood vessels*.

THE ARTERIES

The blood vessels passing from the heart to the organs and carrying blood to them are called **arteries**.

The wall of the artery consists of three coats:

- the **inner coat** (*tunica intima*) is lined with endothelium and inner elastic membrane;
- the **middle coat** (*tunica media*) is composed of two layers of smooth muscle fibres, which are replaced with elastic fibres;
- the **outer coat** (*tunica externa*) contains connective tissue fibres.

Depending on amount of elastic and muscular tissues, the arteries are divided into elastic, muscular and mixed types.

The **arteries of elastic type** contain well developed elastic tissue in the tunica media (the aorta, the pulmonary trunk, the carotid arteries etc.). These vessels are able to expand greatly and recoil with blood pressure alteration.

The **arteries of muscular type** feature well-developed muscular layer. They are medium-sized and small.

The **mixed-type arteries** constitute the transitional type of arteries. The arteries

feature more or less developed peripheral links called **anastomoses**. Intersystem anastomoses link the branches of different main arteries and intrasystem link the branches pertaining to one main artery. The anastomoses are of great importance for blood flow redistribution and collateral circulation. Blood flow within the smallest blood vessels of the transitional segment is called **microcirculation**. The microcirculatory network comprises the following components:

- the **arterioles** which arise from the arteries. They feature the muscular cells;
- the **precapillary vessels** arise from the arterioles. They possess features of both arterioles and capillaries;
- the **capillaries** arise from the precapillaries. They take part in metabolism. The capillary wall consists of a single layer of flat endothelial cells adherent to the basal membrane. They merge to form the capillary network;
- the **postcapillary** arise from merging capillaries. They are similar to the precapillaries;
- the **venules** arise from the postcapillaries. They are paired vessels that accompany the arterioles. The venules become continuous with the veins;
- the **arteriole-venular anastomoses** (the vascular shunts) link the arterioles and venules directly.

THE VEINS

The wall of greater veins is similar to the arterial wall though it is much thinner. The veins anastomose widely among themselves and form **venous plexuses**. Venous blood is prevented from flowing in the opposite direction by special valves in the venous walls. These valves are shaped from the folds of the endothelium with a layer of connective tissue inside. The free edge of the valves is turned toward the heart. The blood flows through the veins by massaging action of skeletal muscles, contractions of venous muscular tunic and forced aspiration of the heart and the diaphragm. The somatic veins are divided into the superficial and the deep veins.

THE SYSTEMIC AND PULMONARY CIRCULATION ROUTES

Lesser (pulmonary) circulation begins in the right ventricle into which venous blood from the right atrium flows through the right atrioventricular orifice. The pulmonary trunk arises from the right ventricle; in the lungs it branches into arteries which narrow into capillaries. In the capillary networks entwining the lung vesicles, the blood yields carbon dioxide in exchange for a new supply of oxygen. The oxidized blood flows from the capillaries to the veins which merge to form four pulmonary veins (two veins per side) and drain into the left atrium of the heart. The arterial blood that entered the left atrium proceeds via the left atrioventricular orifice into the left ventricle where the process of greater circulation begins.

Greater (systemic) circulation supplies all organs and tissues of the body with nutrients and oxygen. The process begins in the left ventricle of the heart, from which the aorta arises carrying arterial blood. The aorta branches into arteries, which pass to all organs and tissues of the body and narrow into arterioles and further into capillaries. The capillaries in turn form venules and then veins. The arterial blood flowing in the capillaries yields the nutrients and oxygen which it carries and, in exchange, receives the products of metabolism and carbon dioxide. The veins form two large trunks, the superior vena cava and the inferior vena cava, which end in the right atrium of the heart.

Differences between the arteries and the veins are in wall structure and blood flow direction. The arteries are the vessels that carry blood away from the heart; the blood flows through the arteries under relatively high pressure, so the arteries feature rather thick walls with well-developed elastic and muscular layers. The veins carry the blood to the heart; the blood pressure is lower than in the arteries, so the venous walls feature lack muscular and connective tissue layers.

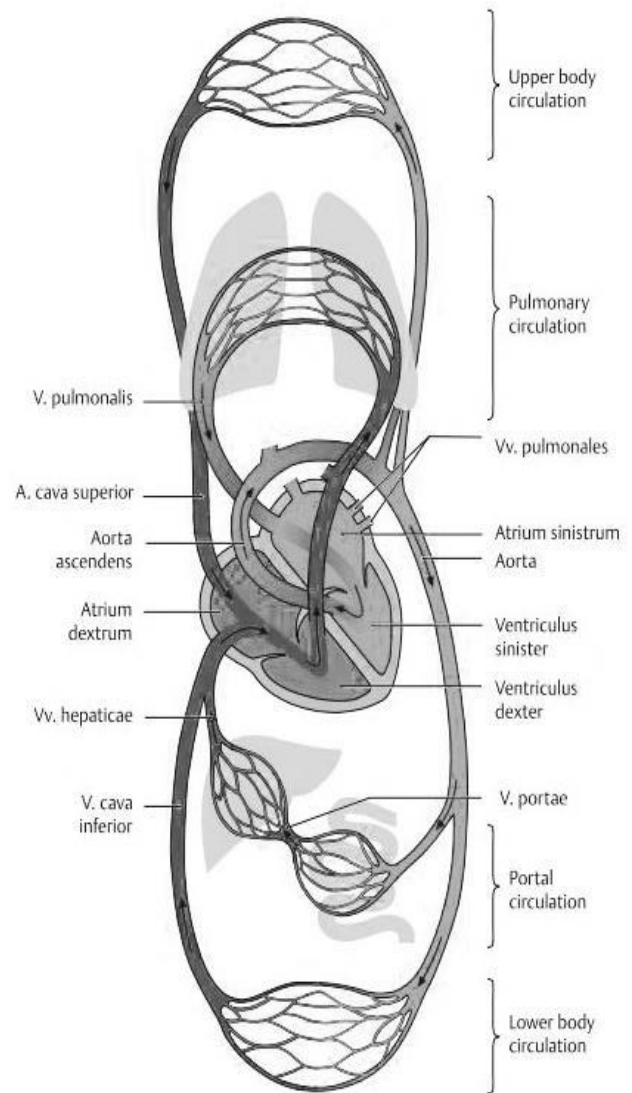


Figure 38-The Systemic and Pulmonary Circulation Routes
THE HEART

The **heart** (*cor*) is a hollow muscular organ. It receives the blood from the venous trunks draining into it and pumps the blood into the arterial system. The cavity of the heart is subdivided into four chambers: two atria and two ventricles. Contraction of the right and left atria occurs simultaneously. The ventricles also contract simultaneously, but in regular sequence with the atria. Contraction of the walls of the heart chambers is called *systole*. Their relaxation is called *diastole*.

The heart is shaped like a slightly flattened cone. The **apex of the heart** faces downward, forward, and to the left; the apex is formed by the left ventricle. The **base of the heart** faces upward, backward, and to the right. It is formed by the atria and in front by the aorta and pulmonary trunk.

The **anterosuperior (sternocostal) surface of the heart** faces forward, upward, and to the left and is located behind the body of sternum. The *coronary sulcus* passing transversely to the longitudinal heart axis divides the heart into upper area formed by the atria and larger lower area formed by the ventricles. The *anterior interventricular groove* passing on the borderline between the ventricles is formed by the right ventricle and the smaller part by the left ventricle.

The **inferior (diaphragmatic) surface** adjoins the central tendon of the diaphragm. The *posterior interventricular groove* separates the surface of the left ventricle (larger) from the surface of the right ventricle (smaller). The lower ends of the anterior and posterior interventricular grooves of the heart merge to form the incisure (notch) of the cardiac apex.

The **left and right pulmonary surfaces** face the respective lungs. The right and left borders of the heart differ in shape: the right is sharp while the left border is rounded.

THE CARDIAC CHAMBERS

The atria are blood receiving chambers. The ventricles pump blood from the heart into the arteries. The atria are separated by the *interatrial septum* and the ventricles – by the *interventricular septum*. The right atrium and the right ventricle constitute the right (venous) part of the heart; the left atrium and the left ventricle constitute the left (arterial) part.

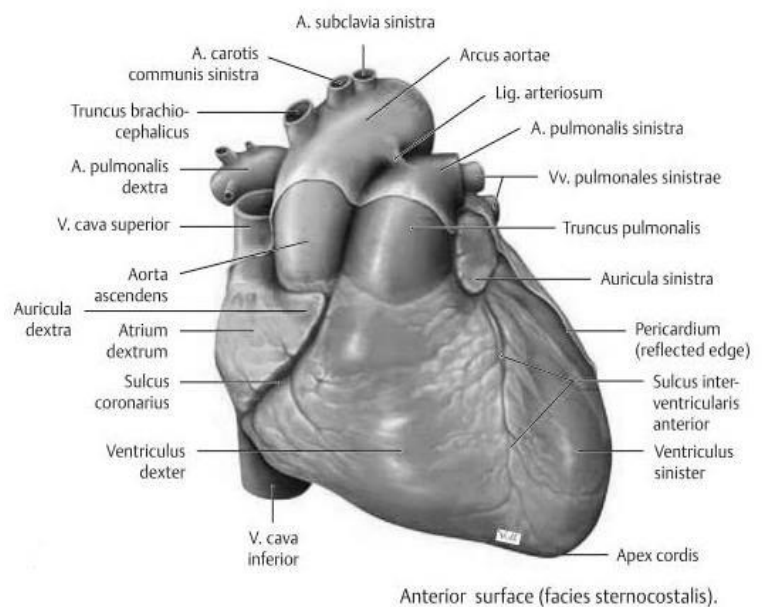
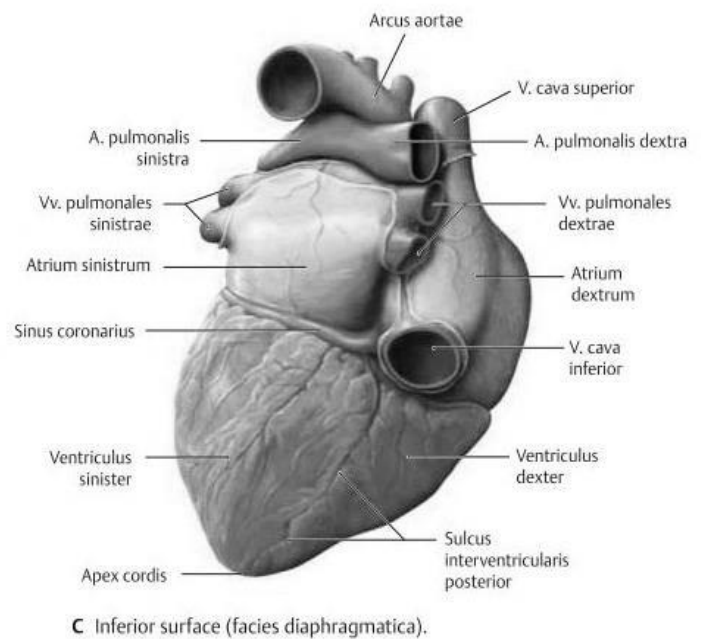


Figure 39 Surfaces of the Heart

THE RIGHT ATRIUM

The **right atrium** is shaped like a cube. In the back it receives the superior vena cava above and the inferior vena cava below. In front, the atrium is continuous with a hollow process, the **auricle of the right atrium**. The right and left auricle embrace the base of the aorta and the pulmonary trunk. The **interatrial septum** is set obliquely. It passes to the back and to the right from the anterior wall. There is an oval depression (**fossa ovalis on**), the septum which is bounded superiorly and anteriorly by a prominent wargin (the **limbus fossae ovalis**). In embryo, the area features the wide opening (the **foramen ovale**) that communicates the atria. Shortly after delivery the foramen closes. The inner surface of the right atrium is smooth except for the inner surface of the auricle where the **pectinate muscles** form a series of small vertical columns. Superiorly the pectinate muscles are continuous with a crest, to which the **sulcus terminalis** corresponds on the external surface of the atrium.

The veins that run into the right atrium are:

- the **superior vena cava** which opens into the atrium with the **opening of superior vena cava**. It is located between the superior and inferior atrium walls;

- the **inferior vena cava** which opens on the posterior wall with the **opening of inferior vena cava**. It neighbours with the sulcus terminalis. A variably sized crescentic fold (the **valve of inferior vena cava**) stretches from the inferior margin of the orifice of the inferior vena cava to the limbus fossae ovalis;

- the **coronary sinus** is the venous collector that drains the cardiac walls. Its opening located between the atrioventricular orifice and the opening of inferior vena cava are surrounded by a small fold (the **valve of coronary sinus**). The small veins of the heart drain independently into the right atrium.

THE RIGHT VENTRICLE

The **right ventricle** is shaped like a triangular pyramid. The cavity of the ventricle is subdivided into two parts: the section near the right atrioventricular orifice- **corpus**, and the anterosuperior section close to the orifice of the pulmonary trunk- **conus arteriosus**.

The right atrioventricular orifice leading from the cavity of the right atrium into the cavity of the right ventricle is supplied with a **tricuspid valve** which prevents the return of blood into the atrium during systole. Three cusps of the valve are divided according to their location for the **anterior cusp, posterior** and **septal ones**. The smallest is the medial cusp. The free margins of the cusps face to the ventricle. Fine tendinous threads (**chordae tendineae**) are attached to them. These chordae are attached to the apices of the **papillary muscles** on the an other ends. The papillary muscles are conical muscular projections with the apex projecting into the cavity of the ventricle and the base which continues with the ventricular wall. There are usually three papillary muscles in the right ventricle: the **anterior muscle**, the largest one which gives rise to tendinous chords attached to the anterior and posterior cusps of the tricuspid valve; the smallest **posterior muscle** which sends tendinous chords to the posterior and septal cusps, and the third inconstant **septal papillary muscle** which sends tendinous chords to the anterior and septal cusps.

The wall of the right ventricle is smooth in the region of the conus arteriosus, but elsewhere there are inwardly projecting muscular **trabeculae carneae** that form the networks.

Blood from the right ventricle enters the pulmonary trunk through the **opening of pulmonary trunk** supplied with the **pulmonary valve** which prevents the return of blood from the pulmonary trunk into the right ventricle during diastole. The valve is composed of three semilunar cusps; they appear as three small pouches: the **anterior semilunar cusp**, the **left semilunar cusp**, and the **right semilunar cusp**. The spaces bounded by the cusps and the trunk wall are the **sinuses of**

pulmonary trunk. Each free margin of the cusps features small *nodules of semilunar cusp* for better cusp contact.

THE LEFT ATRIUM

The **left atrium** adjoins posteriorly to the descending aorta and the oesophagus. The space of atrium is of irregular cubic shape. The anterior wall projection is the *left auricle* that neighbours with the pulmonary trunk. The internal surface of the auricle features well visible ridges formed of *musculi pectinati*. The rest of the internal surface is smooth.

The left atrium accepts four pulmonary veins (two from each lungs) that carry oxygenated blood: the *right superior pulmonary vein*, the *right inferior pulmonary vein*, the *left superior pulmonary vein*, the *left inferior pulmonary vein*. The *openings of pulmonary veins* are located on the posterior wall of atrium: the veins lack valves.

THE LEFT VENTRICLE

The **left ventricle** has a conical shape. As wall is two or three times thicker than the wall of the right ventricle. It is explained by the muscular layer and by the greater workload of the left ventricle (systemic circulation). The *trabeculae carneae* are thinner and more numerous in the left ventricle than in the right one and the most of them are located on the diaphragmatic wall and in the region of the apex. The *left atrioventricular orifice* is oval, and supplied with a **mitral (left) atrioventricular valve (bicuspid valve)**. The smaller cusp is located to the left and back (the *posterior cusp*), the larger to the right and front (the *anterior cusp*). The free margins of the valve face to the ventricular cavity; the *chordae tendineae* are attached to both cusps. There are two papillary muscles, anterior and posterior in the left ventricle. They are much larger than the papillary muscles in the right one.

The *aortic orifice* leading into aorta is supplied with the **aortic valve**. It is similar in structure to the valve of the pulmonary trunk.

The aortic valve comprises three semilunar cusps: the *posterior semilunar cusp*, the *left semilunar cusp*, and the *right semilunar cusp*. The spaces bounded by the cusps and the aortic wall are the *aortic sinuses*. The right and the left sinuses house the openings of the respective coronary arteries. The free margins of the cusps feature *nodules of semilunar cusp*. Laterally from the nodules one can distinguish thickened areas called the *lunules of semilunar cusps*.

THE INTERVENTRICULAR SEPTUM

The **interventricular septum** consists mainly of muscle tissue (the *muscular part*), except for the uppermost area where it is formed of fibrous tissue covered on both sides with the endocardium (the *membranous part*).

STRUCTURE OF THE HEART WALLS

The walls of the heart consist of three layers:

- the **endocardium** is the inner layer. It lines the heart chambers. The valves are the endocardial duplication with dense fibrous tissue featured;
- the **myocardium** consists of thick muscle tissue of the heart. It contains the specific muscular bundles of the conductive system of the heart;
- the **epicardium** is the outer layer represented with the visceral lining of the serous coating of the heart (the pericardium).

The heart valves and the muscular fibers are attached to the fibrous rings that constitute a dense fibrous skeleton of the heart. There are four fibrous rings:

- the *right fibrous ring* surrounds the right atrioventricular orifice;
- the *left fibrous ring* surrounds the left atrioventricular orifice;
- the fibrous ring around the opening of the pulmonary trunk;
- the fibrous ring around the aortic opening.

The left fibrous ring fuses with the aortic ring to form two *left* and *right fibrous trigones* located posterior to the aorta. The

atrial myocardium is separated from the ventricular by rings and trigones. As the fibres of atrial myocardium are not continuous with those of the ventricle, the atria can contract separately from the ventricles.

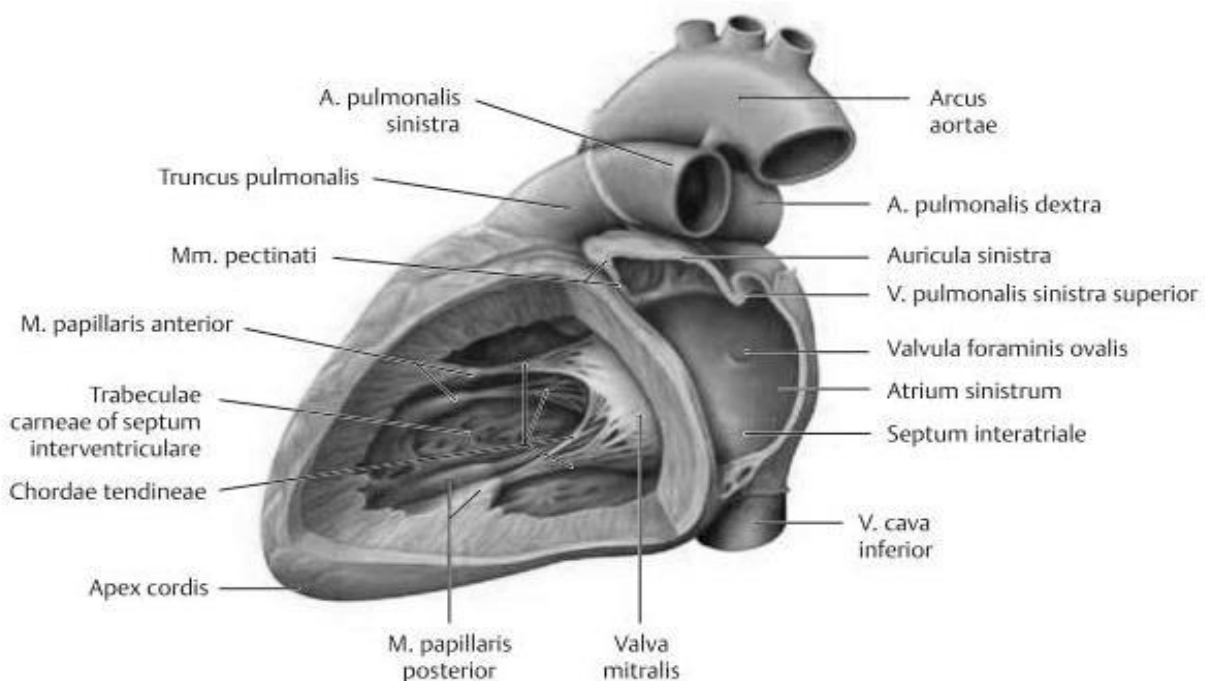
The **atrial myocardium** consists of the superficial and deep layers; the superficial layer divided by atria features transverse muscular fibers. The deep layer consists of longitudinal fibres arising from the fibrous rings and encircling the atrium like a loop. The large venous trunks draining into the atria are surrounded by circular fibres like sphincters. The fibres of the superficial layer encircle both atria; the deep fibres are distinguished in each atrium.

The **ventricular myocardium** is thicker than that of atria. The thickest muscular layer has the left ventricle. The ventricular myocardium comprises complex system of looping and interlaced fibers arranged into three layers:

- the **external (oblique) layer** is composed of longitudinal fibres which arise from the fibrous rings and descend obliquely; on the heart apex they form a whorled arrangement

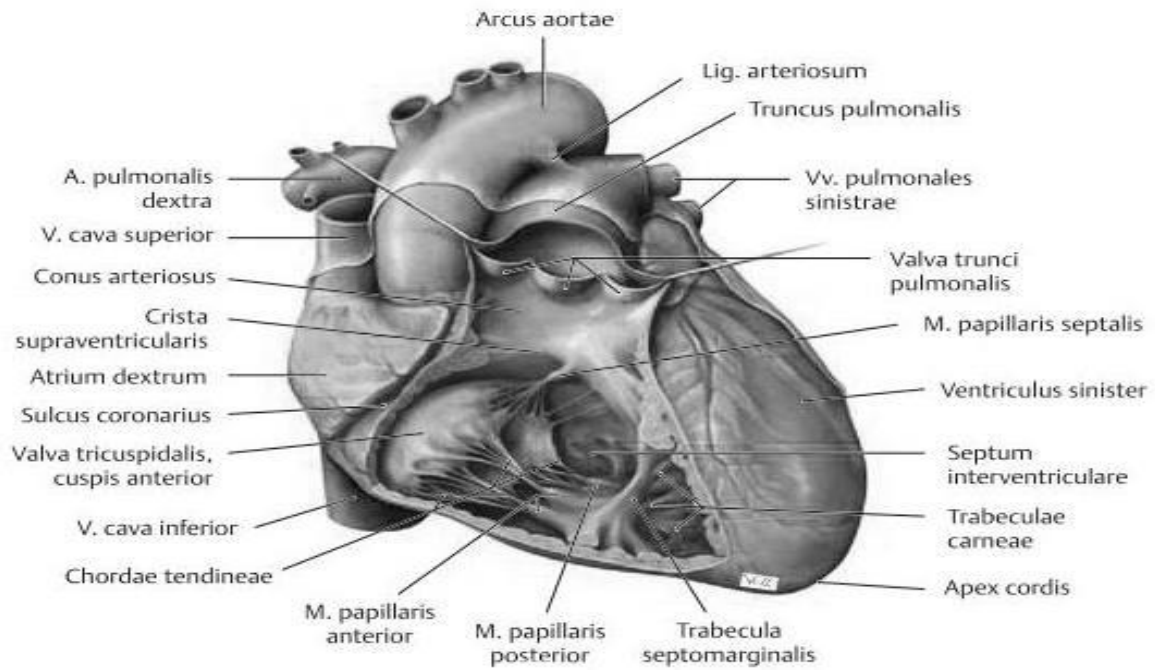
of muscle fibers (*vortex of heart*) making loops in the depths of the muscle and forming the **internal longitudinal layer**. The upper ends of the fibres of this layer are attached to the fibrous rings. The internal longitudinal layer gives rise to the trabeculae carneae and the papillary muscles. Both layers are separated by the ventricles;

- the **middle layer** is the strongest. The fibres of the middle layer are transverse, so they enfold each ventricle separately. They are independent components of each ventricle.

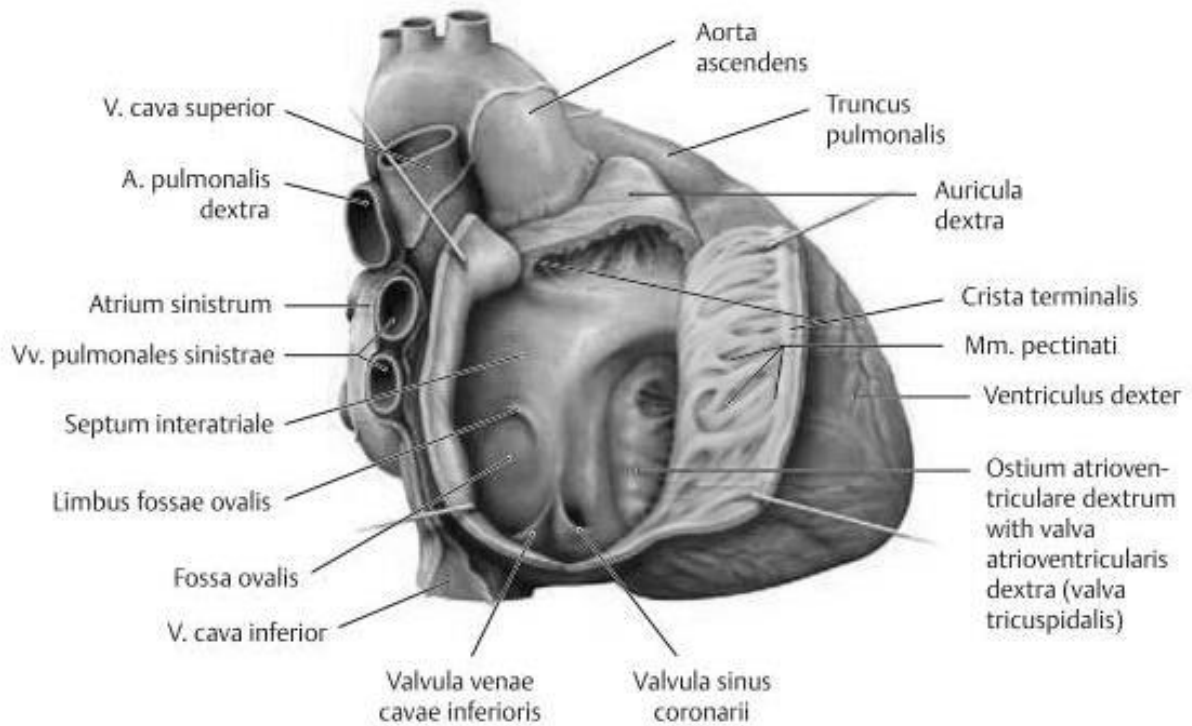


Atrium sinister and ventriculus sinister, left lateral view.

Figure 40-The Left Atrium and Ventricle of the Heart



Ventriculus dexter, anterior view.



Atrium dextrum, right lateral view.

Figure 41-The Right Atrium and Ventricle of the Heart

THE CONDUCTING SYSTEM OF THE HEART

The conducting system of the heart plays an important role in the rhythmic work of the heart and in the coordination of the activity of the musculature of the separate heart chambers. It is composed of the complex of muscle fibres of the special structure (light, poor in myofilaments and rich in sarcoplasm) with featured automation i. e. with possibility of generation and transmission of rhythmic impulses to the working myocardium. The following nodes and bundles are distinguished in the conducting system:

1. The **sinu-atrial node** (node of Keith Flack) is located within the right atrial wall below the epicardium between the superior vena cava and the right auricle. The node accepts numerous nerve fibers and generates impulses at rate of 60 – 80 bpm (resting rate); the impulses expand along the bundles to reach the atrial myocardium and the atrioventricular node. The node is the principal pacemaker.

2. The **atrioventricular node** (node of Aschoff – Tawara) is located below the endocardium within the upper portion of the interventricular septum on the right. It gives rise to the atrioventricular bundle.

3. The **atrioventricular bundle** (the bundle of His) transects the right fibrous triangle and becomes continuous within the interventricular septum as 1 cm long trunk. In the septum, the bundle of His divides into **right and left crura** (legs). The crura descend below the endocardium on each side of the interventricular septum and split into numerous subendocardial branches (the **fibers of Purkinje**) that penetrate working myocardium. The atrioventricular bundle conducts the impulses from the atria to the ventricles.

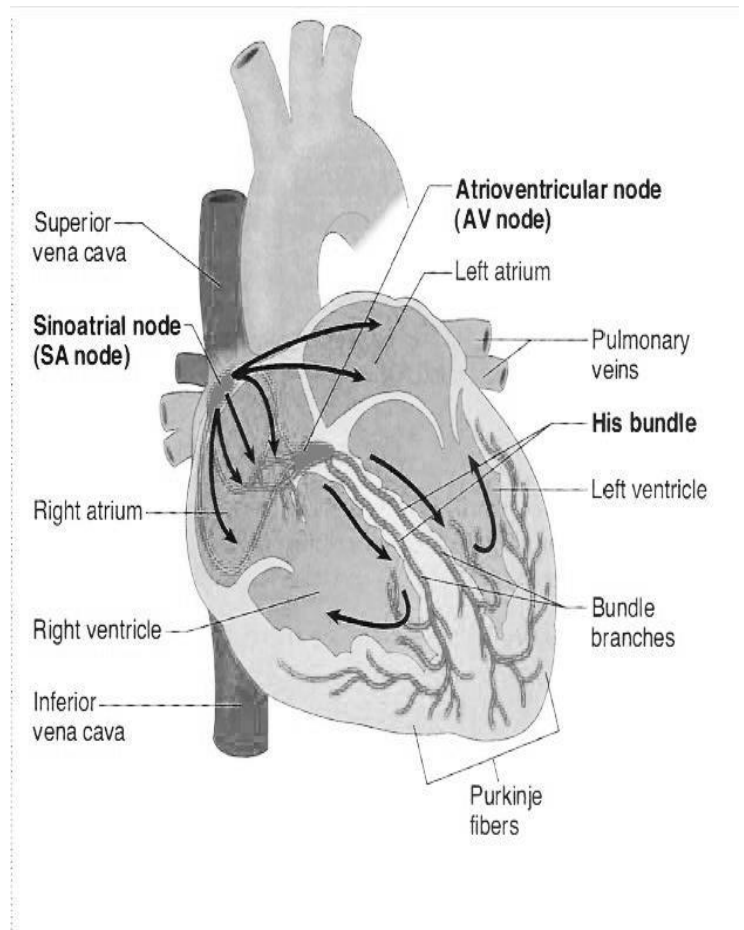


Figure 42-The Conducting System of the Heart

THE PERICARDIUM

The **pericardium** is a closed serous sac, in which two layers are distinguished: outer fibrous layer (the **fibrous pericardium**), and inner serous layer (the **serous pericardium**). The serous pericardium is divided in turn into two layers: **visceral layer** or the epicardium, and **parietal layer** which fuses with the inner surface of the fibrous pericardium and lines it. A slit-like **serous cavity** containing a small amount of serous fluid is located between the visceral and parietal layers. The pericardial cavity features two sinuses:

- the **transverse pericardial sinus** is bounded by the aorta and the pulmonary trunk anteriorly and the superior vena cava and right atrium posteriorly;
- the **oblique pericardial sinus** is bounded by the left pulmonary veins and left atrium on the left and the inferior vena cava on the right.

The intact pericardium is shaped like a cone, the base of which fuses with the central tendon of the diaphragm, while the blunted apex is directed upward and embraces the roots of the large vessels. The pericardium is directly attached to the mediastinal pleura on both sides; free anterior portion is attached to the sternum and related costal cartilages by means of connective tissue called the *sternocostal ligaments*. Superiorly, the anterior surface of the pericardium neighbours the thymus. The posterior surface of fibrous pericardium neighbours the viscera of posterior mediastinum (the thoracic aorta, the esophagus, the azygos and the hemiazygos veins).

TOPOGRAPHY OF THE HEART

The heart is located asymmetrically in the middle mediastinum. The long axis of the heart extends obliquely downward from right

to left and from back to front. Thus, the heart is rotated so that the right venous part lies more to the front and the left arterial part more to the back.

RELATIONS OF THE HEART TO THE ANTERIOR THORACIC WALL:

1. The **apex of the heart** is related to the 5th left intercostal space 1 – 1,5 cm medially from the left midclavicular line.
2. The **superior boundary** runs horizontally along the upper margins of the cartilages of both 3rd ribs.
3. The **right boundary** runs vertically down from the 3rd to the 5th rib, 2 cm away from the right margin of the sternum.
4. The **left boundary** runs obliquely down and laterally from the upper margin of the 3rd rib along the parasternal line to the apex of the heart.
5. The **inferior boundary** runs almost transversely and joins the cartilage of the right 5th rib and the apex of the heart.

The opening of the pulmonary trunk is related to the junction of the left 3rd rib and sternum. The aortic opening is related to the 3rd intercostal space at the left border of the sternum.

The atrioventricular orifices are related to the line that joins the left 3rd costal cartilage with the right 6th costal cartilage. The left orifice is related to the left 3rd costal cartilage and the right orifice – to the right 5th costal cartilage.

Valve auscultation points do not correspond to the surface mapping points of the cardiac openings. This results from sound conduction within the pertaining soft tissues. The **mitral valve** (the bicuspid valve) auscultatory area is related to the apex of the heart. The **tricuspid valve** auscultatory point is at the base of xiphoid process. The **aortic valve** point is in the right 2nd intercostal space and the **pulmonary valve** point is in the left 2nd intercostal space.

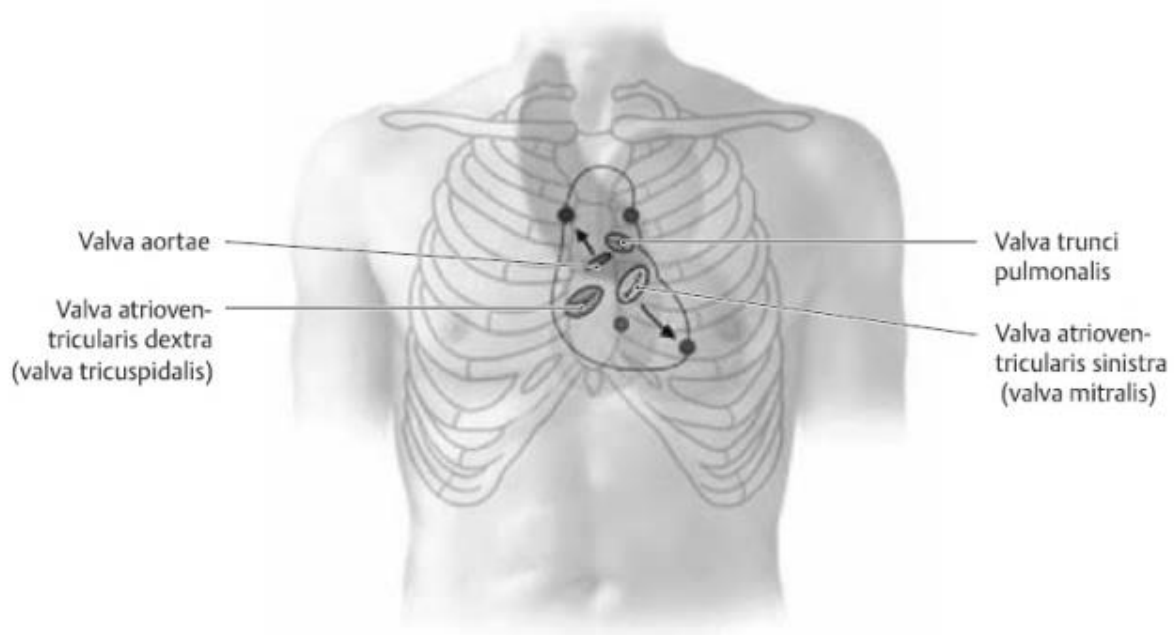
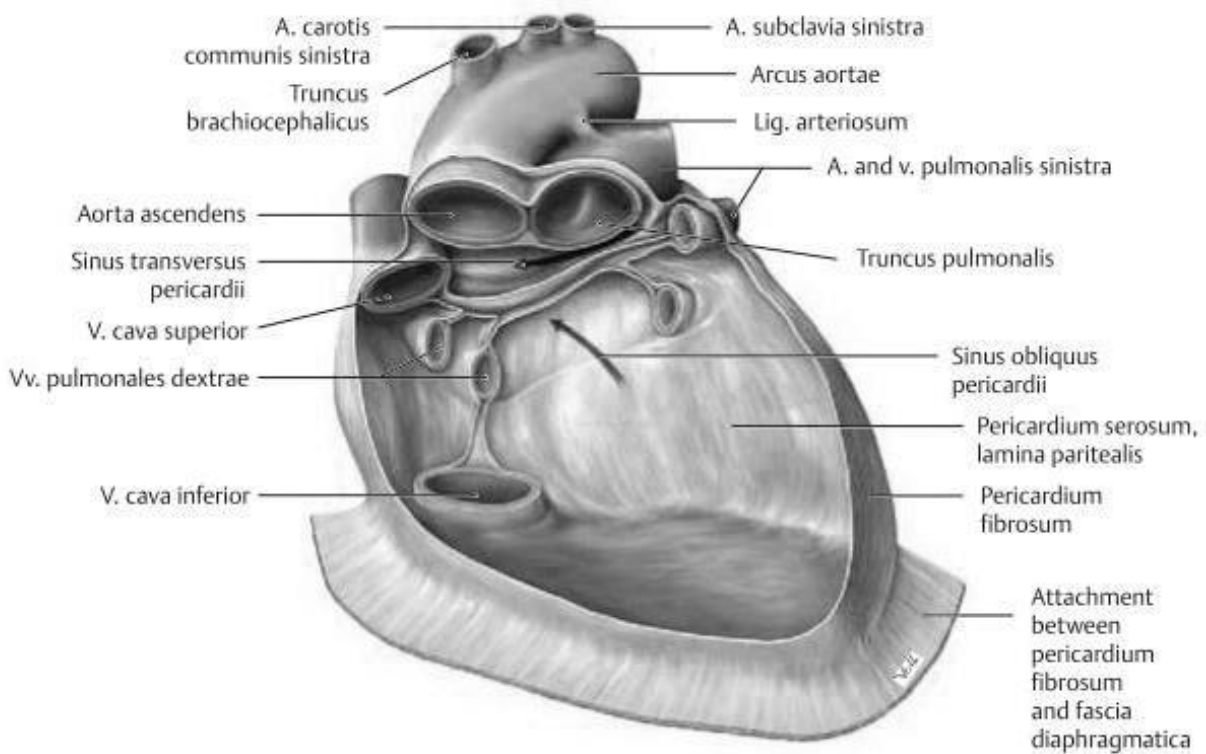


Figure 43 – 44 Topography of the Heart and Pericardium



Pericardium with heart removed, anterior view.

THE CORONARY ARTERIES

The right and left coronary arteries arise from the aortic bulb below the superior margins of the semilunar valves. As a result, during systole the entrance to the coronary arteries is closed by the valves, while the arteries themselves are compressed by the contracted heart muscles. As a consequence, the supply of blood to the heart diminishes during systole; blood enters the coronary arteries during diastole when the openings of these arteries in the orifice of the aorta are not closed by the semilunar valves.

The **right coronary artery** arises from the aorta corresponding to the right semilunar valve and passes between the aorta and the right auricle. From there it curves around the right border of the heart in the coronary sulcus and passes over to its posterior surface. Here it is continuous with the **posterior interventricular branch**. The posterior interventricular branch descends in the posterior interventricular sulcus to the heart apex where it anastomoses with the anterior interventricular branch of the left coronary artery.

The branches of the right coronary artery vascularize: the right atrium, part of the anterior and the entire posterior wall of the right ventricle, a small area of the posterior wall of the left ventricle, the interatrial septum, the posterior one-third of the interventricular septum, the papillary muscles of the right ventricle, and the posterior papillary muscle of the left ventricle.

The **left coronary artery** arises from the aorta at the left semilunar valve and also lies in the coronary sulcus to the front of the left atrium. Between the pulmonary trunk and the left auricle it gives off two branches: thinner- **anterior interventricular branch** and larger- **circumflex branch**.

The first branch descends along the anterior interventricular sulcus to the heart apex where it anastomoses with the branch of the right coronary artery. The second is a continuation of the main trunk of the left coronary artery; it curves around the heart from the left side in the coronary sulcus and is

also connected with the right coronary artery. As a result, an arterial ring is formed along the whole coronary sulcus which is located in a horizontal plane. It is a functional adaptation for the collateral circulation of the heart.

The branches of the left coronary artery vascularize the left atrium, the entire anterior and the greater part of the posterior left ventricular wall, part of the anterior wall of the right ventricle, the anterior two thirds of the interventricular septum, and the anterior papillary muscle of the left ventricle.

BRANCHING VARIABILITY OF THE CORONARY ARTERIES

Developmental variants of the coronary arteries may occur as the correlations of the blood supply channels differ. Three forms of branching patterns are distinguished from this standpoint:

1. The **uniform pattern** is the similar development of both coronary arteries. This type constitutes about 60 % of occurrences.

2. The **left dominant pattern**. In this case the posterior interventricular branch arises from the left coronary artery; it supplies the entire posterior wall of the left ventricle and most part of the posterior wall of the right ventricle. The interventricular septum is supplied by the anterior and the posterior septal branches given only by the left coronary artery. The left coronary artery prevails. This type constitutes about 10 % of occurrences.

3. The **right dominant pattern**. The posterior interventricular branch arises from the right coronary artery and it supplies the most part of the posterior wall of the left ventricle. The circumflex branch is small. The interventricular septum is supplied by both coronary arteries. This type constitutes about 30 % of occurrences.

ANASTOMOSES

The branches of coronary arteries form small anastomoses subdivided into intersystem and intrasystem.

The **intersystem anastomoses** are formed from the branches of the left and the right coronary arteries. These anastomoses are located on the apex of the heart, in the posterior portion of the coronary sulcus and within the interventricular septum.

The **intrasystem anastomoses** are formed from the branches given by one and the same coronary artery (either right or left). They are found in various areas.

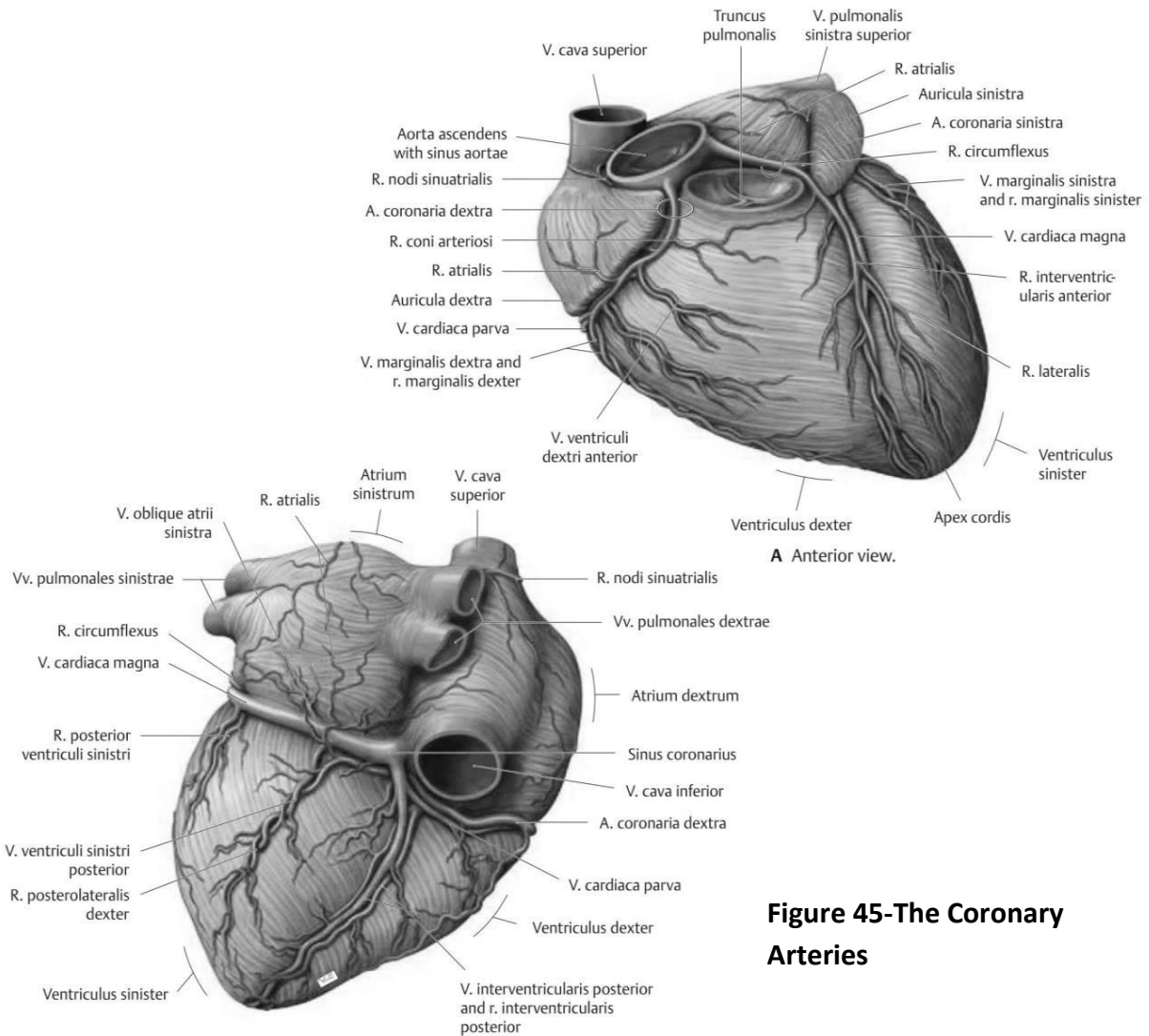


Figure 45-The Coronary Arteries

THE CARDIAC VEINS

The veins of the heart drain not into the venae cavae but directly into the heart cavity. They arise as network in different layers of the wall of the heart. The venous bed significantly predominates over the arterial bed. Venous blood drains along three routes into: the coronary sinus (1); the anterior cardiac veins (2); and the small cardiac veins (Thebesian veins) (3).

1. The **coronary sinus** is a short though wide venous collector. It is located in the posterior section of the coronary sulcus between the left atrium and the left ventricle. Its thicker right end opens into the right atrium between the valvule of the inferior vena cava and the interatrial septum. The opening features a small *valve of the coronary sinus*. The following veins drain into the coronary sinus:

– the **great cardiac vein** arises at the apex of the heart, ascends in the anterior interventricular sulcus of the heart, turns to the left and, curving over the left side of the heart continues with the coronary sinus. The great cardiac vein accepts the ventricular veins and the atrial veins;

– the **middle cardiac vein** also originates on the apex of the heart. It ascends along the posterior interventricular sulcus and joins the coronary sinus. The middle cardiac vein accepts the left and the right ventricular veins that drain the posterior wall of both ventricles;

– the **small cardiac vein** is a small vein located within the right portion of the coronary sinus. It drains several right small atrial and ventricular branches;

– the **posterior vein(s) of the left ventricle** is one or more small venous trunks on the posterior surface of the left ventricle which drain into the coronary sinus or into the middle cardiac vein;

– the **oblique vein of the left atrium** is a small branch on the posterior surface of the left atrium flows into the coronary sinus near to the great cardiac vein.

2. The **anterior cardiac veins** are small veins on the anterior surface of the right ventricle. They drain directly into the cavity of the right atrium (i. e. they bypass the coronary sinus).

3. The **small cardiac veins** are very small venous trunks which do not appear on the heart surface but, having formed from capillaries, drain directly into the cavity of the right atrium and the right ventricle by numerous openings of small cardiac veins.

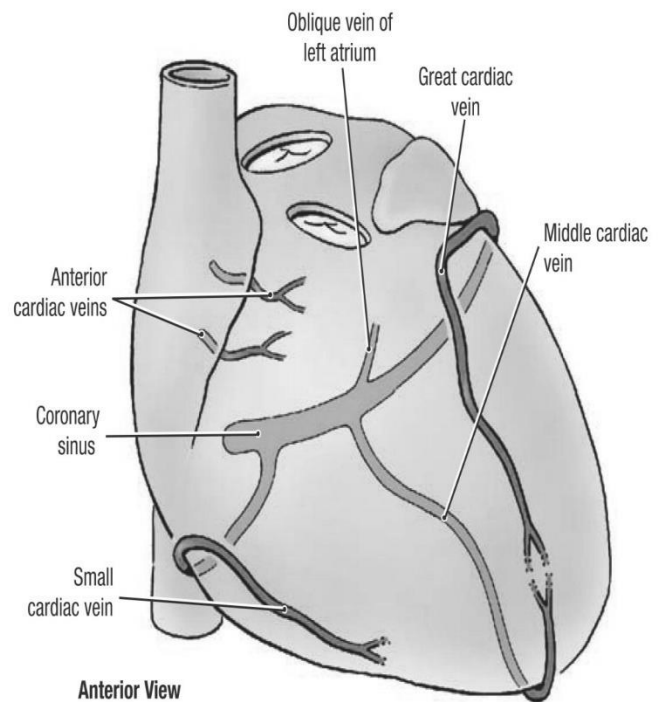
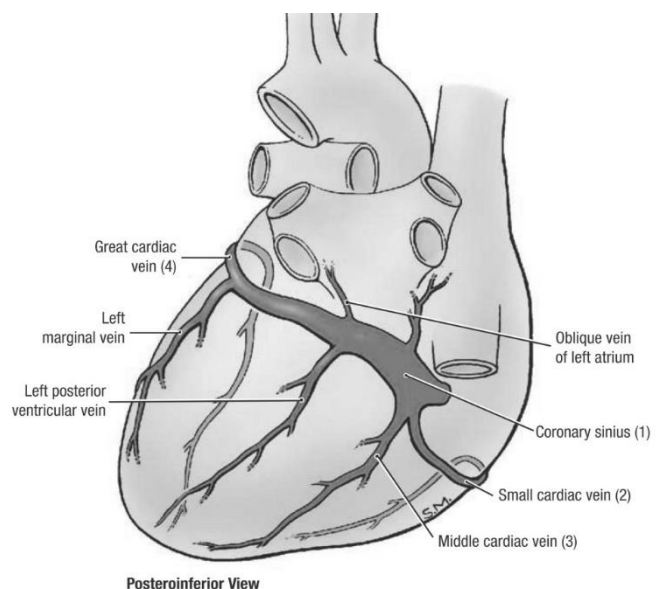


Figure 46-The cardiac veins



DEVELOPMENT OF THE HEART IN HUMANS

The *heart*, a derivative of **mesoderm**, develops early in the third week after impregnation. In the ventral region of the embryo inferior to the foregut, the heart develops from a group of mesodermal cells called the **cardiogenic area**.

The next stage in its development is the formation of a pair of tubes, the **endocardial tubes** which develop from the cardiogenic area. These tubes then unite to form a common tube referred to as the **primitive heart tube**.

Then, the primitive heart tube develops in five separate regions: (1) **truncus arteriosus**, (2) **bulbus cordis**, (3) **ventricle**, (4) **atrium**, and (5) **sinus venosus**. Because the bulbus cordis and ventricle grow most rapidly, and heart enlarges more rapidly than its superior and inferior attachments, firstly it assumes U-shape and then S-shape. The flexures of the heart are arranged so that the atrium and sinus venosus eventually lie superior to the bulbus cordis, ventricle, and truncus arteriosus.

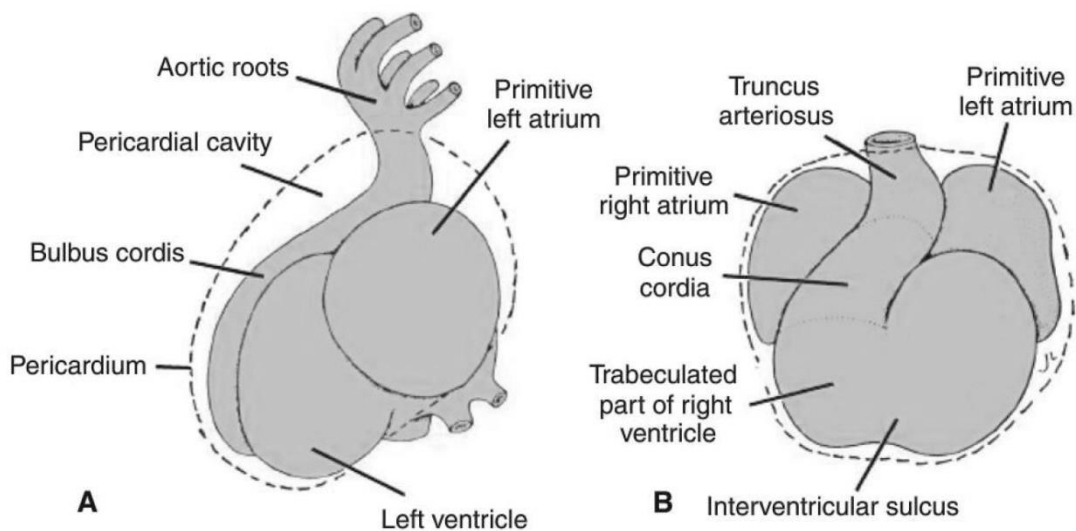
Contractions of the primitive heart begin to the end of the third week of development; they originate in the sinus venosus and fill with blood through the tubular heart.

At about seventh week of development, a partition called the **interatrial septum** is formed in the atrial region. This septum divides the atrial region into the *right atrium* and *left one*.

The opening in the partition is the **foramen ovale** which normally closes at birth or soon thereafter and later forms a depression called *the fossa ovalis*.

The **interventricular septum** also develops; it divides the ventricular region into *right ventricle* and *left ventricle*. The bulbus cordis and truncus arteriosus are divided into two vessels, the *aorta* (arising from the left ventricle) and the *pulmonary trunk* (arising from the right ventricle).

The great veins of the heart—the *superior vena cava* and *inferior vena cava* develop from the venous end of the primitive heart tube.



Heart of a 5-mm embryo [28 days]. **A.** Viewed from the left. **B.** Frontal view. The bulbus cordis is divided into the truncus arteriosus, conus cordis, and trabeculated part of the right ventricle. *Broken line*, pericardium.

Figure 47-Development of Heart in Humans

THE VESSELS OF PULMONARY CIRCULATORY ROUTE

THE ARTERIES OF PULMONARY CIRCULATION

The **pulmonary trunk** carries venous blood from the right ventricle of the heart to the lungs. It passes obliquely to the left crossing the aorta which lies behind it. After distance of 5–6 cm the trunk is divided under the aortic arch on the level of the T4 and T5 vertebrae into two terminal branches—the **right** and **left pulmonary arteries**, each passing to the corresponding lung.

The right pulmonary artery, which is longer, stretches to the right lung behind the ascending aorta and superior vena cava; the left pulmonary artery passes in front of the descending aorta. On approaching the lungs, both pulmonary arteries are divided again into branches that lead to the corresponding pulmonary lobes, stretch to the bronchi, and branch into small arteries and capillaries.

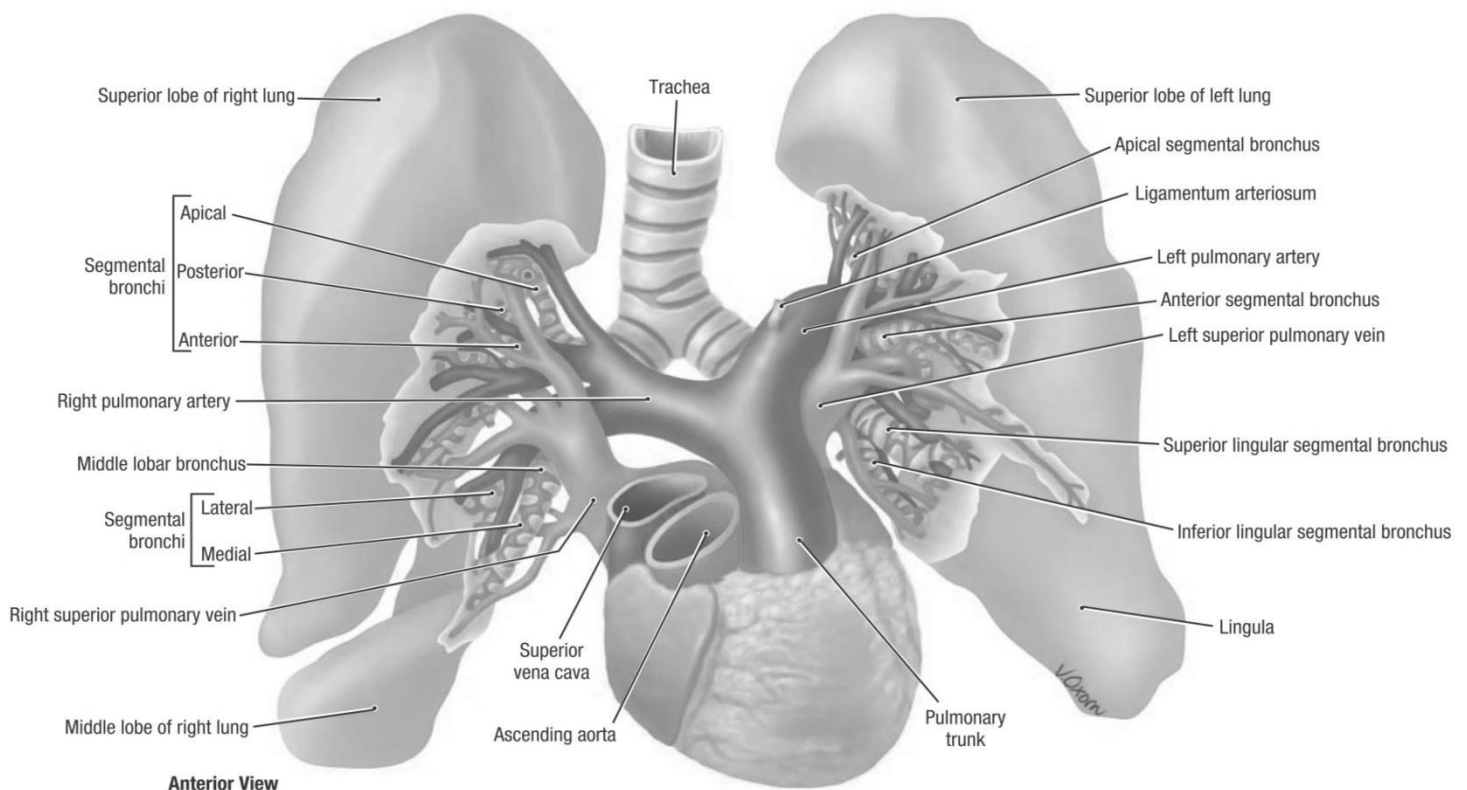
The pulmonary trunk is covered with a layer of pericardium up to its dividing point. A cord of connective tissue, **ligamentum arteriosum**, stretches from the place of the division to the concave side of the aorta. This ligament is the obliterated **ductus arteriosus**

(**Botallo duct**). During fetal period it shunts the blood from the pulmonary trunk to the aorta.

THE VEINS OF PULMONARY CIRCULATION

The **pulmonary veins** carry arterial blood from the lungs into the left atrium. They arise from the capillaries of the lungs and unite into large trunks, two from each lung (one superior and the other inferior). Within the root of the right lung, both veins are found below the pulmonary artery. When passing to the left atrium, the right pulmonary veins cross the posterior wall of the right atrium transversely. Both left pulmonary veins are located below the pulmonary artery and below the left main bronchus. Each vein drains through the separate orifice of the left atrium. The pulmonary veins do not have valves.

Figure 48-The Vessels of Pulmonary Circulatory Route



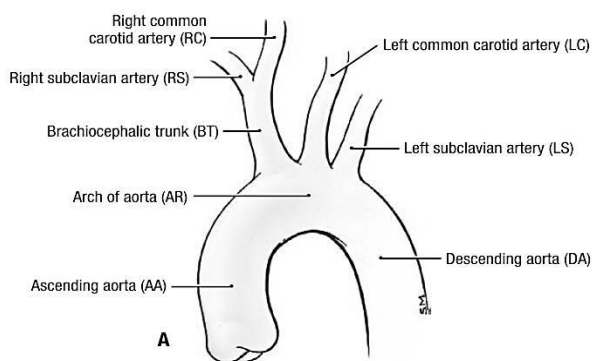
THE VESSELS OF SYSTEMIC (GREATER) CIRCULATION

THE ARTERIES OF SYSTEMIC CIRCULATION. THE AORTA

The **aorta** is the main arterial trunk of systemic circulation. It carries blood from the left ventricle of the heart. The following three sections can be distinguished in the aorta: (1) the ascending aorta, (2) the arch of the aorta, and (3) the descending aorta.

1. The ascending aorta (6 cm long) begins as a bulbous expansion called the **aortic bulb**. There are three sinuses of the aorta found between the wall of the aorta and the cusps of its valve. Within the distension here the aorta gives two coronary arteries. The ascending aorta ascends posteriorly to the right to the pulmonary trunk and to the left from the superior vena cava. On the level with the 2nd right sternocostal joint the ascending aorta continues with the arch of aorta.

2. The arch of aorta bends posteriorly and to the left, curves over the left main bronchus at its very origin, and then continues with the descending aorta on the level with the T4 vertebra. Between two segments one can see minor narrowing called the **aortic isthmus**. There is the **ligamentum arteriosum** on the concave side of the arch of aorta.



Branches of aortic arch

A. Aortic arch. B. Aortic angiogram. Observe the ascending aorta (AA), the arch of the aorta (AR), the descending aorta (DA), the brachiocephalic (BT) trunk (artery) branching into the right subclavian (RS) and right common carotid (RC) arteries, and the left subclavian (LS) and left common carotid (LC) arteries arising directly from the aorta.

3. The descending aorta lies in the posterior mediastinum to the left of the spine. Then it deviates slightly to the right so, that

passing through the aortic hiatus of the diaphragm on the level of the T12 vertebra, the aortic trunk is located in front of the spine on the midline. To the level of the aortic hiatus passes the descending aorta which is called the **thoracic aorta**; when aorta is in the abdominal cavity it is called the **abdominal aorta**. The abdominal aorta ends by splitting into two **common iliac arteries** at the level of L4 (**the aortic bifurcation**) and then continues into the pelvis as a small thin trunk (the middle sacral artery).

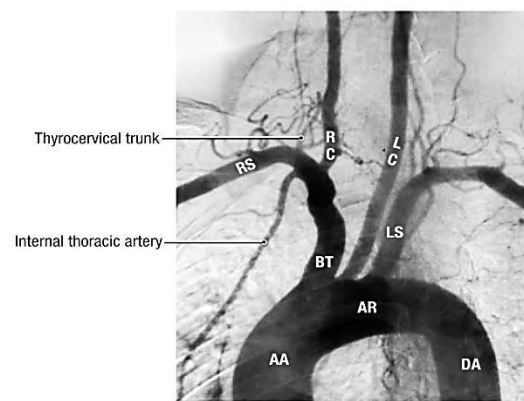
THE BRANCHES OF AORTIC ARCH

The aortic arch gives rise to three great arterial trunks that supply the head, neck and upper limbs. They are:

1. The brachiocephalic trunk (3–4 cm long) runs obliquely upward, backward, and to the right, anteriorly to the trachea where it gives off a branch to the thyroid gland and is divided behind the right sternoclavicular joint into its terminal branches - the **right common carotid** and the **right subclavian arteries**.

2. The left common carotid artery ascends leftwards, anterior to the trachea. In the cervical region the artery runs laterally from the trachea.

3. The left subclavian artery ascends leftwards, enters the interscalene space and eventually appears within the axillary cavity.



B. Left Anterior Oblique View

Figure 49-The Branches of Aortic Arch

THE COMMON CAROTID ARTERY

The **common carotid artery** arises from the brachiocephalic trunk on the right and independently from the aortic arch on the left side posterior to the manubrium of sternum. Both common carotid arteries run upward on the side of the trachea and esophagus within the carotid sheath. The right common carotid artery consists only of a cervical section and thus is shorter than the left one which consists of thoracic section (from the aortic arch to the left sternoclavicular joint) and cervical section. The common carotid artery passes in the trigonum caroticum and at the level of the superior border of the thyroid cartilage divides into its terminal branches the **external** and **internal carotid arteries (the carotid bifurcation)**. To stop bleeding, the common carotid artery is pressed to carotid tubercle of the C6 vertebra at the level of the inferior border of the cricoid cartilage.

At the carotid bifurcation one can see the dilated area called **the carotid sinus**. It expands into the internal carotid artery. Its wall contains nerve terminations from the

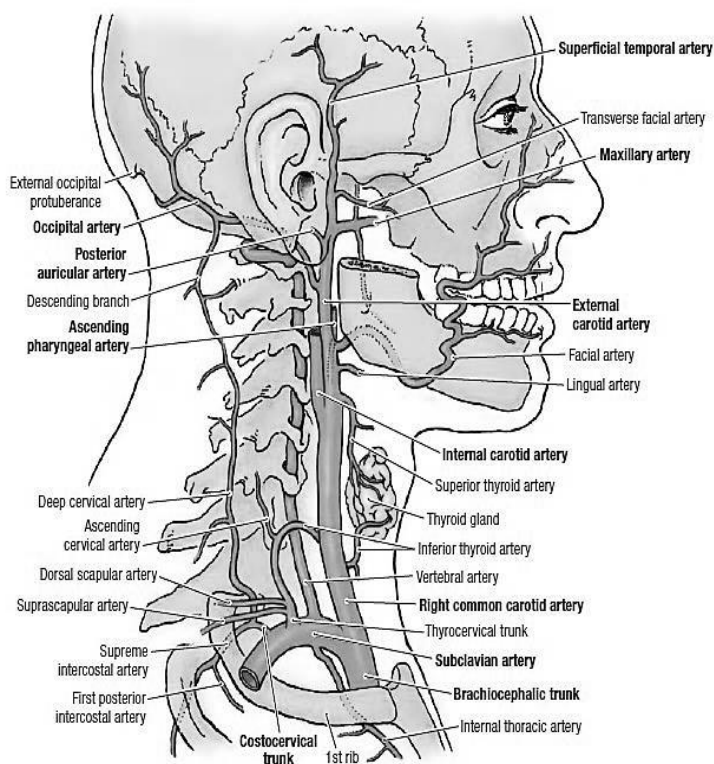


Figure 50-The Common Carotid Artery

glossopharyngeal and vagus nerve and from the sympathetic trunk. This area takes place in regulation of blood pressure. Between the arteries one can see a small **carotid body**. The body is the endocrine gland; it is formed of chromaffin tissue.

THE INTERNAL CAROTID ARTERY

Having branched off from the common carotid artery **the internal carotid artery** rises to the base of the skull and enters the canalis caroticus in the temporal bone. At its origin it lies laterally from the external carotid artery but then the artery dislocates medially. In accordance with the convolutions of the canalis caroticus, the internal carotid artery at first runs upwards and then curves anteromedially. The artery enters the skull cavity through the internal carotid foramen. Bending upward it rises along the carotid sulcus of the sphenoid bone and enters the cavernous sinus. Within the sinus, the artery forms S like flexure. On leaving the sinus, the artery penetrates the dura mater and gives the terminal branches.

The internal carotid artery is divided into four parts as follows:

- 1. The cervical part** is the segment that expands from the bifurcation to the external opening of the carotid canal.
- 2. The petrous part** occupies the carotid canal. Here the artery gives small branches to the tympanic cavity (**the caroticotympanic arteries**).
- 3. The cavernous part** is incorporated into the cavernous sinus.
- 4. The cerebral part** is the terminal segment that gives the main branches.

THE BRANCHES OF THE INTERNAL CAROTID ARTERY

The **ophthalmic artery** together with optic nerve penetrates the optic canal into the orbit where it divides into its terminal branches:

- the **central retinal artery** runs within the optic nerve; it enters the

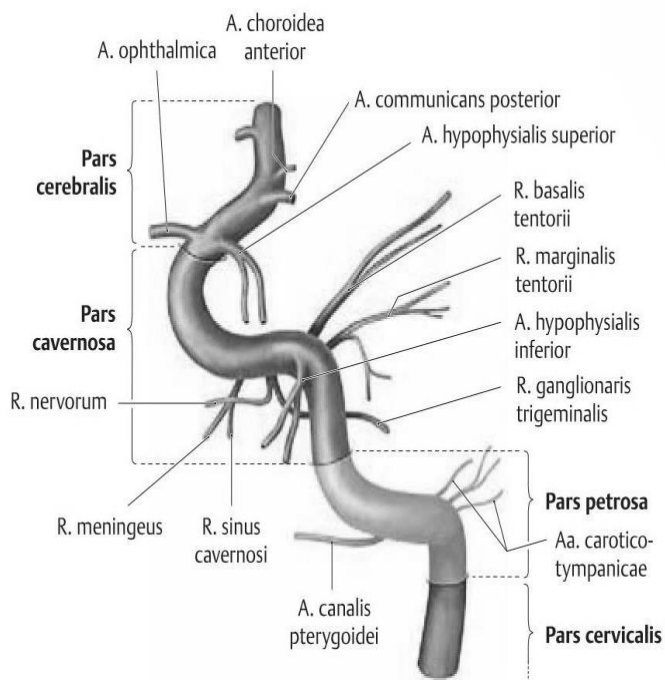


Figure 51-The Branches of the Internal Carotid Artery

eyeball and terminates within the retina next to the optic disc;

- the **posterior ciliary arteries** (long and short) run along the optic nerve. They traverse the sclera and terminate within the vascular layer of the eyeball;
- the **anterior ciliary arteries** supply the anterior portion of the sclera and conjunctiva;
- the **lacrimal artery** supplies the lacrimal gland; its terminal branches are the *lateral palpebral arteries*;
- the **anterior and posterior ethmoidal arteries** leave the orbit via the openings of the same name. They supply the mucosa of ethmoidal cells and nasal mucosa. The anterior ethmoidal artery gives rise to the *anterior meningeal branch*;
- the **supra orbital artery** leaves the orbit along the supraorbital notch (or foramen) and gives branches to the frontal area;
- the **supratrochlear artery** leaves the orbit along the frontal notch and terminates within the frontal area as well;
- the **medial palpebral arteries** are the terminal branches of the ophthalmic artery. They supply the eyelids;

- the **dorsal nasal artery** is also the terminal branch supplied the nose. It anastomoses with the *angular artery* given by the facial artery.

The **anterior cerebral artery** stretches forward medially to the beginning of the longitudinal sulcus of the brain, curves around the knee of the corpus callosum, and stretches along the inner surface of the cerebral hemisphere back to the beginning of the longitudinal sulcus of the brain giving off branches along the way to the cerebral cortex. At the origin of the longitudinal sulcus of the brain it joins with the artery of the same name from the other side by means of a transverse trunk - the **anterior communicating artery**.

The **middle cerebral artery** is the greatest branch of the internal carotid artery. It passes laterally into the depth of the lateral cerebral sulcus giving numerous branches that supply the external surface of the frontal, temporal, and parietal lobes with blood.

The **posterior communicating artery** runs posteriorly and joins the *posterior cerebral artery* (from the *basilar artery*).

The **anterior choroidal artery** passes back laterally and on reaching the surface of the temporal lobe of the brain, enters the inferior horn of the lateral ventricle and terminates in the *choroid plexus* of both lateral and third ventricles.

The anterior communicating artery, initial segment of the anterior cerebral arteries, posterior communicating arteries, and posterior cerebral arteries (from *basilar artery*) join to form closed **cerebral arterial circle** (Willis' circle). In the subarachnoid space. These anastomoses provide redistribution of blood flow and compensation of restricted blood flow. The cerebral arteries form numerous anastomoses on the surface, thus forming the arterial network. The network gives branches: the *short cortical branches* that supply the cerebral cortex; the *long cerebral branches* that reach the white matter, the basal ganglia and the thalamus receive branches from the inferior surface of the brain. The intrinsic arteries form few anastomoses mainly communicating via microcirculatory network.

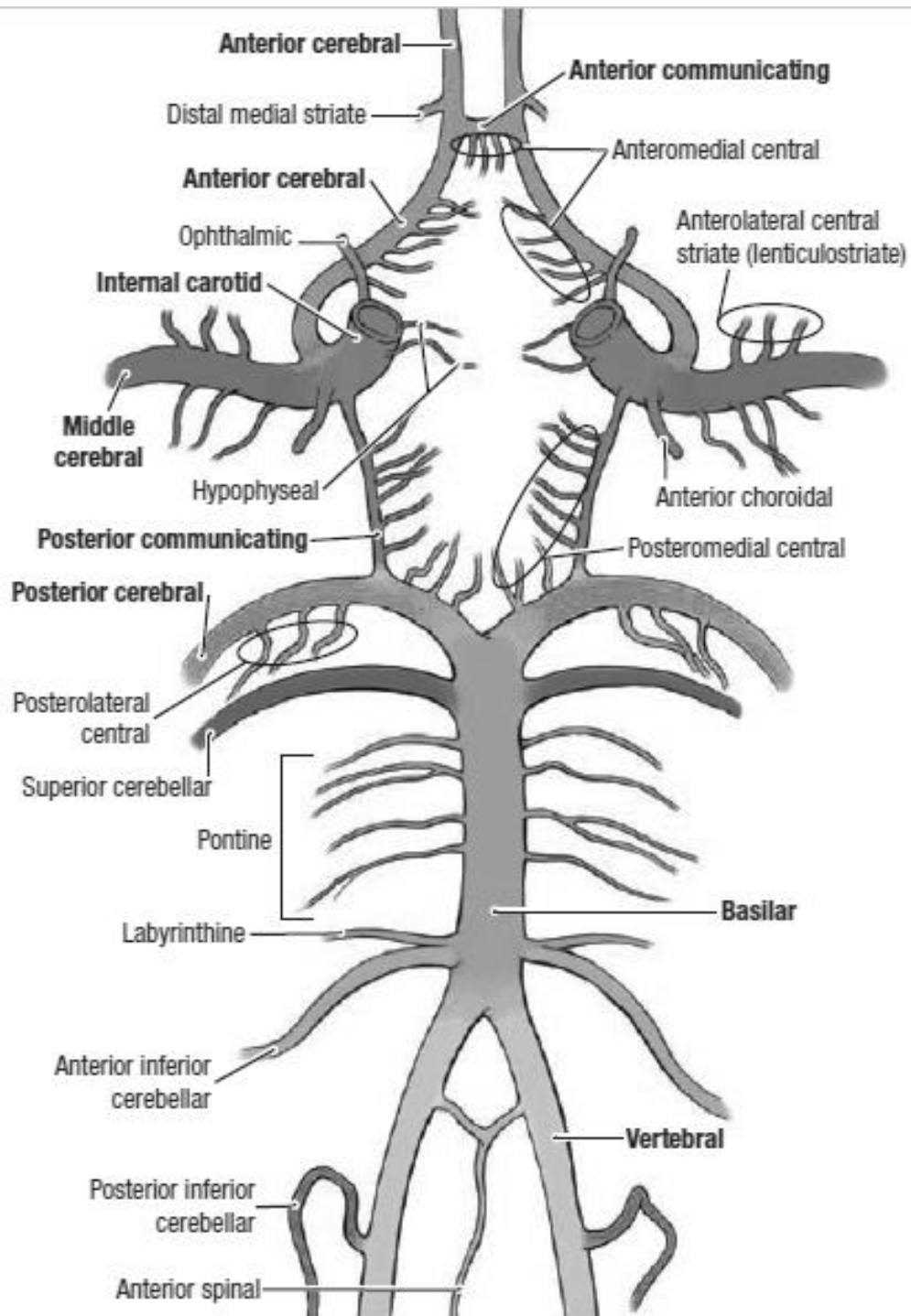


Figure 52-Cerebral Arterial Circle (willis circle)

THE EXTERNAL CAROTID ARTERY

The **external carotid artery** supplies blood to the external part of the head and neck. From its point of origin, the external carotid artery runs upward, passing medial to the posterior belly of the digastric and stylohyoid muscles, pierces the parotid gland, and divides into its terminal branches behind the neck of the mandibular condyloid process. The external carotid artery gives the off anterior, medial, posterior and terminal branches.

The anterior group

The **superior thyroid artery** arises from the external carotid artery immediately above its origin and runs downward and anteriorly to the thyroid gland where it anastomoses with the other thyroid arteries. Along the way it gives off branches to the sternocleidomastoid and thyrohyoid muscles, the hyoid bone, and the larynx. The larynx is reached by the **superior laryngeal artery** which together with the superior laryngeal nerve pierces the thyrohyoid membrane and supplies the muscles, ligaments, and mucosa of the larynx with blood.

The **lingual artery** arises at the level of the greater horns of the hyoid bone, runs upward through Pirogov's triangle (the lingual triangle), and then passes to the tongue. Before entering the tongue, it gives off branches to the hyoid bone, palatine tonsils, and the sublingual gland (*the sublingual artery*). The lingual artery extends to the tip of the tongue and called the **deep lingual artery**. It gives off multiple branches to the back of the tongue (*the dorsal lingual branches*).

The **facial artery** arises slightly above the lingual artery at the level of the mandibular angle, passes medially to the posterior belly of the digastric muscle, and reaches the anterior border of the masseter muscle where it bends at the right angle over the border of the mandible onto the face. (It can be pressed here to the mandible in front of the masseter). It passes further to the medial angle of the eye where its terminal branch (*the angular artery*) anastomoses with the *dorsal nasal artery* (a

branch of the ophtalmic artery). The facial artery gives the following branches:

- the **glandular artery** supplies the submandibular gland.
- the **ascending palatine artery** supplies the soft palate and the palatine tonsil.
- the **submental artery** supplies the mental area.
- the **superior and inferior labial arteries** supply the respective lips.

The posterior group

The **occipital artery** arises below the posterior belly of the digastric muscle, lies in the sulcus of the same name on the mastoid process of the temporal bone, emerges under the skin in the occipital region, and gives off branches. The artery supplies the occipital tissues (*the occipital branches*), the auricle (*the auricular branches*), the mastoid process (*the mastoid branch*), and the dura mater of the posterior cranial fossa (*the meningeal branch*).

The **posterior auricular artery** arises above the posterior belly of the digastric muscle, runs upward and to the back to the skin behind the auricle, and reaches the parietal area. The artery supplies the auricle (*the auricular branch*), the skin of the mastoid and occipital regions, and the tympanic cavity into which its branch penetrates via the stylomastoid foramen (*the posterior tympanic artery* supplies the mucosa, and the *stapedial branch* supplies the stapedius muscle).

The **sternocleidomastoid artery** runs to the muscle of the same name.

The medial group

The **ascending pharyngeal artery** is a small artery that arises from the external carotid artery close to its origin and ascends along the lateral pharyngeal wall. It supplies with blood the pharynx, soft palate, palatine tonsil, auditory tube, tympanic cavity (*the inferior tympanic artery* enters the tympanic cavity via the *tympanic canaliculus*), and the dura mater of the posterior cranial fossa (*the posterior meningeal artery* enters the skull cavity via the *jugular foramen*).

The terminal branches

The **superficial temporal artery** stretches as the continuation of the external carotid artery in front of the external acoustic meatus onto the temple under the skin. The artery can be pressed here to the temporal bone. On the level of the superior orbital border, it divides into two large anterior (the **frontal branch**) and posterior (the **parietal branch**) branches which bifurcate in the region of the vertex and temple. The artery also supplies the parotid gland (with the **parotid branch**), the auricle, the external acoustic meatus, the zygomatic bone and the temporal muscle. One of the branches arising from the superficial temporal artery below the zygomatic arch passes forward next to the parotid duct and bifurcate on the posterior surface of the face (the **transverse facial artery**).

The **maxillary artery** is the second large artery of the group. For the sake of convenience it is classified into three sections: the first (the **mandibular segment**) curves around the neck of the mandible; the second (the **pterygoid segment**) passes in the infratemporal fossa on the surface of the lateral pterygoid muscle; and the third (the **pterygopalatine segment**) penetrates the pterygopalatine fossa and gives off its terminal branches.

The **first segment** gives off the branches as follows:

- the **anterior tympanic artery** reaches the tympanic mucosa via the petrotympanic fissure;
- the **deep auricular artery** supplies the temporomandibular joint, the external acoustic meatus and the tympanic membrane;
- the **middle meningeal artery** enters the cranial cavity via the foramen spinosum and gives off the branches to the dura mater of the middle cranial fossa and the **superior tympanic artery** to the tympanic mucosa;

- the **inferior alveolar artery** passes into the mandibular canal. Before entering the canal, the artery gives off the **mylohyoid branch** to the mylohyoid muscle, while in the canal it supplies the lower teeth and gums with branches. It leaves the canal through the mental foramen. It is called the **mental branch** which supplies the skin and muscles of the chin and the lower lip.

The branches of the **second segment** are:

- the **muscular branches** supply all muscles of mastication receiving name that correspond to the muscles and buccinators;
- the **superior posterior alveolar arteries** pass to mucosa of the maxillary sinus and upper molars via the alveolar foramina of the temporal surface of the maxilla.

The **third segment** gives off three terminal branches:

- the **infra-orbital artery** enters the orbit via the inferior orbital fissure, then passes through the infra orbital canal; it leaves the canal through the infra orbital foramen and gives off branches to the lower eyelid, lacrimal sac, nose, and down to the upper lip and cheek. Here it anastomoses with the branches of the facial artery. As the infra-orbital artery passes through the infra-orbital canal, it gives the **superior anterior alveolar arteries** that supply the superior premolars, canine tooth, incisors, gums and mucosa of the maxillary sinus;
- the **descending palatine artery** passes within the greater palatine canal; it supplies the entire palate. The artery gives rise to the **artery of the pterygoid canal** which supplies the upper portion of the pharynx and the auditory tube;
- the **sphenopalatine artery** runs through the foramen of the same name into the nasal cavity. It supplies the nasal mucosa with blood and anastomoses with the **anterior and posterior ethmoidal arteries** (from the **ophthalmic artery**).

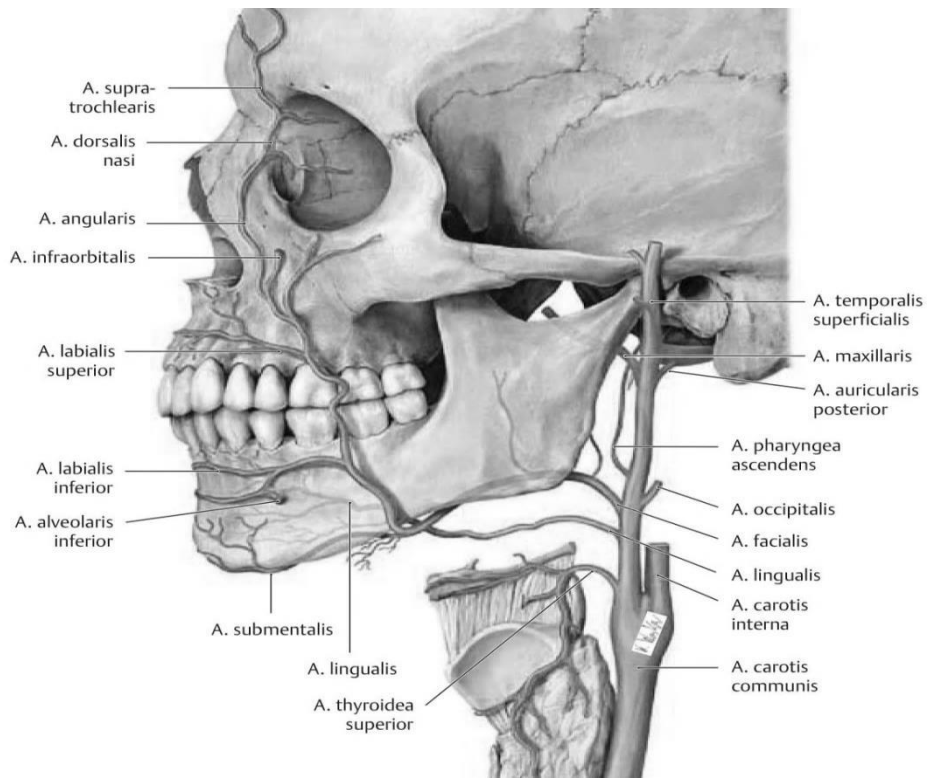


Figure 53-The Anterior Branches of the External Carotid Artery

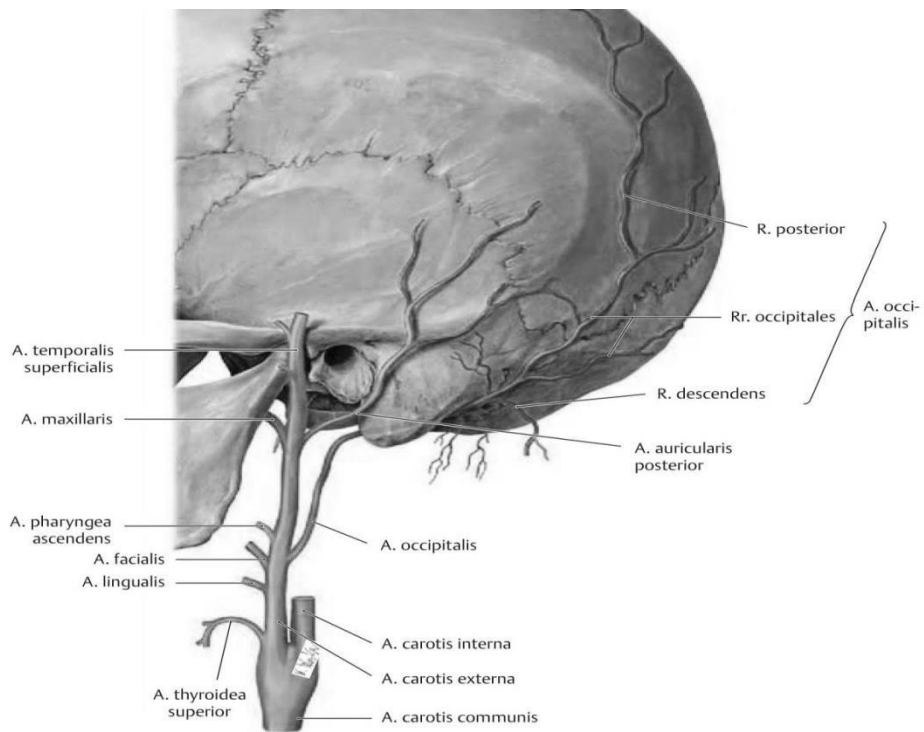


Figure 54-The Posterior Branches of the External Carotid

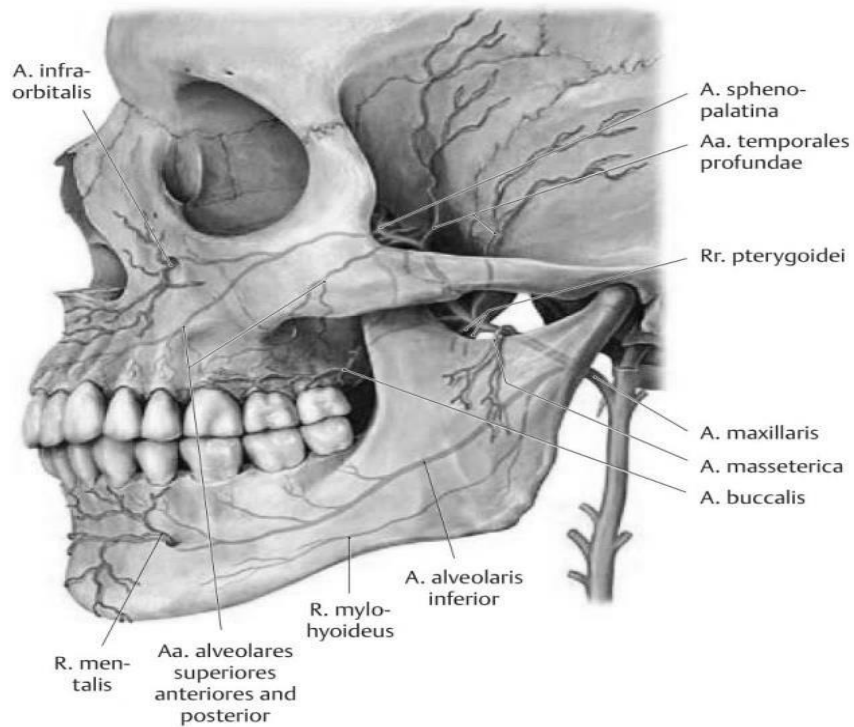


Figure 55-The Terminal Branches of the External Carotid Artery (the maxillary artery)

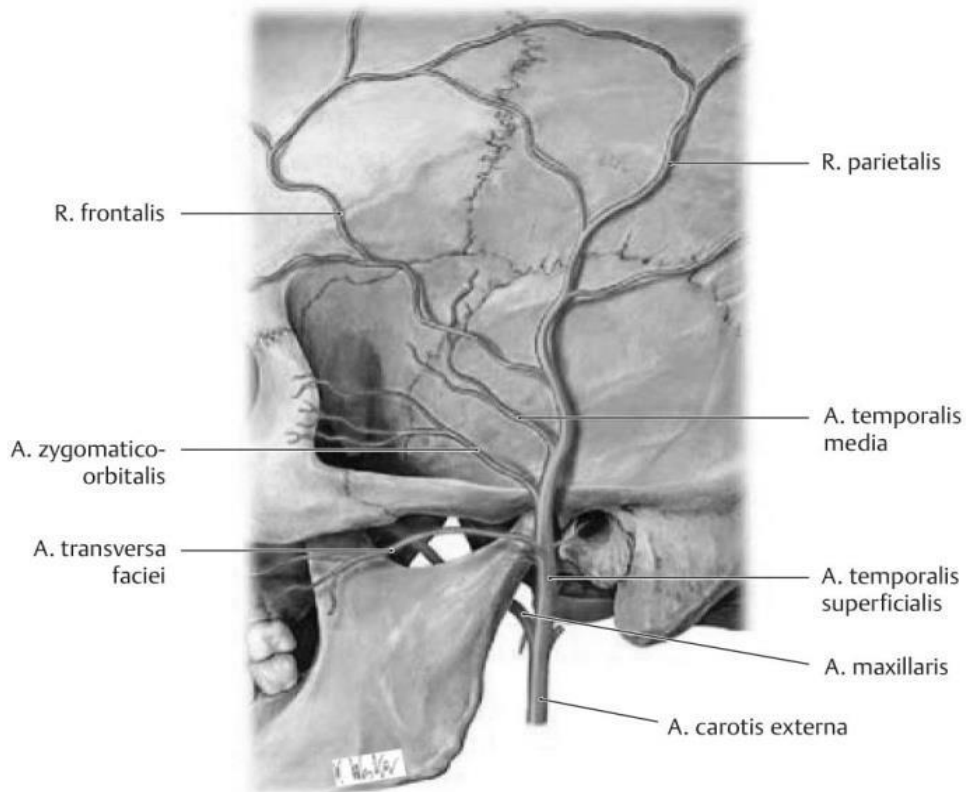


Figure 56-The Terminal Branches of the External Carotid Artery (superficial temporal artery)

THE SUBCLAVIAN ARTERY

Only the left subclavian artery belongs to the group of arteries branching directly off the aortic arch. The artery on the right is a branch of the brachiocephalic trunk. As a result, the right subclavian artery is slightly shorter than the left.

The artery forms a convex arch curving around the cupula of the pleura. It leaves the thoracic cavity through the thoracic inlet, approaches the clavicle, penetrates into the subclavian groove of the first rib and bends over it. Here the subclavian artery may be compressed to stop the flow of blood to the first rib. Within the cervical region, the artery is located posterior to the vein of the same name and laterally from the trachea and esophagus. Along the way, the subclavian artery, together with the nervous brachial plexus passes through the interscalene space. On leaving the space, the artery becomes continuous with the axillary artery; the arteries are delimited by the outer border of the first rib.

Thus, three segments can be distinguished in the subclavian artery: (1) the first from the beginning of the artery to the entrance into the interscalene space; (2) the second in the interscalene space; (3) the third from its exit to the transition into the axillary artery.

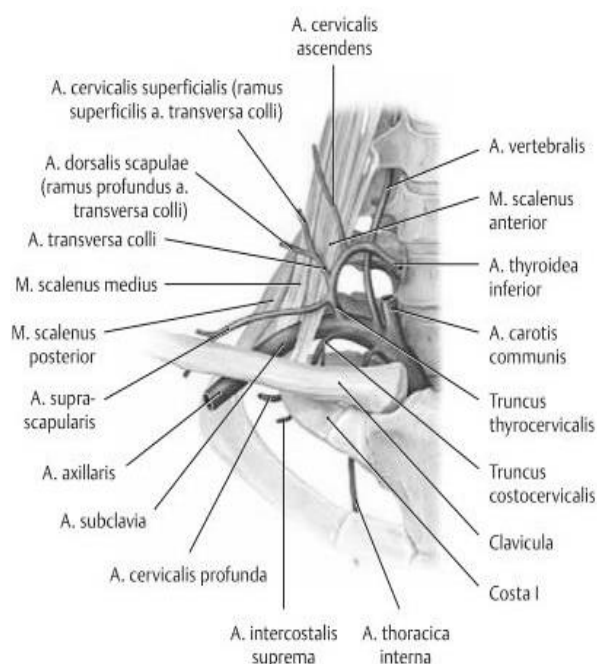


Figure 57-The Vertebral Artery

The branches of the first segment of the subclavian artery

The first division gives rise to the following branches: the vertebral artery, the internal thoracic artery and the thyrocervical trunk.

The vertebral artery

The **vertebral artery** is the greatest branch of the subclavian artery. It bends upward into the space between the anterior scalene and longus colli muscles at the level of C6, passes into the foramen transversarium of C6, and rises through the openings in the transverse processes of the cervical vertebrae. On leaving the foramen transversarium of C1, the artery proceeds along the groove for the vertebral artery of the same vertebra and forms a flexure (siphon). Then the artery traverses the atlantooccipital membrane and enters the cranial cavity via the foramen magnum. On reaching the medullopontine sulcus, the arteries fuse to form the **basilar artery**.

Divisions of the vertebral artery

The vertebral artery is subdivided into four parts with the respect to area occupied:

- the **prevertebral part** is the segment that expands from origination point to the foramen transversarium of C6;
- the **cervical part** corresponds to the foramina transversaria of C6 through C2;
- the **atlantic part** corresponds to C1;
- the **intracranial part** is located within the cranial cavity.

The branches of the vertebral artery:

- the **spinal branches** arise from the cervical part and enter the vertebral canal through the intervertebral foramina. They supply the spinal cord with blood;
- the **muscular branches** given by the same part, supply the deep cervical muscles;
- the **posterior spinal artery**, paired, is the branch of the intracranial part. It descends along the posterior surface of medulla oblongata and posterolateral surface of the spinal cord to terminate at the cauda equine;
- the **anterior spinal artery**, paired, both arteries run medially and then merge on the midline at the level of pyramidal

decussation. The trunk formed descends along the anterior median fissure of the spinal cord to the cauda equina.

The anterior and posterior spinal arteries run along the spinal cord and anastomoses with the spinal branches given by the vertebral, intervertebral and the lumbar arteries. They maintain the same lumen diameter all the way down to the destination point;

- the **posterior inferior cerebellar artery** branches out on the lower surface of the cerebellum;

- the **anterior inferior cerebellar artery** supplies the inferior surface of the cerebellum;
- the **superior cerebellar artery** runs to the superior surface of the cerebellum;
- the **pontine arteries** supply the pons;
- the **mesencephalic arteries** run to the midbrain;
- the **labyrinthine artery** reaches the labyrinth of the inner ear via the internal acoustic meatus.

Two vertebral arteries joined in one trunk and two anterior spinal arteries joined in one trunk form **Zakharchenko's arterial circle**, which together with the cerebral arterial circle is important in the collateral circulation of the medulla oblongata.

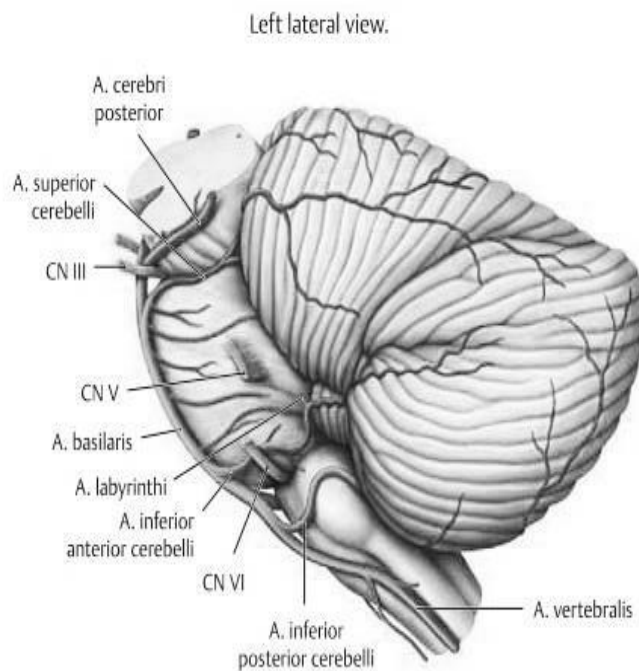


Figure 58-The Basilar Artery

The **basilar artery** is formed by the union of both vertebral arteries. It is unpaired and lies in the *basilar sulcus* of the pons. At the anterior margin of the pons, it divides into two the **posterior cerebral arteries**, which pass back and upward curving around the lateral surface of the cerebral peduncles, and branch out on the lower, inner, and external surfaces of the occipital lobe. Receiving the *posterior communicating arteries* from the internal carotid artery, the posterior cerebral arteries participate in the formation of the **cerebral arterial circle (Willis' circle)**. The basilar artery also gives the following branches:

The internal thoracic artery

The **internal thoracic artery** originates from the subclavian artery opposite the origin of the vertebral artery and descends medially, close to the pleura. Beginning from the cartilage of the first rib, it extends vertically at a distance of about 12 mm from the edge of the sternum. When it reaches the lower edge of the seventh rib cartilage, the internal thoracic artery divides into two terminal branches:

- the **musculophrenic artery**, which stretches laterally along the line of attachment of the diaphragm and gives off branches to it, to the abdominal muscles and intercostal spaces 7 through 11;
- the **superior epigastric artery** penetrates through the sheath of the rectus abdominis muscle and, on reaching the navel, anastomoses with the *inferior epigastric artery* (from the *external iliac artery*);

The internal thoracic artery also gives the following branches:

- the **pericardiophrenic artery** passes together with the phrenic nerve to the diaphragm, giving off small branches along the way to the pleura and pericardium;
- the **anterior intercostal branches** run through the six superior intercostal spaces and anastomoses with the

posterior intercostal arteries (from the thoracic aorta);

- the **thymic branches** supply the thymus;
- the **perforating branches** run to the thoracic muscles;
- the **medial mammary branches** supply the mammary gland;
- the **bronchial branches** supply the lower end of the trachea and bronchi;
- the **sternal and mediastinal branches** supply the sternum and the mediastinal fat.

The thyrocervical trunk

The **thyrocervical trunk** branches upward from the subclavian artery at the medial margin of the anterior scalene muscle. The trunk runs at a distance of about 4 cm and then divides into the following branches:

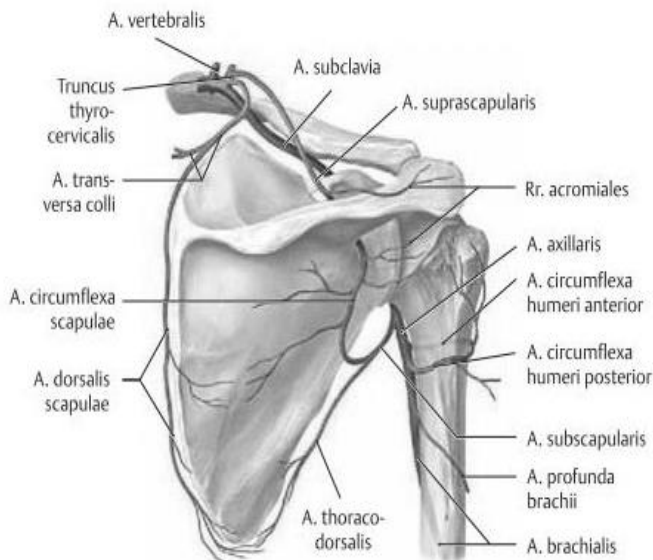


Figure 59-The Thyrocervical Trunk (posterior view)

- the **inferior thyroid artery** passes to the posterior surface of the thyroid gland between the common carotid artery in front and the vertebral artery in back, giving off the **inferior laryngeal artery** which branches out in the muscles and mucosa of the larynx and anastomoses with the **superior laryngeal artery** (from the **superior thyroid artery**). Also the inferior thyroid artery supplies the trachea, esophagus, and thyroid gland; the branches of the thyroid gland anastomose with the branches of the **superior thyroid artery**;

- the **ascending cervical artery** passes upwards along the anterior scalene muscle and supplies the deep muscles of the neck and spinal cord (the **spinal branches**);
- the **suprascapular artery** passes anterior to the anterior scalene muscle and posterior to the clavicle. It reaches both the supraspinous and infraspinous fossae via the suprascapular notch. It supplies the scapular muscles (here it anastomoses with the **circumflex scapular artery**) and shoulder joint;
- the **superficial cervical artery** runs above the suprascapular artery. It reaches the lateral cervical region to supply the muscles of the neck and back. This artery may be absent.

The branches of the second segment of subclavian artery

The **costocervical trunk** arises from the subclavian artery within the interscalene space and passes upwards and back wards to the neck where it divides into two branches:

- the **deep cervical artery** supplies the deep cervical muscles;
- the **supreme intercostal artery** branches into the first and second intercostal spaces.

The branches of the third segment of the subclavian artery

The **transverse cervical artery** perforates the brachial plexus. On reaching the superior angle of the scapula, the artery gives two branches:

- the **ascending branch** that supplies the cervical muscles;
- the descending branch that runs along the medial border of the scapula to supply the muscles and the skin of the back.

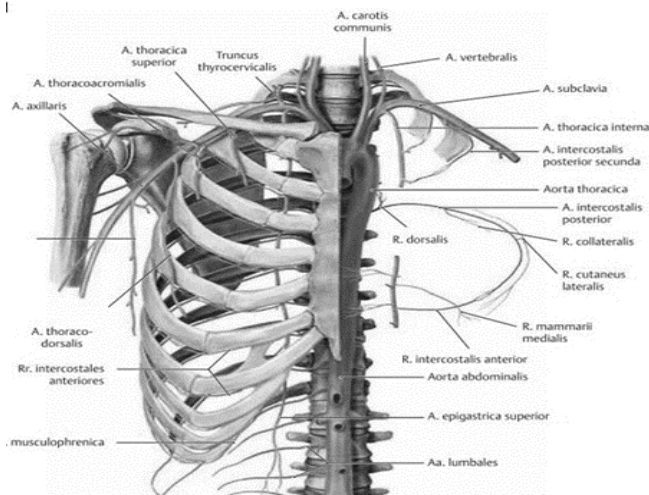


Figure 60-The Subclavian and Axillary Artery

THE AXILLARY ARTERY

The **axillary artery** is a direct continuation of the subclavian artery. In turn, the axillary artery is continuous with the brachial artery. The proximal border of the trunk of the axillary artery is on the level with the external edge of the first rib. The distal border is on the inferior edge of pectoralis major (anteriorly) and the latissimus dorsi (posteriorly). The axillary artery lies in the axillary cavity; in front and medial of it is the axillary vein with the cords of brachial plexus on three sides (they run medially, laterally and posteriorly from the artery). With respect to triangles of the anterior wall of the axillary cavity, the artery is subdivided into three parts.

The branches of the axillary artery in the clavipectoral triangle:

- the **superior thoracic artery** is a small branch that supplies the intercostal muscles in the 1st and 2nd intercostal spaces;
- the **thoraco-acromial artery** originates at the superior margin of the pectoralis minor and divides into branches. The **acromial branch** supplies the acromion and anastomoses with the *suprascapular artery* (from the subclavian artery) to form a network of vessels that supplies the shoulder joint with blood. The **deltoid branch** supplies the deltoid muscle and the **pectoral branch** supplies the pectoralis major.

The branch of the axillary artery in the pectoral triangle:

- the **lateral thoracic artery** descends on the lateral wall of the chest and gives off branches to the mammary gland and the serratus anterior muscle.

The branches of the axillary artery in the subpectoral triangle:

- the **subscapular artery** is the largest branch of the axillary artery. It descends along the inferior margin of the subscapular muscle, giving off branches to it. The subscapular artery separates into two terminal branches:

a) the **thoracodorsal artery** is a continuation of the subscapular artery. It supplies the subscapular muscle, the latissimus dorsi and the serratus anterior;

b) the **circumflex scapular artery** passes through the *triangular opening* to the dorsal surface of the scapula to supply related muscles. The artery anastomoses with the *suprascapular artery* (from the subclavian artery);

- the **anterior circumflex humeral artery** is a small artery that curves around the surgical neck of the humerus anteriorly;
- the **posterior circumflex humeral artery** is thicker; it passes to the back into the *quadrangular opening* together with the axillary nerve, bounds posteriorly around the surgical neck of the humerus and terminates within the deltoid muscle anastomosing with the anterior circumflex artery. Both circumflex arteries supply the adjacent muscles and shoulder joint.

THE BRACHIAL ARTERY

The **brachial artery** is a direct continuation of the axillary artery. It joins the neurovascular bundle that runs along the *medial bicipital groove*; at the level of the neck of the radius, the artery divides into its terminal branches: the **radial** and the **ulnar** arteries. It gives off small branches to the bone and muscles, and gives rise to the following branches:

1. The **deep artery of the arm** arises from the brachial artery after the origin of the latter. It is a large branch which together with the radial nerve passes into the *radial canal*. The artery supplies the triceps brachii muscle and the humerus (with the **humeral nutrient artery**). Besides, the deep artery of the arm gives several terminal branches:

a) the **radial collateral artery** emerges onto the anterior surface of the cubital fossa, reaches the lateral epicondyle to anastomose with the *recurrent radial artery* (a branch of the radial artery).

b) the **middle collateral artery** is the direct continuation of the deep artery of the arm. It penetrates through the thickness of the triceps brachii, muscle descends to the posterior surface of the lateral epicondyle of the humerus where it anastomoses with the *recurrent interosseous artery* (from the posterior interosseous artery).

2. The **superior ulnar collateral artery** arises from the brachial artery in the middle of the arm and passes into the *ulnar groove* of the humerus behind the medial epicondyle where it anastomoses with the posterior branch of the *recurrent ulnar artery*.

3. The **inferior ulnar collateral artery** arises from the brachial artery immediately above the medial epicondyle. It descends anteriorly and anastomoses with the anterior branch of the same *recurrent ulnar artery*.

The ulnar collateral arteries supply the brachial muscles and participate in formation of the arterial network of the elbow joint.

THE RADIAL ARTERY

The **radial artery** continues directly with the brachial artery. It occupies the radial groove of the forearm together with the paired accompanying veins and the superficial branch of the radial nerve. In the lower one-third of the forearm, the radial artery is covered only with the fascia and skin. The pulsation of the artery can be easily taken here as the artery is close to the surface. On reaching the top of the styloid process of the radial bone, the radial artery passes to the back of the hand, curving around the lateral

edge of the wrist and settling into the “anatomical snuffbox” from where it comes to the palm through the first interosseous space between the bases of the first and second metacarpal bones. On the palm the radial artery, together with the deep branch of the ulnar artery forms the deep palmar arch.

The branches of the radial artery in the forearm region:

- **muscular branches** supply the surrounding muscles with blood;

- the **recurrent radial artery** originates in the cubital fossa and passes in the proximal direction toward the anterior surface of the lateral epicondyle where it anastomoses with the *radial collateral artery* (given by the deep artery of the arm);

- the **palmar carpal branch** originates in the lower part of the forearm and passes to meet a similar branch rising from the ulnar artery. The anastomosis results in palmar carpal network;

- the **superficial palmar branch** passes over the thenar eminence or penetrates it and, joining the end of the ulnar artery, participates in the formation of the *superficial palmar arch*;

- the **dorsal carpal branch** rises from the region of the “anatomical snuffbox” and, with the same branch of the ulnar artery, forms the *dorsal carpal arch*;

- the **first dorsal metacarpal artery** passes over the dorsal surface of the hand to the radial side of the index finger and to both sides of the thumb;

- the **princeps pollicis artery** runs over the palmar surface of the first metacarpal bone and divides into *proper palmar digital arteries* to both aspects of the thumb and the *radialis indicis artery* to the forefinger.

THE ULNAR ARTERY

The **ulnar artery** is the larger of two terminal branches of the brachial artery. From its origin in the cubital fossa, it runs under the pronator teres and enters the *ulnar groove* in the lower half of the forearm. Then it descends to the wrist joint together with the ulnar nerve and reaches the hand on passing into the *ulnar carpal canal*. On the hand the

ulnar artery continues with the superficial palmar arch.

The branches of the ulnar artery in the forearm region:

- the **ulnar recurrent artery** arises from the beginning of the ulnar artery and ascends to the medial epicondyle. There it splits into the *anterior* and the *posterior branches*, which anastomose with the *superior* and *inferior ulnar collateral arteries* (from the brachial artery). These anastomoses, together with the anastomoses mentioned above, which connect branches of the *deep artery of the arm*, the *radial artery*, the *brachial artery* and the *ulnar artery* result in the *arterial cubital network*;

- the **common interosseous artery** is a short trunk directed toward the interosseous membrane. Here it divides into two branches:

a) the **anterior interosseous artery** passes along the anterior surface of the interosseous membrane and reaches the pronator quadratus where it pierces the membrane and terminates at the *dorsal carpal arch*. At its origin the anterior interosseous artery gives off a *median artery* (passing together with the median nerve), the branches to the bones of the forearm and to the surrounding muscles. Before entering the dorsal surface of the hand, the anterior interosseous artery gives off the *palmar carpal branch*.

The **palmar carpal arch** is formed by the union of the palmar carpal branches of the *radial* and *ulnar arteries* and the *anterior interosseous artery*. The palmar carpal network lies under the flexor tendons; its branches supply nutrients to the ligaments and the radiocarpal and mediocarpal joints. The arch anastomoses with the deep palmar arch.

b) the **posterior interosseous artery** passes through the interosseous membrane to the dorsal side. The artery gives the **recurrent interosseous artery** that anastomoses with the *middle collateral artery* (a branch of the deep artery of the arm).

The **dorsal carpal arch** is formed by the union of the dorsal carpal branches of the *radial* and *ulnar arteries* and branches of the *interosseous arteries*. It lies under the extensor tendons and gives off the **dorsal metacarpal arteries**, which run along the second, third, and fourth interosseous spaces.

At the base of the fingers, each branch divides into the **dorsal digital arteries**.

The **palmar carpal branch** meets and anastomoses with the palmar carpal branch of the *radial artery*.

The **dorsal carpal branch** meet the dorsal carpal branch of the *radial artery*.

The **deep palmar branch** penetrates the muscles of the hypothenar and appears below the tendons of flexors. Together with the radial artery, it participates in forming the *deep palmar arch*.

The **superficial** and the **deep palmar arches** are located on the palm.

The **superficial palmar arch** is located under the palmar aponeurosis. The continuation of the *ulnar artery*, the superficial arch diminishes in calibre as it moves to the radial side where it is joined by the *superficial palmar branch* of the *radial artery*. The arch gives off four **common palmar digital arteries**. Three of them pass in one line with the second, third, and fourth interosseous spaces, while the fourth extends to the ulnar side of the little finger. At the base of the proximal phalanges, each artery divides into two **proper palmar digital arteries** (6 in total), stretching on the continuous sides of the adjacent fingers.

The **deep palmar arch** lies deep under the flexor tendons on the basis of the metacarpal bones, proximal to the superficial arch. It is formed of the terminal portion of the *radial artery* and the *deep palmar branch* of the *ulnar artery*. The deep arch gives rise to three arteries extending distally to three interosseous spaces, beginning with the second space. There are **palmar metacarpal arteries**, which anastomose with the ends of the *common palmar digital arteries* (around the bases of proximal phalanges). The arch also gives rise to three small branches, the **perforating branches**, which pass dorsally through the interosseous spaces (second, third, and fourth) and anastomose with the *dorsal metacarpal arteries* on the dorsal surface of the hand.

The superficial and deep arterial arches are the result of the important functional adjustment. When the hand performs a grasping action, its vessels are often compressed; when the flow of blood in the

superficial palmar arch is disturbed, the supply of blood to the hand is not disturbed since it flows along the arteries of the deep arch in such cases.

Right limb. A. ulnaris and a. radialis are interconnected by the arcus palmaris superficialis and arcus palmaris profundus, the rr. perforantes, and the dorsal carpal network.

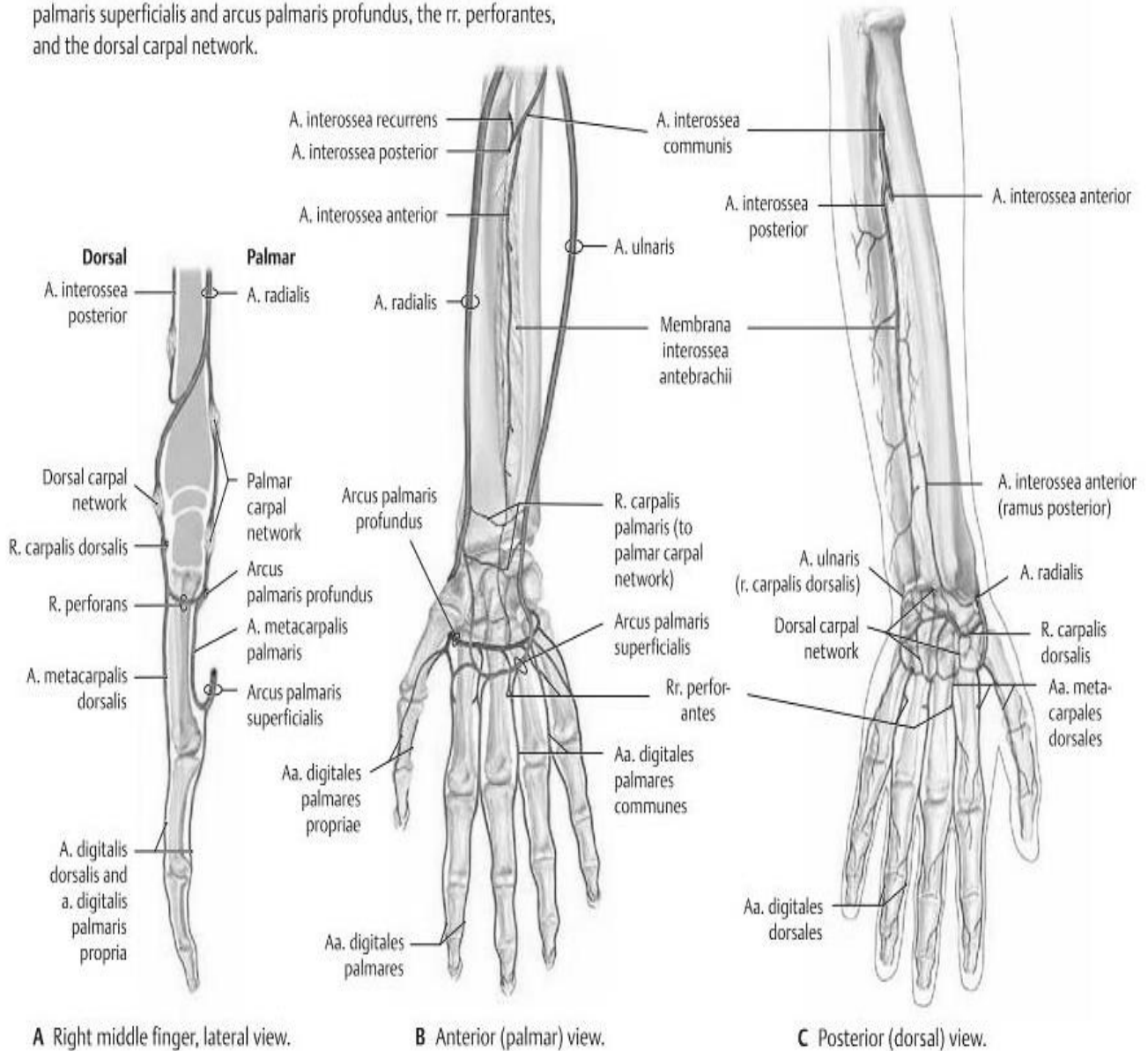


Figure 61-Arteries of the Upper Limb (forearm, wrist and fingers)

THE THORACIC AORTA

The **thoracic aorta** is the part of the descending aorta; it is a continuation of the aortic arch. The aorta passes through the posterior mediastinum next to the vertebral column. It is located to the left and then posteriorly from the esophagus. The thoracic aorta passes through the aortic hiatus of the diaphragm to become continuous with the abdominal aorta. Other adjacent organs are the thoracic duct (on the left), the azygos and hemiazygos veins and the sympathetic trunk (also on the left).

The branches of the thoracic aorta are subdivided into the visceral and parietal ones.

The **visceral branches** supply the thoracic viscera:

- the **bronchial branches** supply nutrients to the lung as an organ, enter the lungs with the bronchi and carry arterial blood for the lymph nodes and tissue of the

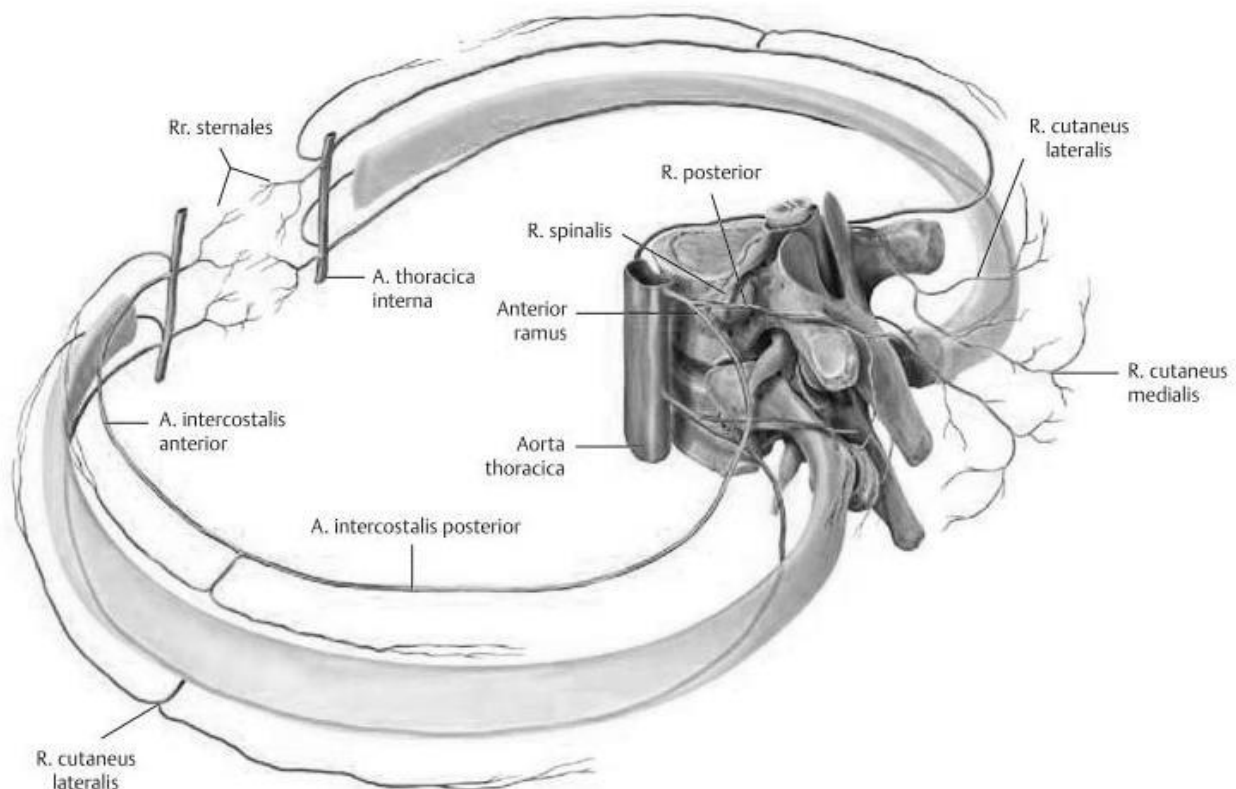
lung as far as the alveoli. The bronchial branches anastomose with the branches of the *pulmonary artery*;

- the **esophageal branches** supply the esophagus and form anastomoses with the *inferior thyroid artery* and with the *left gastric artery* in the lower section;
- the **mediastinal branches** pass to the lymph nodes and connective tissue of the mediastinum;
- the **pericardial branches** stretch to the posterior surface of the pericardium.

The **parietal branches** of the thoracic aorta:

- the **posterior intercostal arteries** (10 pairs) run along the intercostal spaces 3 through 11. The 12th artery passed below the rib is the **subcostal artery**. The right arteries are longer than the left ones, they cross the vertebral column.

At the beginning of the intercostal spaces, each posterior intercostal artery gives rise to a



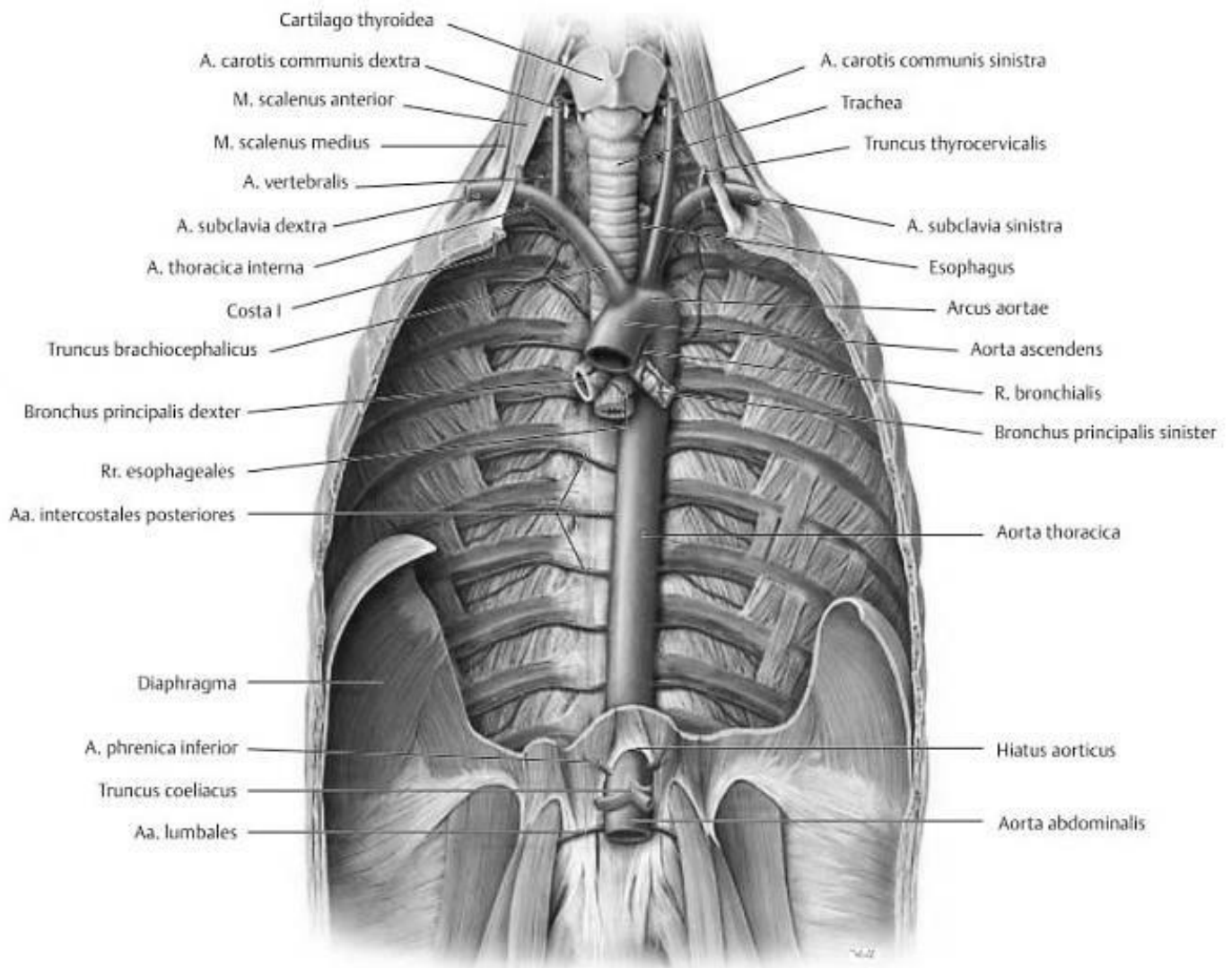
Aa. intercostales posteriores, oblique posterosuperior view. The posterior intercostal arteries give rise to cutaneous and muscular branches, as well as spinal branches that supply the spinal cord.

Figure 62-The Thoracic Aorta and Parietal Branches

dorsal branch, extending to the spinal cord (the **spinal branch**) and to the muscles and skin of the back. Near the angles of the ribs, the arteries pass between the internal and innermost intercostal muscles. Laterally from the angles of the ribs, the intercostal arteries pass along the *costal grooves*, running superior to the intercostal nerves and inferior to the intercostal veins (VAN) between the external and internal intercostal muscles, and their ends form anastomoses with the *anterior intercostal branches* of the internal thoracic artery. The lower three intercostal arteries anastomose with the *superior epigastric artery*. The intercostal arteries supply the thoracic and the abdominal walls.

The **superior phrenic arteries** branch out on the superior surface of the diaphragm where they form anastomoses with the

pericardiophrenic, *musculophrenic* (from the internal thoracic artery), the *posterior intercostal arteries*, and the *inferior phrenic artery* (from the abdominal aorta). The branches supply the lumbar part of the diaphragm.



Aorta thoracica in situ, anterior view. Removed: Heart, lungs, portions of diaphragma.

Figure 63-The Thoracic Aorta

THE ABDOMINAL AORTA

The **abdominal aorta** originates from the aortic hiatus of the diaphragm and terminates with the *aortic bifurcation* at L4. It descends along the left side of the vertebral column. The inferior vena cava is located on the right. The abdominal aorta gives rise to **visceral** (paired and unpaired) and **parietal** branches.

THE UNPAIRED VISCERAL BRANCHES

1. The **coeliac trunk** is a short (2 cm), thick artery rising at the level of the Th12. It passes

forward above the superior border of the pancreas where it divides into three branches (the site of division is called the *Haller's tripod*): the left gastric, the common hepatic and the splenic arteries.

The **left gastric artery** extends in direction of the cardial part of the stomach. Then it turns back to appear on the lesser curvature of the stomach. Running leftwards along the curvature, the artery anastomoses with the *right gastric artery*. It supplies the stomach and the abdominal part of the esophagus (the *esophageal branches*).

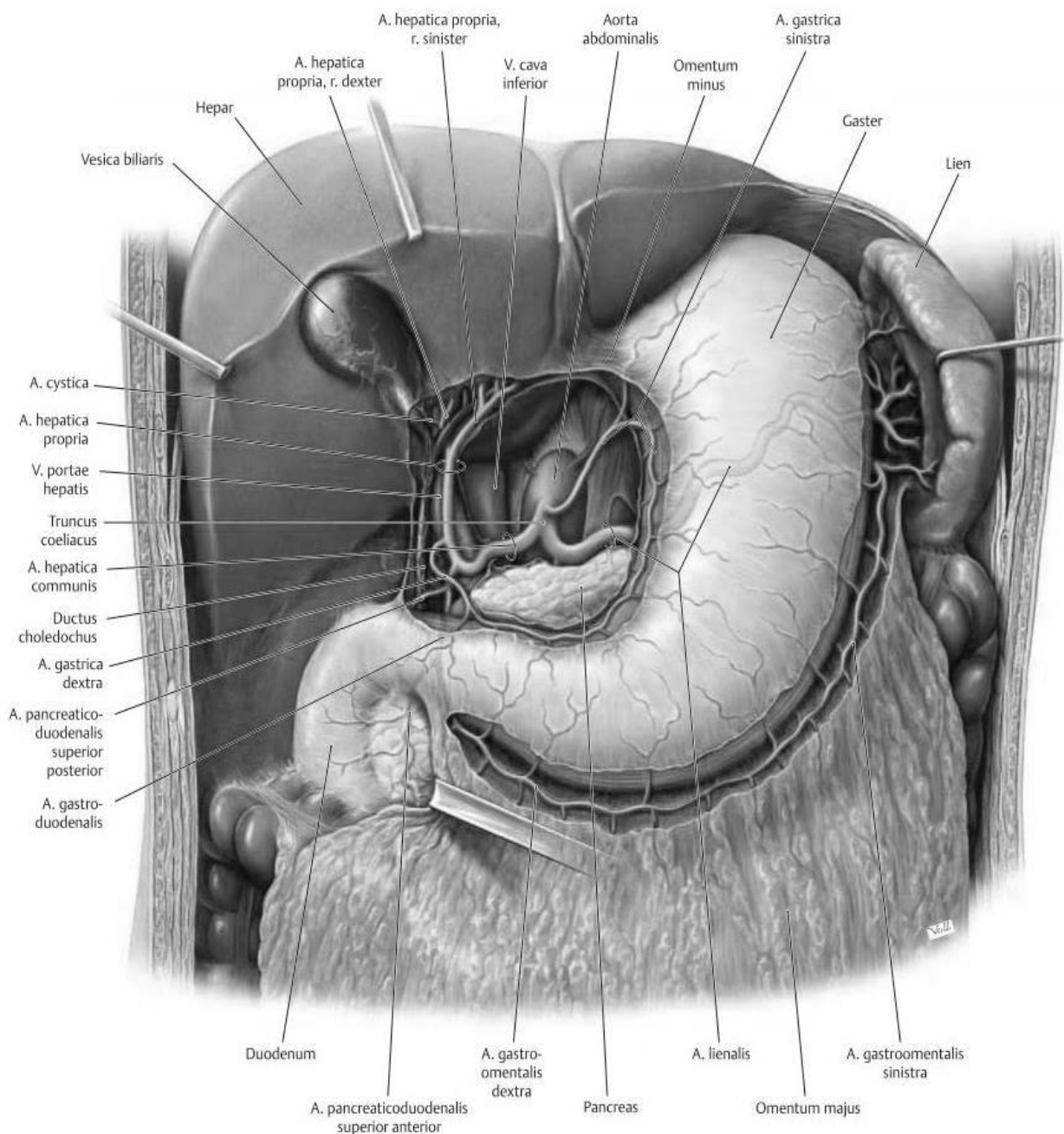


Figure 64-The Coeliac Trunk and Vascularization of Upper Abdominal Organs

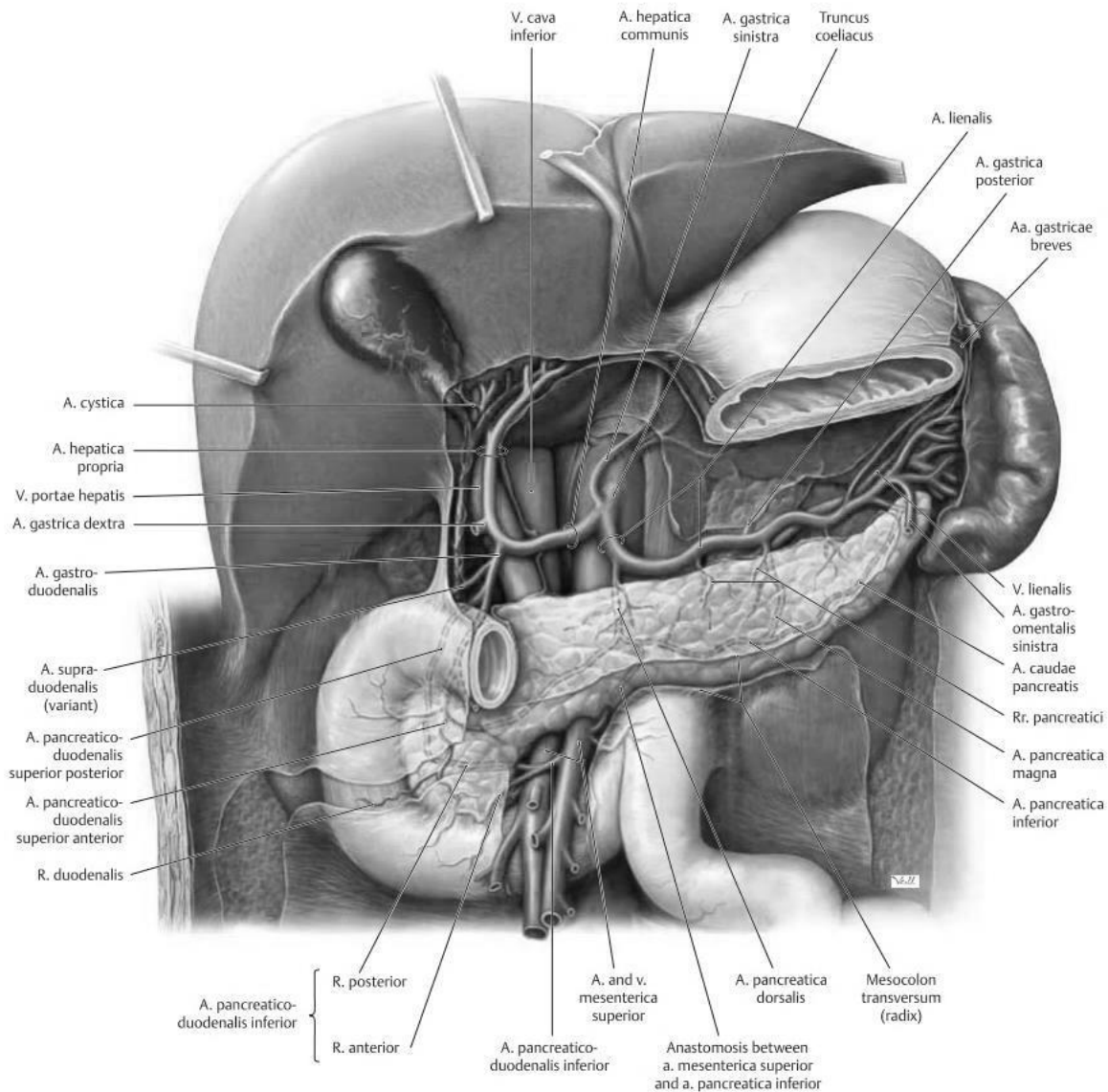


Figure 65-The Branches of the Celiac Trunk, Supplying the Spleen, Stomach, Pancreas, Duodenum and Liver

The **common hepatic artery** passes along the superior margin of the head of the pancreas to the superior border of the duodenum. It divides into three branches:

- the **hepatic artery proper** lies between the two layers of the hepatoduodenal ligament (from right to left DVA), and reaches the porta hepatis where it divides into **right** and **left branches**. The right branch gives rise to the artery of the gallbladder (the **cystic artery**);
- the **right gastric artery** stretches from right to left to meet the **left gastric artery**. The right gastric artery may arise from the hepatic artery proper;
- the **gastroduodenal artery** passes behind the duodenum and divides into two branches:

a) the **right gastroepiploic artery** passes from right to left on the greater curvature of the stomach and gives off branches to the stomach and greater omentum. It anastomoses with the **left gastroepiploic artery** (given by the splenic artery).

b) the **superior pancreaticoduodenal artery** (anterior and posterior) branches out in the head of the pancreas and in the descending part of the duodenum.

The **splenic artery** is the largest branch of the coeliac trunk. It passes from right to left on the superior border of the pancreas to the spleen. At the spleen it divides into several **splenic branches** that enter the splenic hilum. Other branches given by the splenic artery are:

- the **pancreatic branches** supply the pancreas;
- the **left gastroepiploic artery** passes from left to right on the greater curvature of the stomach and anastomoses with the **right gastroepiploic artery**;
- the **short gastric arteries** run within the gastrosplenic ligament to the fundus of the stomach.

There are two arterial arches located on the lesser curvature called the **left and right gastric arteries**, and on the greater curvature called the **left and right gastroepiploic arteries** around the stomach.

The **superior mesenteric artery** is a large branch of the abdominal aorta. It arises from the anterior surface of the aorta below the coeliac trunk (at the level of L1), passes forward and downward into the slit between

the inferior border of the head of the pancreas in front and horizontal part of the duodenum behind, enters the mesentery of the small intestine, and descends to the right iliac fossa.

The **branches of the superior mesenteric artery** are as follows:

- the **inferior pancreaticoduodenal artery** ascends to the right to meet both anterior and posterior branches of the **superior pancreaticoduodenal artery**. It supplies the same area as the superior artery;
- the **intestinal arteries** (10 to 16 branches) pass to the left, to the jejunum and ileum, on the way they dichotomize and anastomose adjacent branches, as a result of which three rows of arches are formed along the jejunal arteries and two rows along the ileal arteries. The arched anastomoses is called **arcades**. The distal line gives numerous forking

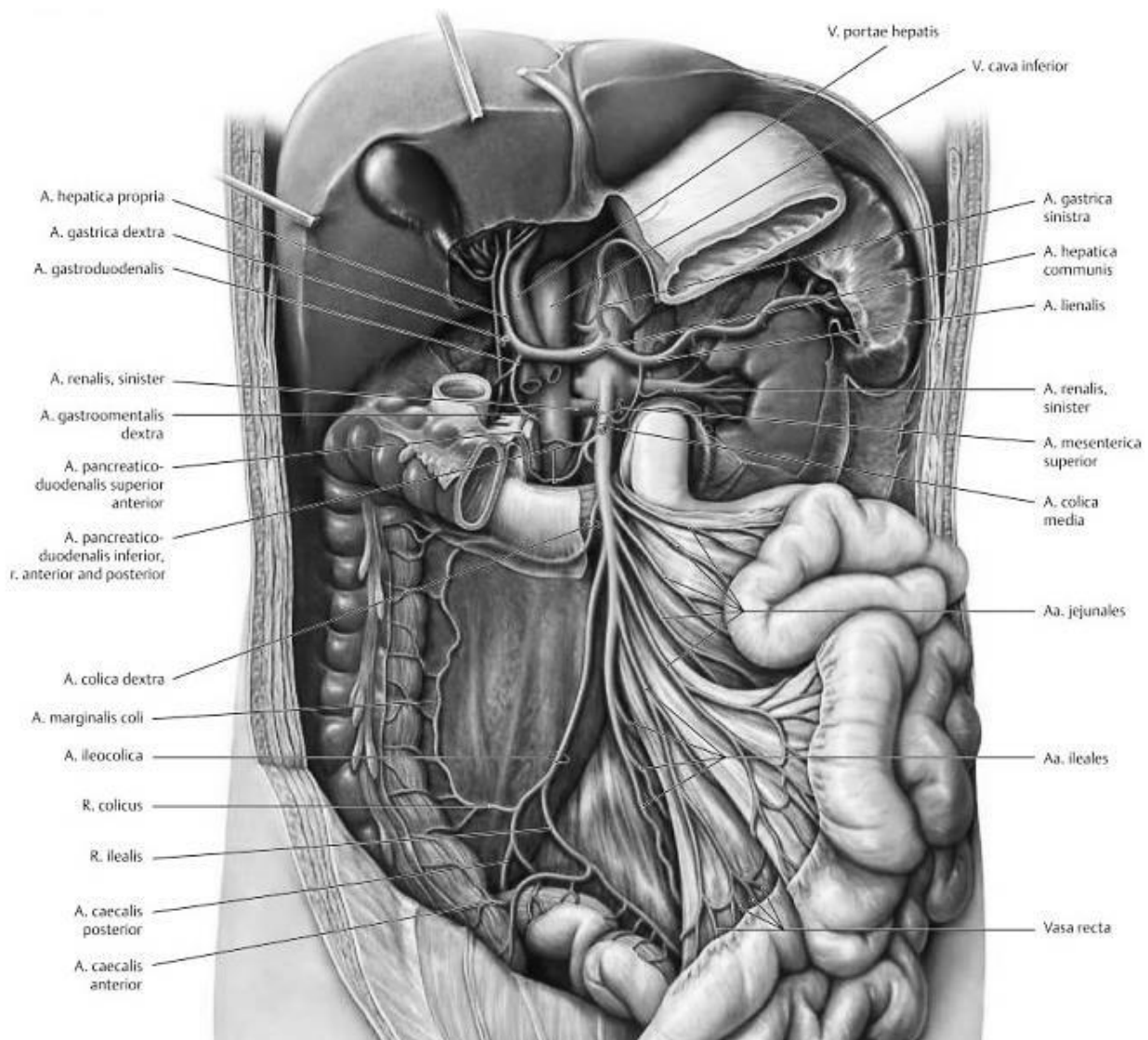


Figure 66-The Branches of the Superior Mesenteric Artery

branches that encircle the intestinal tube. The arcades are the result of functional adjustments to ensure the supply of blood to the intestine during any movement or position of its loops;

- the **ileocolic artery** branches off the superior mesenteric artery to the right, descends rightwards and reaches the ileocecal angle to give off the branches to the terminal portion of the ileum (the **ileal branches**), to the caecum (the **anterior** and **posterior caecal branches**), to the vermiform appendix (the **appendicular**

artery);

- the **right colic artery** stretches behind the peritoneum to the ascending colon and divides next to it into two branches – an **ascending branch**, which rises to meet the **middle colic artery**, and a **descending branch**, which descends to meet the **ileocolic artery**; the resulting arches send branches to the adjoining parts of the colon;
- the **middle colic artery** passes between the layers of the transverse mesocolon and on reaching the transverse colon divides into the **right** and **left**

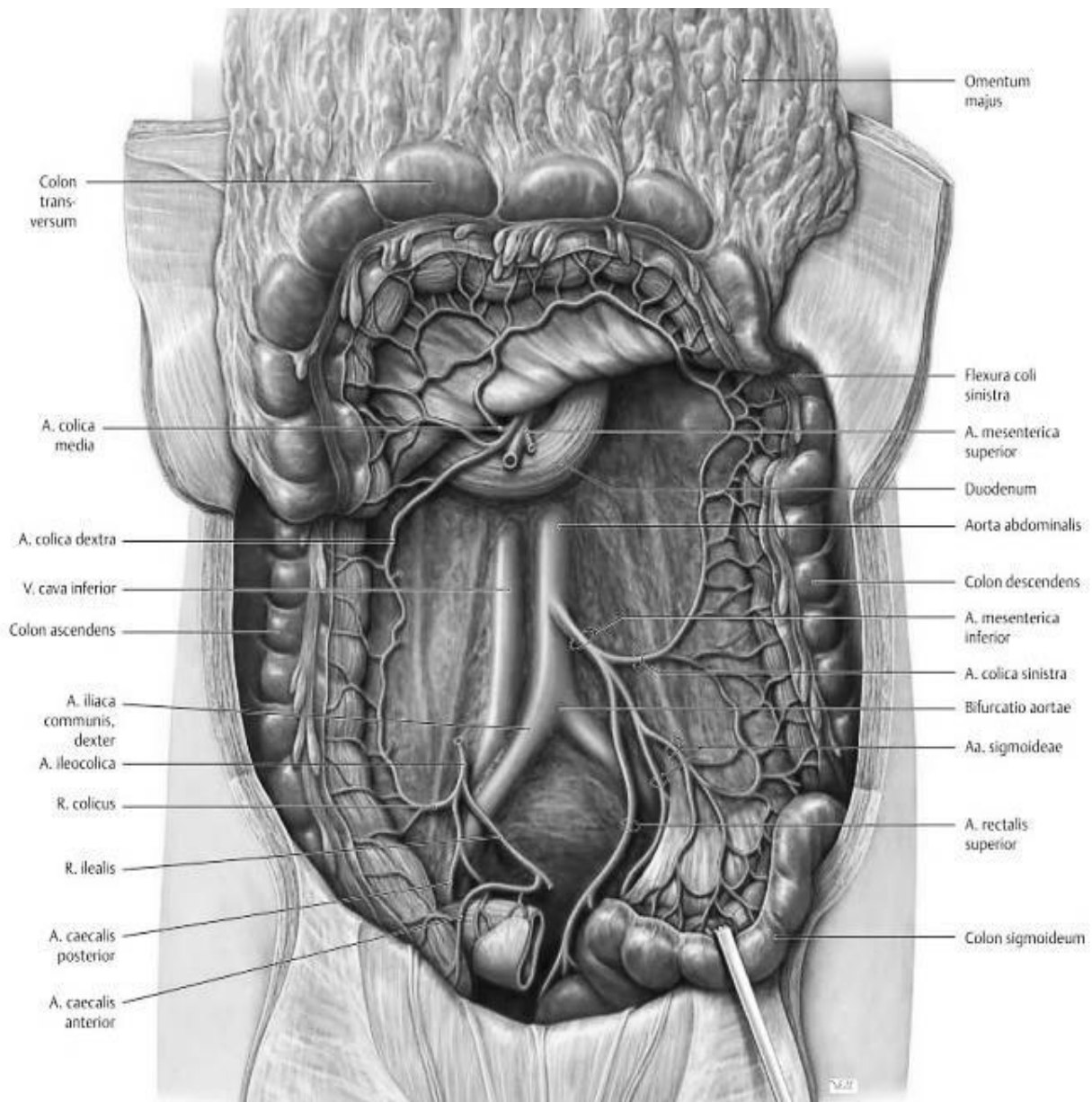


Figure 67-The Inferior Mesenteric Artery

branches which diverge to their respective sides. The right branch anastomoses with the *right colic artery*, the left branch with the *left colic artery*.

The **inferior mesenteric artery** arises from the anterior aspect of the abdominal aorta on the level of L3 (one vertebra above the aortic bifurcation) and descends leftwards lying behind the peritoneum on the anterior surface of the left psoas major muscle.

The artery gives the branches as follows:

- the **left colic artery** divides into two branches. The **ascending branch** passes to the left flexure of the colon to meet the *middle colic artery* (from the superior mesenteric artery) and the **descending branch** anastomoses with the *sigmoid arteries*. Next to the left colic flexure one can distinguish the intersystem anastomosis formed of the branches given by the *superior* and *inferior mesenteric arteries* (by the *middle* and *left colic arteries*). This anastomosis is called the **Riolan's arch**;
- the **sigmoid arteries** pass to the sigmoid colon within the sigmoid mesocolon. Their **ascending branches** anastomose with the descending branch of the *left colic artery*, **the descending branches** with the *superior rectal artery*;
- the **superior rectal artery** is a continuation of the inferior mesenteric artery. It descends in the root of the sigmoid mesentery into the true pelvis, crossing the left common iliac artery in front, and divides into branches leading to the rectum and anastomose with the *sigmoid arteries* and with the *middle rectal artery* (from the internal iliac artery).

As the result of communications there is a chain of interconnected anastomoses for the entire length of large intestine between the branches of the ileocolic, right colic, middle colic, left colic and rectal arteries.

THE PAIRED VISCERAL BRANCHES OF THE ABDOMINAL AORTA

The **renal artery** branches off the aorta almost at the right angle at the level of L2 and passes transversely to the hilum of the

corresponding kidney. The diameter of the renal artery is large, what is explained by the uropoietic function of the kidney for which a rich blood flow is needed. In the hilum of the kidney, the renal artery divides into the anterior and posterior branches that enter the kidney parenchyma. The right artery is longer than the left one. It runs behind the inferior vena cava, the head of the pancreas, and the descending part of the duodenum. The left artery passes behind the pancreas. The renal vein lies in front of the artery. Each renal artery gives rise to the **inferior suprarenal artery**, ascending to the suprarenal gland, and some small branches to the ureter (the **ureteric branches**). Number variations of the renal arteries are of quite a frequent occurrence.

The **middle suprarenal artery** arises from the aorta above the renal artery and passes to the suprarenal gland.

The **testicular (ovarian) artery** is a long, thin vessel rising from the aorta below the origin of the renal artery. Such high origination point is specified by development of gonads (their primordia appear within the lumbar region). In males, the testicular artery enters the inguinal canal via the deep inguinal ring and reaches the testis running within the spermatic cord. In females, the ovarian artery runs within the suspensory ligament of the ovary. On passing the mesovarium, the artery enters the hilum of the ovary, anastomosing with the *ovarian branch* of the *uterine artery*.

THE PAIRED BRANCHES OF THE ABDOMINAL AORTA

The **median sacral artery** is the unpaired branch that arises from the aortic bifurcation. It descends along the pelvic surface of the sacrum to the lesser pelvis.

The **inferior phrenic artery** arises from the uppermost segment of the abdominal aorta. It supplies the diaphragm and gives small branches to the suprarenal gland (the **superior suprarenal arteries**) anastomosing with the *middle suprarenal artery* and the *inferior suprarenal artery* (from the renal artery).

The **lumbar arteries** (4 pairs) run laterally crossing the bodies of the lumbar vertebrae. They supply blood to the corresponding vertebrae, muscles and skin of the back and abdomen and anastomose with each other, with the *inferior intercostal* and

the *superior* and *inferior epigastric arteries*. Each artery gives the **dorsal branch** which in turn gives off the **spinal branch** supplying the spinal cord.

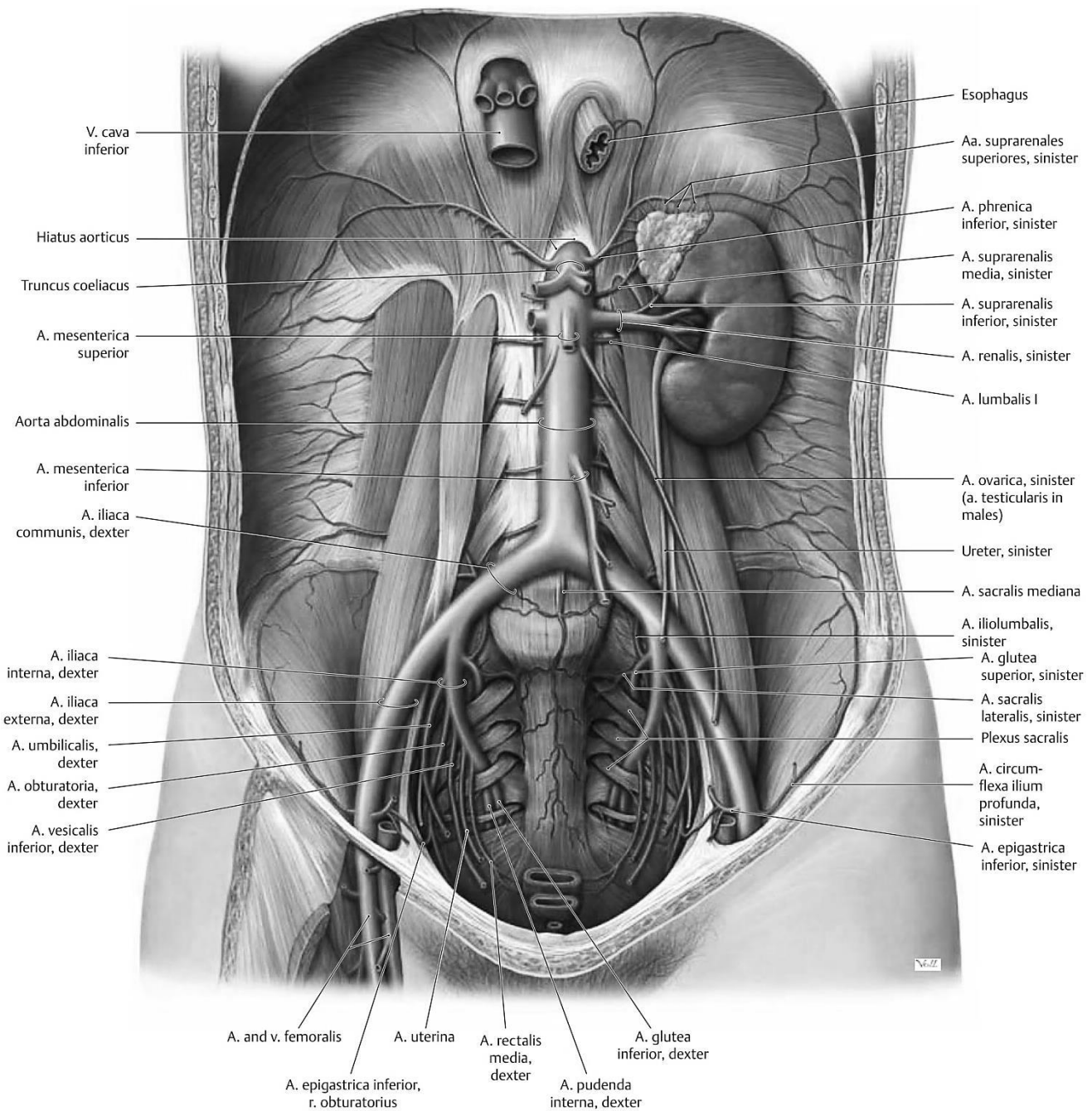


Figure 68-The Parietal Branches of the Abdominal Aorta

THE COMMON ILIAC ARTERY

The **common iliac arteries** are two terminal branches into which the aorta divides at the level of L4. The division occurs slightly to the left of the midline, as a result of which the right common iliac artery is 6–7 mm longer than the left one. From the aortic bifurcation the common iliac arteries diverge at an acute angle (approximately 60 degrees in males and 68–70 degrees in females due to the wider females pelvis) and pass downward and laterally to the sacroiliac joint. Here each artery divides into two terminal branches: the **internal iliac artery**, supplying the walls and organs of the pelvis with blood, and the **external iliac artery**, serving the lower limb.

THE INTERNAL ILIAC ARTERY

The **internal iliac artery** extends from the level of the sacroiliac joint to the superior edge of the greater sciatic foramen. It divides into parietal and visceral branches. But it usually divides into two main trunks: the posterior trunk, which gives rise to the iliolumbar, lateral sacral, and superior gluteal arteries, and the anterior trunk, from which the other branches rise. The internal iliac artery is covered by peritoneum, in front of it extends the ureter, the internal iliac vein passes behind the artery.

The parietal branches:

- the **iliolumbar artery** ascends posteriorly to the related muscles, ilium and spinal cord (the **spinal branches**). It anastomoses with the *deep circumflex iliac artery* (from the external iliac artery);
- the **lateral sacral arteries** run to the sacrum and spinal cord (the **spinal branches**). They anastomose with the *median sacral artery*;
- the **superior gluteal artery** is a continuation of the posterior trunk of the internal iliac artery. It leaves the lesser pelvis cavity via the

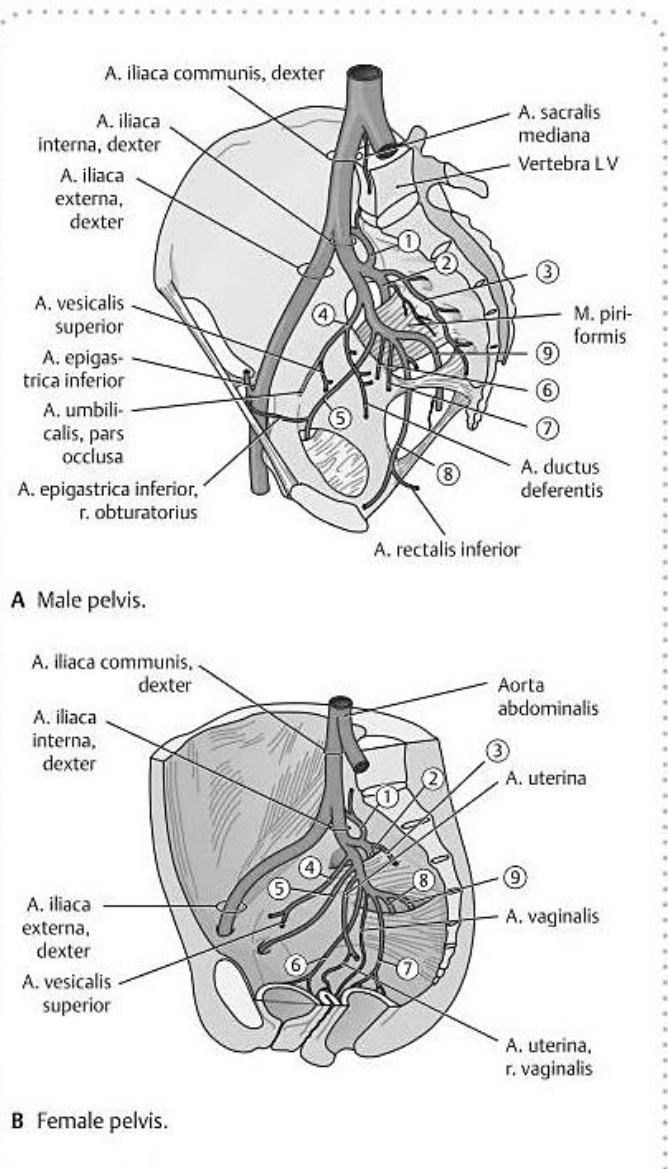


Table 15.3 Branches of the *A. iliaca interna*

The *A. iliaca interna* gives off five parietal (pelvic wall) and four visceral (pelvic organs) branches.* Parietal branches are shown in italics.

| Branches | | |
|----------|------------------------------|---|
| ① | <i>A. iliolumbalis</i> | |
| ② | <i>A. glutea superior</i> | |
| ③ | <i>A. sacralis lateralis</i> | |
| ④ | <i>A. umbilicalis</i> | <i>A. ductus deferentis</i> <i>A. vesicalis superior</i> |
| ⑤ | <i>A. obturatoria</i> | |
| ⑥ | <i>A. vesicalis inferior</i> | |
| ⑦ | <i>A. rectalis media</i> | |
| ⑧ | <i>A. pudenda interna</i> | <i>A. rectalis inferior</i> |
| ⑨ | <i>A. glutea inferior</i> | |

* In the female pelvis, a. uterina and a. vaginalis may arise directly from a. iliaca interna.

Figure 69-The Internal Iliac Artery (scheme)

suprapiriform foramen and reaches the gluteus medius and minimus muscles;

- the **inferior gluteal artery** passes through the *infrapiriform foramen* with the internal pudendal artery and the sciatic nerve. Within the gluteal region, the artery supplies the gluteus maximus and other proximate muscles and anastomosing branches, which join with the *obturator, superior gluteal, and medial circumflex femoral arteries*;
- the **obturator artery** passes to the obturator foramen. Before entering the obturator canal it gives off the **pubic branch** which anastomoses with the *inferior hypogastric artery* via the *pubic branch*. In 25 % of people this anastomosis is quite well developed. This variant is of surgical concern because the artery passes next to the internal femoral ring thus, can be damaged during surgery (“*corona mortis*”). The obturator

artery supplies the adductors of the thigh and hip joint. The hip joint receives blood from the **acetabular branch** that passes within the ligament of the head of the femur.

The visceral branches:

- the **umbilical artery** retains its lumen in the adult only for a small distance (the *patent part*) from its origin to the site where it gives off the **superior vesical artery** to the urinary bladder. The remaining segment of its trunk to the umbilicus obliterates and transforms into the *medial umbilical ligament*;
- the **inferior vesical artery** descends to the fundus of the urinary bladder, anastomosing with the *superior vesical arteries*. It also gives off branches to the vagina (in females) and to the prostate and seminal vesicles (in males);

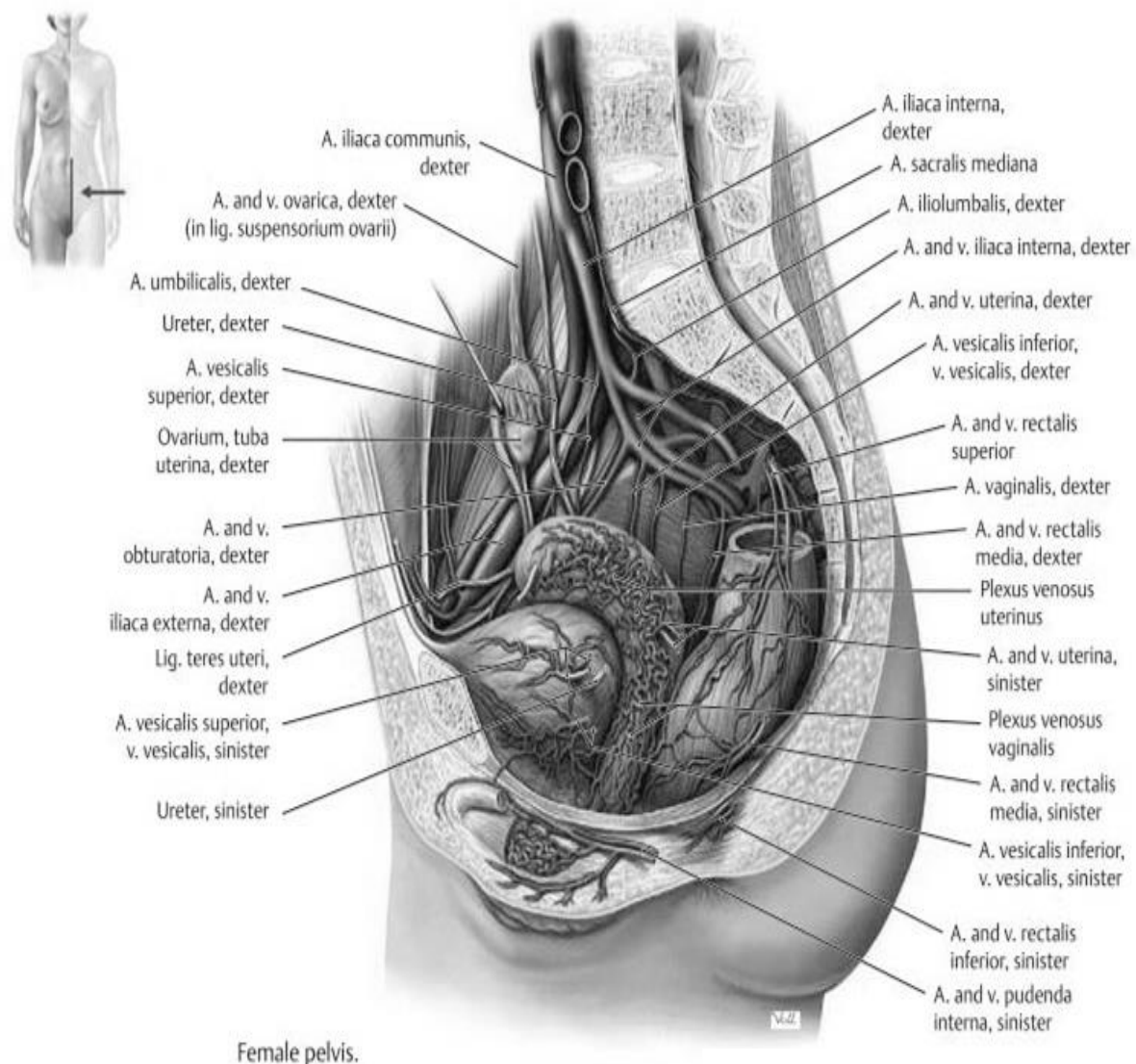


Figure 70-Blood Supply of Organs of the Female Pelvis

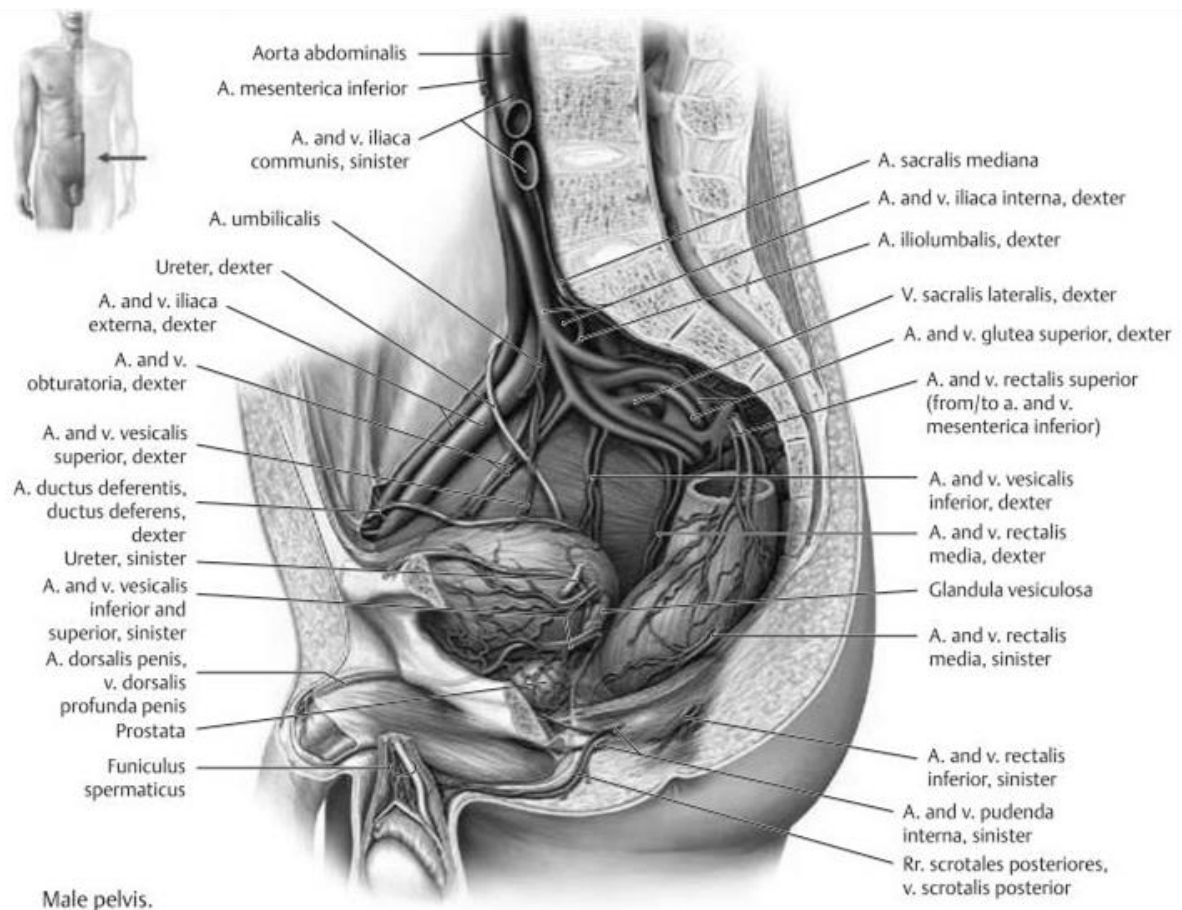


Figure 71-Blood Supply of Organs of the Male Pelvis

- the **middle rectal artery** originates either from the internal iliac artery or from the inferior vesical artery branching through the walls of the rectum and anastomosing with the *superior rectal artery* (from the *inferior mesenteric artery*) and *inferior rectal artery* (given by the internal pudendal artery). This artery also gives off branches to the ureter, urinary bladder, prostate, seminal vesicles (in males), and to the vagina (in females);
- the **internal pudendal artery** passes inferolaterally; it leaves the pelvis through the infrapiriform foramen and then, bending around the posterior side of the ischial spine, enters again the pelvis through the lesser sciatic foramen into the ischio-anal fossa. Here it divides into the following branches:
 - a) the **inferior rectal artery** passes to the anus;
 - b) the **perineal artery** supplies the urethra, the perineal muscles and skin;
 - c) the **artery of the bulb of the penis** (in males) supplies the respective bulb of the penis;

- d) the **dorsal artery of the penis (clitoris)** passes below the skin to the penis or clitoris respectively;
- e) the **deep artery of the penis (clitoris)** take the same route as the latter arteries yet deeper;
- f) the **posterior labial branches** and the **posterior scrotal branches** supply the respective external genitals;
 - the **uterine artery** (in females) descends on the lateral wall of the pelvis, anterior to the internal iliac artery, and enters the root of the broad ligament of the uterus. Here it passes medially to reach the lateral border of the uterus superior to the lateral part of the fornix of the vagina and directly superior to the ureter. On reaching the side of the cervix, the uterine artery divides into the descending **vaginal branch** that supplies the cervix and the vagina and the **ascending branch** that runs along the lateral margin of the uterus, supplying the body and fundus of the uterus. The ascending branch divides into **ovarian** and **tubal branches** which supply the

respective organs and anastomose with the *ovarian* and *tubal branches* of the ovarian artery. The uterine artery is twisted in women who have given birth.

THE EXTERNAL ILIAC ARTERY

The **external iliac artery**, beginning at the level of the sacroiliac joint, stretches down and forward along the medial edge of the *psoas major* muscle to the inguinal ligament and leaves the lesser pelvis via the *vascular space*. Within the *femoral triangle*, the artery becomes continuous with the femoral artery. The external iliac artery gives rise to two branches, which originate very close to the inguinal ligament.

The **inferior epigastric artery** passes medially and then upward between the fascia transversalis in front and the parietal peritoneum behind, occupying the lateral umbilical ligament. The artery enters the rectus sheath and ascends along its posterior surface to reach the umbilical ring. Here it anastomoses with the *superior epigastric artery* (from the internal thoracic artery). In its initial segment the artery bends around the medial edge of the *deep inguinal ring*, at the point of which it gives off two branches:

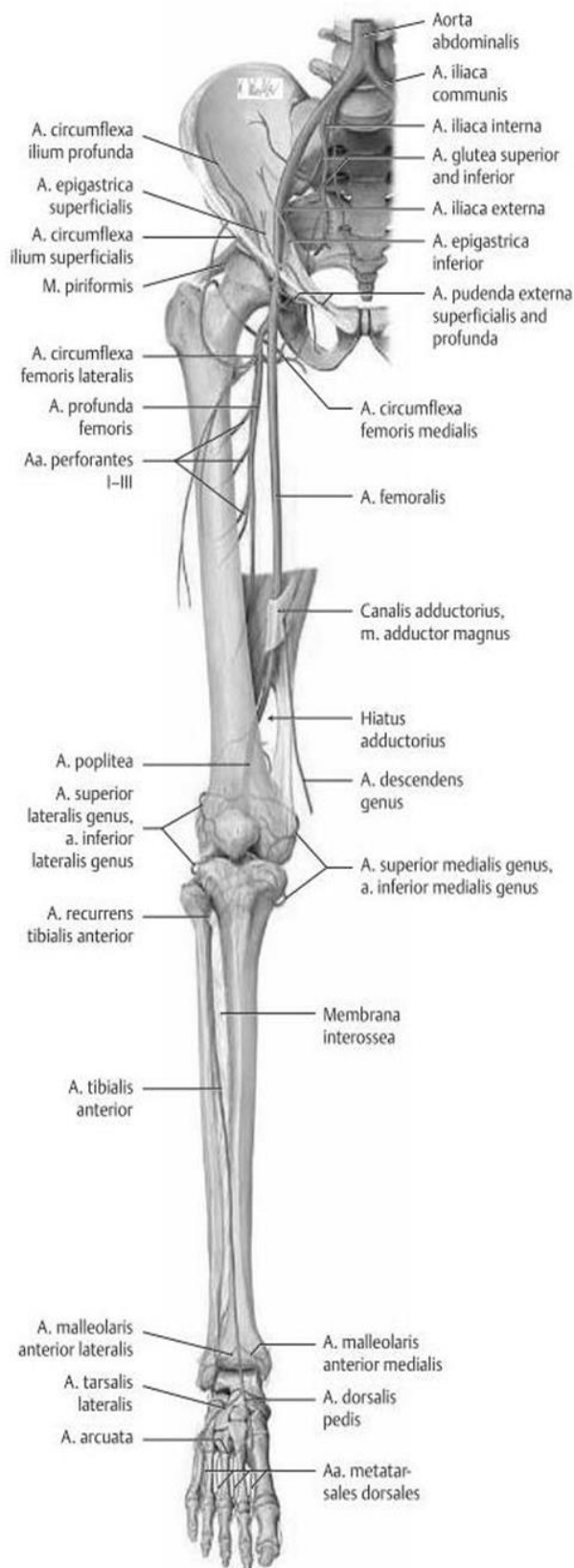
a) the **pubic branch** to the pubic symphysis, which anastomoses with the obturator artery;

b) the **cremasteric artery** supplies the cremaster muscle and testis.

The **deep circumflex iliac artery** runs laterally along the inguinal ligament and the iliac crest. It supplies the iliacus muscle and muscles of the abdominal wall.

THE FEMORAL ARTERY

The **femoral artery** is a continuation of the trunk of the external iliac artery. On leaving the vascular space, the artery appears within the *femoral triangle* together with the femoral nerve (found laterally) and the femoral vein (found medially). To stop bleeding artery the artery is compressed in the area related to the vascular space. Within the femoral triangle, the artery runs along the *iliopectineal groove* and along the *femoral groove*. From the femoral groove, the artery proceeds to the *adductor canal*, which leads it to the *popliteal fossa* where it continues in the popliteal artery.



C Course of the arteries, anterior view.

Figure 72-The External Iliac Artery (blood supply to the lower limb)

The branches of the femoral artery:

- the **deep artery of the thigh** is the main vessel through which the vascularization of the thigh is accomplished. It is a thick trunk, which originates from the posterior side of the femoral artery from 4 to 5 cm below the inguinal ligament, lying at first behind the femoral artery, then appearing from the lateral side, and giving off numerous branches rapidly diminishing in diameter.

The branches of the deep artery of the thigh:

- the **medial circumflex femoral artery** passes upward to enter deep into the adductors of the thigh. The artery gives off the **deep, ascending** and **transverse branches**. They supply the adductors of the thigh, the hip joint (the **acetabular branch**) and anastomose with the **obturator** and **inferior gluteal arteries**;

- the **lateral circumflex femoral artery** passes laterally and divides into the **ascending branch** (to the greater trochanter, anastomosing with the branches of the medial circumflex femoral artery and the inferior gluteal artery) and the **descending branch** (branching into the quadriceps);

- the **perforating arteries** (three) branch off the posterior surface of the deep artery of the thigh and, penetrating through the adductor muscles move to the posterior surface of the thigh. They supply there the related muscles and femur. The arteries reach there the knee joint and anastomose with the branches of the popliteal artery. They are important for collateral circulation.

Other branches of the femoral artery:

- the **superficial epigastric artery** arises near the very beginning of the femoral artery and passes in front of the inguinal ligament under the skin into the region of the navel. It anastomoses there with the **superior epigastric artery**;

- the **superficial circumflex iliac artery** also arises below the inguinal ligament and passes laterally to reach the anterior superior iliac spine. The artery supplies the neighbouring soft tissues.

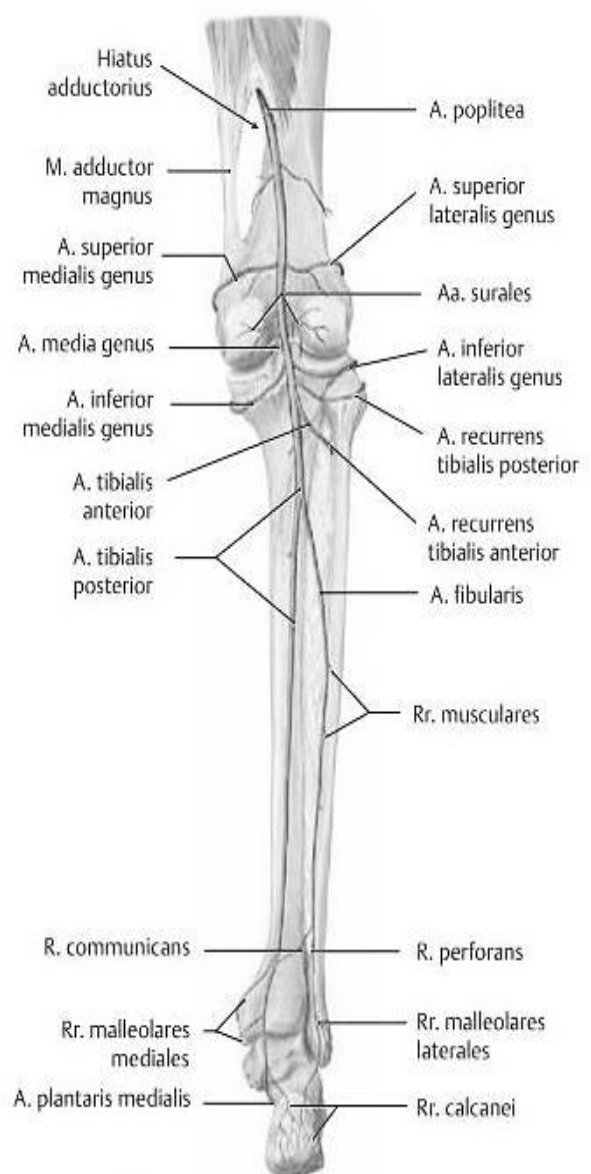
- the **external pudendal arteries**, usually two in number, branch out in the region of the **hiatus saphenus** and lead

medially to the external genitals, scrotum or labia majora;

- the **descending genicular artery** arises within the **adductor canal** and, penetrating through the anterior wall of this canal with the saphenous nerve, supplies the vastus medialis muscle with blood and participates in formation of the arterial network of the knee joint (the **genicular anastomosis**);

- the **muscular branches** lead to the muscles of the thigh.

B Coronal section.



C Arteries of the posterior leg.

Figure 73-The Blood Supply to the Lower Leg

THE POPLITEAL ARTERY

The **popliteal artery** is the direct continuation of the femoral artery. It is located the very bone in on the popliteal fossa and posterior surface of the articular capsule to the front and medially from the popliteal vein; there is the tibial nerve further to the back (from back to front NVA). Further down, the popliteal artery lies on the posterior surface of the popliteal muscle and enters the *cruropopliteal canal*. Here it divides into two terminal branches (the **anterior** and **posterior tibial arteries**).

The branches of the popliteal artery:

- the **superior (medial and lateral) genicular arteries** branch off above the femoral epicondyles, each curving round the knee joint from its own side. They move on to the anterior surface of the joint where they form anastomosis and take part in forming the arterial network of the knee joint (the *genicular anastomosis*);
- the **middle genicular artery** penetrates into the posterior wall of the joint capsule of the knee joint and branches out in the cruciform ligaments;
- the **inferior (medial and lateral) genicular arteries** branch out in the region of the knee joint as the superior arteries. The inferior arteries, however, branch away from the popliteal artery below the femoral epicondyles. Their branches also form the *genicular anastomosis*.

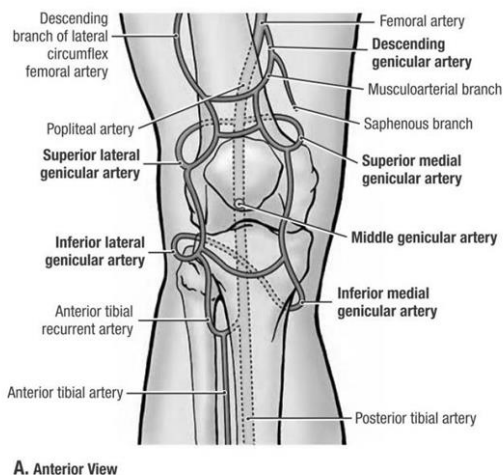


Figure 74-The Popliteal Artery (knee joint blood flow)

The genicular arteries supply the knee joint and neighbouring muscles. They form a wide anastomosis around the knee joint (the *genicular anastomosis*).

THE ANTERIOR TIBIAL ARTERY

The **anterior tibial artery** arises from the popliteal artery within the *cruropopliteal canal*. It leaves the canal through the *anterior opening* in the interosseous membrane and descends to the foot together with the *deep fibular nerve* between the anterior tibialis and extensor hallucis longus muscles. On reaching the ankle joint, the artery comes out under the extensor retinaculum; its continuation on the back of the foot is called the *dorsal artery of the foot*.

The branches of the anterior tibial artery:

- the **muscular branches** supply the neighbouring muscles;
- the **posterior tibial recurrent artery** branches away on the posterior side of the leg, leads upward, and gives off branches to the knee joint (to the *genicular anastomosis*) and to the tibiofibular joint;
- the **anterior tibial recurrent artery** arises on the anterior side of the leg leading up to join the *genicular anastomosis*;
- the **anterior (medial and lateral) malleolar arteries** descend to the respective malleoli. They take part in forming the medial and lateral malleolar networks.

THE DORSAL ARTERY OF THE FOOT

The **dorsal artery of the foot** passes on the back of the foot. A continuation of the anterior tibial artery, it is located between the tendons of the *extensor hallucis longus* and the *extensor digitorum longus*. Here, on the dorsal artery of the foot, one can palpate the pulse by pressing it to the bones. At the first intermetatarsal space, the artery gives off its terminal branches (the *deep plantar artery* and the *first metatarsal artery*).

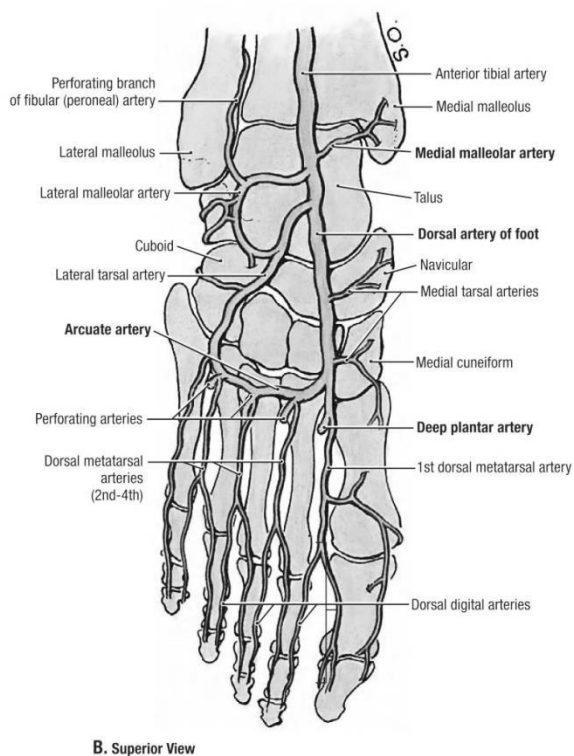
The branches of the dorsal artery of the foot:

- the **lateral and medial tarsal arteries** run to the respective edges of the foot;

- the **arcuate artery** arises at the base of metatarsal bones and passes laterally to anastomose with the *lateral tarsal artery* and the *plantar arteries*. The formed arch gives off three **dorsal metatarsal arteries**, which pass to the corresponding interosseous metatarsal spaces, each dividing into two **dorsal digital arteries** to the sides of the toes facing each other. Each of the metatarsal arteries gives off anterior and posterior **perforating branches**, which pass to the sole of the foot;

- the **first dorsal metatarsal artery** arises directly from the *dorsal artery of the foot*, it is one of its two terminal branches. The artery gives off three **dorsal digital arteries** to both aspects of the big toe and to the medial aspect of the second toe;

- the **deep plantar artery** is the second terminal branch of the dorsal artery of the foot. It passes through the first metatarsal space to the sole; it anastomoses there with the *lateral plantar artery* to form the *deep plantar arch*.



B. Superior View

Figure 75-The Dorsal Artery of the Foot

THE POSTERIOR TIBIAL ARTERY

The **posterior tibial artery** is a continuation of the popliteal artery. Descending along the *cruropopliteal canal* together with the tibial nerve, the artery emerges from under the medial edge of the soleus muscle and comes near the surface. In the lower one third of the leg, the posterior tibial artery lies between the flexor digitorum longus and flexor hallucis longus muscles, located medially from the Achilles tendon, covered here only with skin and fascia. One can palpate pulsation of the artery here. The artery then rounds the medial malleolus, passes under the flexor retinaculum and appears on the plantar surface of the foot. It splits there into two terminal branches: the **lateral** and **medial plantar arteries**.

The branches of the posterior tibial artery:

- the **muscular branches** supply the muscles of the leg;

- the **fibular (peroneal) artery** originates from the posterior tibial artery in the upper one third of the latter, passing downward and laterally into the *inferior musculofibular (musculoperoneal) canal* and ending at the **calcaneal anastomosis**. At the lateral malleolus, the artery gives off the **lateral malleolar branch** that joins the lateral malleolar network. At the ankle joint, the artery gives off the **perforating branch** that traverses the interosseous membrane to anastomose with the branches of the *anterior tibial artery*.

THE PLANTAR ARTERIES

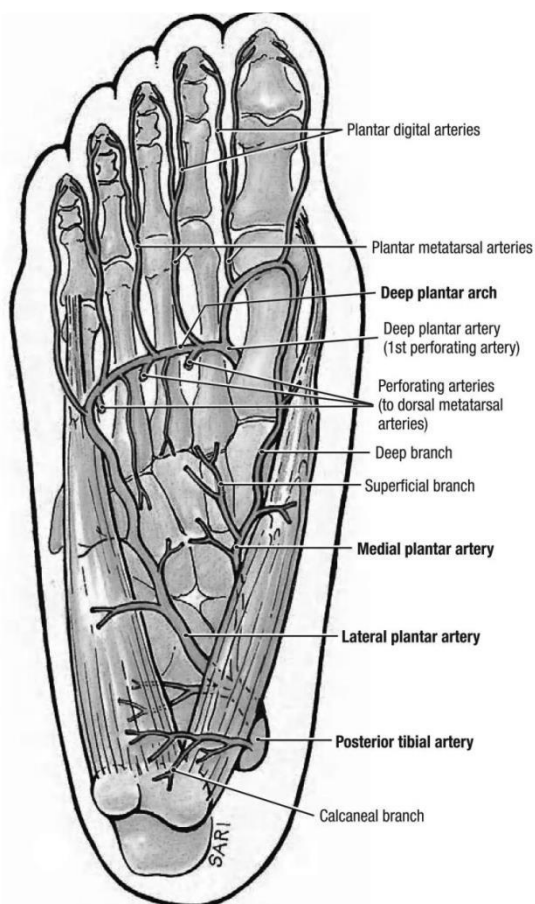
There are the terminal branches of the posterior tibial artery:

- the **medial plantar artery** is the thinnest one. It is located in the *medial plantar groove* and terminates at the head of the first metatarsal bone, joining the **plantar arch**. Along the way it gives off small branches to the adjacent muscles, joints, and skin;

- the **lateral plantar artery**, larger one, passes into the *lateral plantar groove* medially to the base of the fifth metatarsal bone. There it turns to the middle and,

forming a convex arch (the **deep plantar arch**) on the bases of the metatarsal bones, terminates laterally to the first metatarsal bone, anastomosing with the **deep plantar artery** (from the dorsal artery of the foot). Moreover, the lateral plantar artery gives off a small branch that joins the medial plantar artery. The **deep plantar arch** gives off four **plantar metatarsal arteries** which anastomose with the **dorsal metatarsal arteries** by means

Figure 76-The Plantar Arteries



of **perforating branches**. The plantar metatarsal arteries become continuous with the **common plantar digital arteries**, which in turn split into the **plantar digital arteries proper**. The latter arteries run along the aspects of the toes.

The arteries of the sole under constant pressure at standing and walking, form two arches, which are located in mutually perpendicular planes: in the horizontal plane between the **medial plantar artery** and the **lateral plantar artery** and in the vertical plane between the **lateral plantar artery** and the **deep plantar artery**.

THE VEINS OF SYSTEMIC CIRCULATION

The systemic circulatory route comprises three venous systems:

- 1) the **superior vena cava (SVC)** system;
- 2) the **inferior vena cava (IVC)** system;
- 3) the **coronary sinus system** (the veins of the heart).

The inferior vena cava system includes a specific **hepatic portal vein system** that carries blood to the liver.

THE SUPERIOR VENA CAVA

The **superior vena cava** is a thick but short trunk located to the right and posteriorly to the ascending aorta. It is formed by the merger of the **right and left brachiocephalic veins** behind the junction of the first rib with the sternum. The superior vena cava is located behind the right auricle of the heart. From there it passes downward along the right edge of the sternum, posteriorly to the first and second intercostal spaces; it drains into the right atrium at the level of the superior edge of the third rib. On the left one can distinguish the ascending aorta and on the right are the mediastinal pleura and the phrenic nerve. The right pulmonary vein is located posterior to the superior vena cava and thymus; the right lung is located anterior to it. The lower portion of the vein is located in the serous pericardium. The azygos vein drains into the superior vena cava, bending over the root of the right lung and passing from superior to inferior and from posterior to anterior ones.

THE BRACHIOCEPHALIC VEIN

The **brachiocephalic veins** are the veins formed by the merger of the **subclavian** and **internal jugular vein**. The right brachiocephalic vein is shorter than the left one. Originating behind the right sternoclavicular joint, it runs obliquely downward and medially to the place where it joins the contralateral vein on the left. In front the right brachiocephalic vein is covered by the sternocleidomastoid, sternohyoid and

sternothyroid muscles. The left brachiocephalic vein is about twice longer than the length of the right. It originates behind the left sternoclavicular joint and passes behind the manubrium of sternum, separated from it by fat tissue and thymus. From there it leads to the right and downward where it joins the right brachiocephalic vein. The left subclavian artery, the initial section of the left common carotid artery and the brachiocephalic trunk cross the left brachiocephalic vein in front.

The tributaries of the brachiocephalic veins:

- the **vertebral vein** accompanies the vertebral artery (both run through the transverse foramen of the cervical vertebrae). On passing the transverse foramen of the C7, it drains the *vertebral plexuses* and the veins of the occipital region;

- the **inferior thyroid vein** drains the *unpaired thyroid plexus*. The plexus receives the *thymic veins*, the *inferior laryngeal veins*, the *tracheal veins*, the *esophageal veins* etc;

- the **internal thoracic veins** accompany the artery of the same name. They drain the abdominal walls (the *superior epigastric veins*), the diaphragm (the *musculophrenic veins*) and the intercostal spaces (the *anterior intercostal veins*). The *superior epigastric veins* anastomose with the *inferior epigastric veins* and the *paraumbilical veins* forming so called cava-caval and portacaval anastomoses.

THE INTERNAL JUGULAR VEIN

The **internal jugular vein** carries blood from the skull cavity and the organs of the neck. Beginning at the jugular foramen, where it forms a distention (the *superior bulb of the jugular vein*), the vein passes downward, laterally to the internal carotid artery and further down, laterally to the common carotid artery. The second distention (the *inferior bulb of the jugular vein*) is formed at the lower end of the internal jugular vein before it joins the subclavian vein. There are one or two valves in the vein in the region of the neck above this distention. The common carotid artery, the vagus nerve and

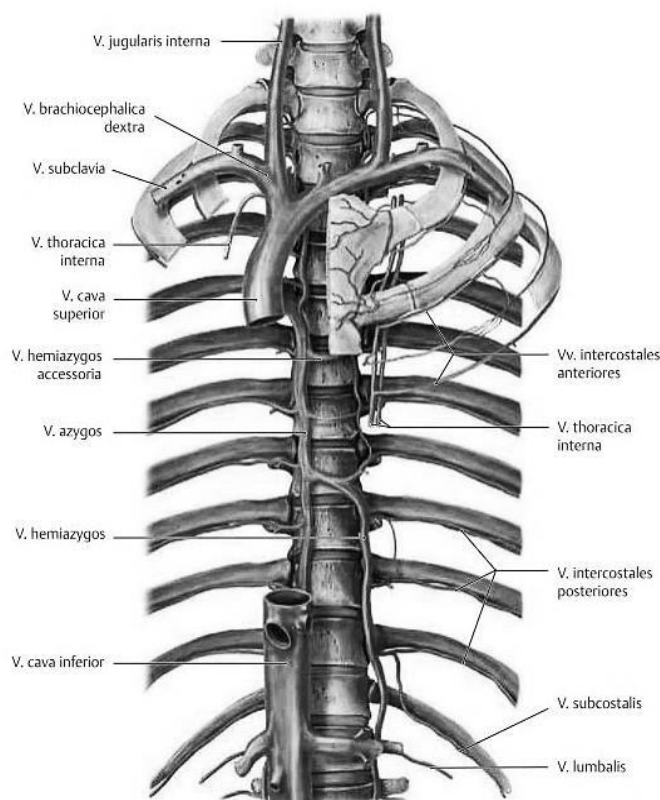
the internal jugular vein constitute the *principal neurovascular bundle of the neck*.

The tributaries of the internal jugular vein

The tributaries of the internal jugular vein are divided into two groups: the intracranial and extracranial tributaries.

THE INTRACRANIAL TRIBUTARIES OF THE INTERNAL JUGULAR VEIN:

1) The **dural venous sinuses** are the endothelium-lined venous canals formed of the dura mater (triangular on transverse section). Unlike the veins, the sinuses are



A Anterior view with rib cage opened.

Figure 77-The Veins of Systemic Circulation (upper and lower vena cava)

formed of dense fibrous tissue and lack muscular tissue. They are fixed to the cranial bones at related grooves and have no valves. They never collapse. The inflexibility of the walls of the venous sinuses provides free drainage of venous blood in changes of intracranial pressure; it is important for uninterrupted activity of the brain.

The venous sinuses are as follows:

- the **transverse sinus** is the largest and widest sinus which runs along the groove for transverse sinus of the occipital bone. It

descends laterally to become continuous with the sigmoid sinus;

- the **sigmoid sinus**, paired, is S-shaped sinus that runs along the sigmoid groove. On reaching the jugular foramen, it becomes continuous with the internal jugular vein;

- the **superior sagittal sinus** is the unpaired sinus that occupies the groove for superior sagittal sinus. It runs on the upper margin of the cerebral falx from front to the back and joins the transverse sinus. At the frontal and parietal bones the sinus has small extensions called the **lateral lacunae**;

- the **inferior sagittal sinus** is unpaired venous canal that runs along the inferior margin of the cerebral falx. It opens into the straight sinus;

- the **straight sinus** runs on the line of attachment of the cerebral falx to the tentorium cerebelli. It receives anteriorly the inferior sagittal sinus and the **great cerebral vein** (the *Galen's vein*). The vein opens into the confluence of sinuses.

The dilated junction area formed of the transverse, superior sagittal, straight, and occipital sinuses is the **confluence of sinuses**.

- the **occipital sinus** arises from the confluence and descends along the internal occipital crest. On reaching the foramen magnum, the sinus splits and then runs along both margins of the foramen; and opens into the sigmoid sinus;

- the **sphenoparietal sinus** (paired) runs along the posterior border of the lesser wing of the sphenoid bone. It opens into the cavernous sinus;

- the **cavernous sinus** (paired) is located on the base of the skull lateral to the sella turcica. Its cavity contains numerous endothelium-lined cells separated by the septa. It is connected with a similar sinus on the other side by means of two transverse **intercavernous sinuses**, passing in front (the **anterior sinus**) and behind the hypophysial fossa (the **anterior** and **posterior intercavernous sinus**). The cavernous sinus is drained of blood by two sinuses located behind it, they are the *superior* and *inferior petrosal sinuses*. Through the cavity of the sinus passes the *internal carotid artery*, *abducent*, *ophthalmic*, *oculomotor* and *trochlear nerves*;

- the **superior** and **inferior petrosal sinuses** (paired) occupy the respective grooves of the temporal bone. They communicate the cavernous sinus with the sigmoid sinus;

- the **basilar plexus** occupies the clivus. It is connected with the petrosal sinuses and with the *vertebral venous plexuses*.

2) The **cerebral veins** collect the venous blood from the brain. They are subdivided into the superficial and deep veins.

The superficial cerebral veins:

- the **superior cerebral veins** (nearly 15 on each side) drain the dorsal and medial surfaces of each cerebral hemisphere (the frontal, parietal and occipital veins). They

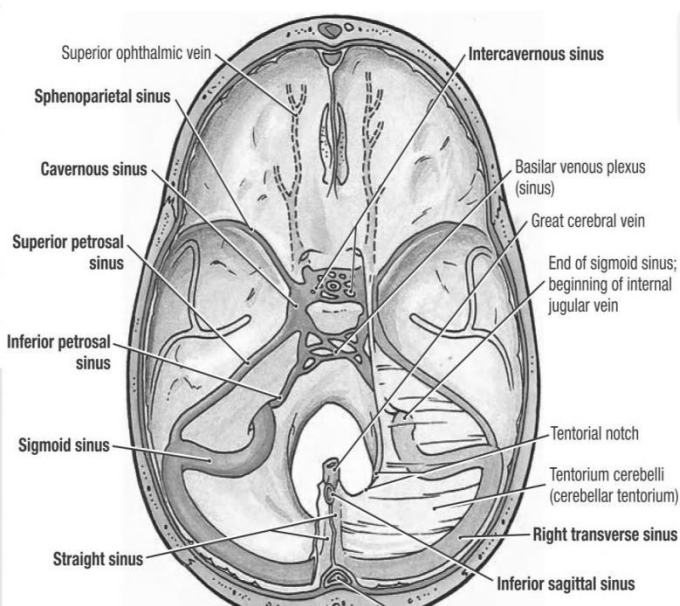


Figure 78-The Intracranial Tributaries of the Internal Jugular Vein

open into the *superior sagittal sinus*;

- the **superficial middle cerebral vein** occupies the lateral sulcus of the hemisphere. It opens into the *cavernous sinus*;

- the **inferior cerebral veins** drain the lateral and inferior surfaces of the hemispheres. The veins open into the *transverse sinus*.

The deep cerebral veins

The **deep cerebral veins** drain the internal compartments of the brain. They merge into two **internal cerebral veins** that collect the venous blood from the *basal nuclei*, the *white matter*, the *hippocampus*, the *thalamus* and the *choroid plexuses*. The

internal veins reside within the roof of the third ventricle. They merge into one **great cerebral vein** (the **Galen's vein**) that opens into the *straight sinus*.

The veins of the brainstem open into the great cerebral vein. The superior veins of the cerebellum drain into the great cerebral vein or the straight sinus. The inferior veins of the cerebellum open into the sinuses of the base of the skull.

3) The **superior** and **inferior ophthalmic veins**.

The **superior ophthalmic vein** runs above the eyeball. It drains the frontal area, superior eyelid, nasal cavity, lacrimal gland, upper portion of the eyeball and muscles of the eyeball. At the medial angle of the eye, the vein anastomoses with the *angular vein* (the initial part of the facial vein). The superior ophthalmic vein leaves the orbit via the *superior orbital fissure* and opens into the *cavernous sinus*;

The **inferior ophthalmic vein** runs along the inferior wall of the orbit. It drains the inferior eyelid, the lower portion of the eyeball and muscles of the eyeball.

4) The **diploic veins** are canals anastomosing with one another and lined by a layer of endothelium; they pass in the spongy substance of the flat cranial bones. In the cranial cavity they drain into the dural venous sinuses and the meningeal veins, but externally they communicate with the extrinsic veins of the head through the emissary veins. The following diploic veins are as follows:

- the **frontal diploic vein** opens into the

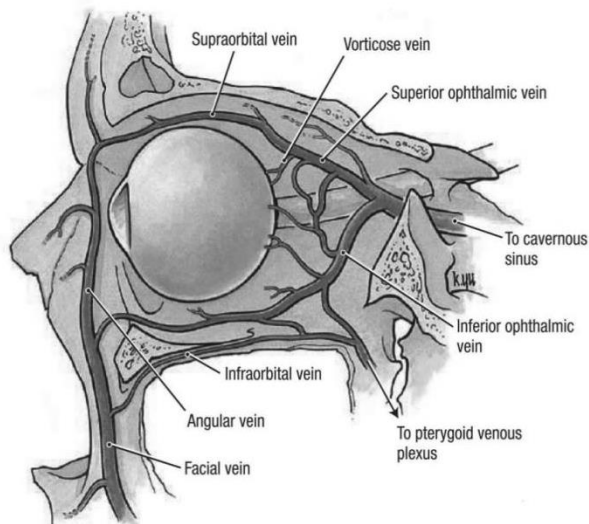


Figure 79-Ophthalmic Veins

. Lateral View

superior sagittal sinus;

- the **anterior temporal diploic vein** drains into the *sphenoparietal sinus*;

- the **posterior temporal diploic vein** drains into the *mastoid emissary vein*;

- the **occipital diploic vein** opens into the *transverse sinus* or the *occipital emissary vein*.

5) The **emissary veins** transmit through openings in the skull bones and communicate the dural venous sinuses with the extrinsic veins of the head. The largest emissary veins are:

- the **parietal emissary vein** passes through the *parietal foramen*. It communicates the superior sagittal sinus with the superficial temporal vein;

- the **mastoid emissary vein** passes within the mastoid foramen. It communicates the transverse sinus with the occipital vein;

- the **condylar emissary vein** passes through the condylar canal. It communicates the sigmoid sinus with the external vertebral plexus.

Small veins leaving the skull together with nerves via the foramen ovale, foramen rotundum, hypoglossal canal, and the carotid canal play the similar role.

THE EXTRACRANIAL TRIBUTARIES OF THE INTERNAL JUGULAR VEIN

The **facial vein** branches off similarly to the facial artery. It arises at the medial angle of the eye (the **angular vein**) and descends to the cervical region. Here it declines posteriorly and joins the retromandibular vein. Two veins merge into the single trunk, which opens into the internal jugular vein. The facial vein drains the frontal region, nose, eyelids, lips, soft palate, parotid gland, muscles of the oral diaphragm and submandibular gland. The facial vein anastomoses directly with the ophthalmic veins and with the pterygoid plexus via the deep facial vein.

The **retromandibular vein** arises anterior to the auricle within the parotid gland. On reaching the cervical region, the vein joins the internal jugular vein. It forms a permanent anastomosis with the *external*

jugular vein. The retromandibular vein is formed of the following veins:

- a) the **superficial temporal veins** drain areas of the head, face, external ear, parotid gland and tympanic cavity;
- b) the **maxillary veins** accompany the

supraclavicular fossa and opens there into the *venous angle* formed by the junction of the *subclavian* and *internal jugular veins*.

The external jugular vein receives the **suprascapular**, **transverse cervical** and the **anterior jugular vein**.

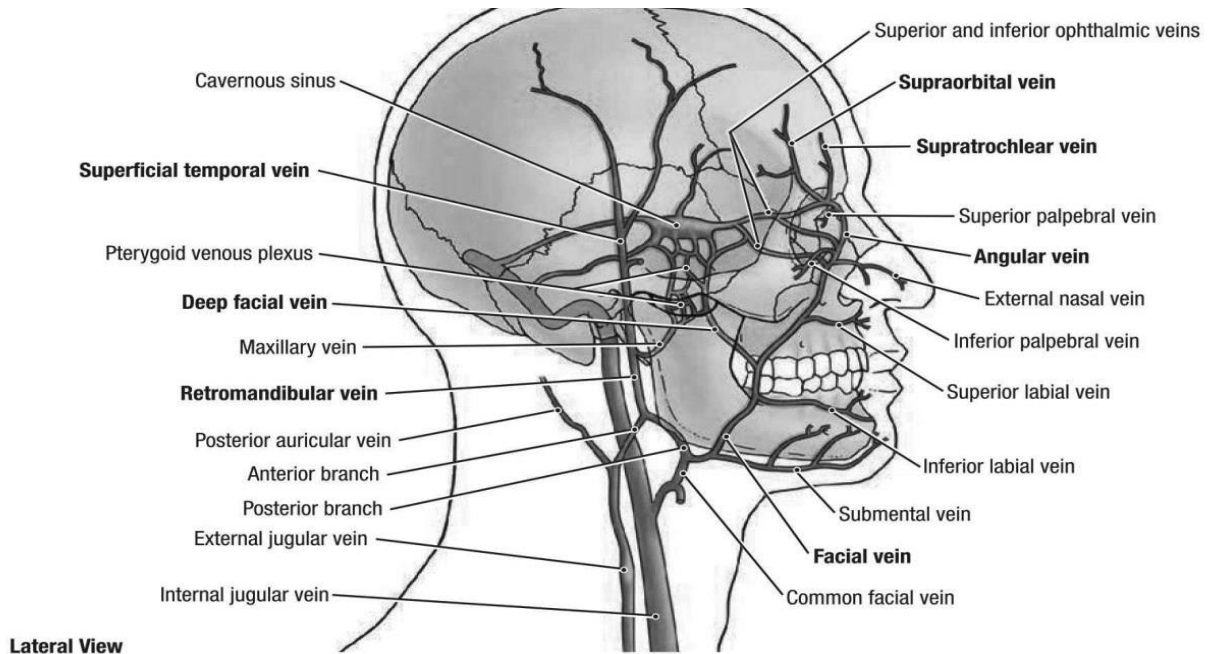


Figure 80-The Tributaries of the Internal Jugular Vein

artery of the same name. They drain the **pterygoid plexus**, located deep around the pterygoid muscles. The plexus, in turn, drains the muscles of the mastication, the dura mater of the brain, upper and lower teeth and the mucous membrane of the oral and nasal cavities. The pterygoid plexus anastomoses with the facial vein via the deep facial vein.

The **lingual vein** drains the tongue.

The **superior thyroid vein** drains the thyroid gland, larynx and cervical muscles.

The **pharyngeal veins** drain the *pharyngeal plexus*.

THE EXTERNAL JUGULAR VEIN

The **external jugular vein** originates behind the auricle by the union of two tributaries – the *anterior*, which *anastomoses with the retromandibular vein*, and *posterior* formed of the *occipital and posterior auricular veins*. The vein descends into the subcutaneous tissue covered by the platysma and runs along the external surface of the sternocleidomastoid muscle, crossing it obliquely downward and posteriorly. The external jugular vein enters the greater

ANTERIOR JUGULAR VEIN

The **anterior jugular vein** consists of small branches located over the hyoid bone, from where it descends. Both anterior jugular veins penetrate the pretracheal fascia of the neck, enter the suprasternal space and drain into the external jugular veins before joining the venous angles. In the *suprasternal space* the anterior jugular veins anastomose with one or two trunks. Thus, the jugular venous arch is formed over the superior edge of the sternum and clavicles.

THE SUBCLAVIAN VEIN

The **subclavian vein** is a direct continuation of the axillary vein. The veins are delimited by the external border of the first rib. The subclavian vein is located below and to the front of the subclavian artery, from which it is separated by the anterior scalenus muscle; behind the sternoclavicular joint the

subclavian vein merges with the internal jugular vein. The merger creates the brachiocephalic vein. The subclavian vein receives the *pectoral veins* and the *dorsal scapular vein*.

THE AXILLARY VEIN

The **axillary vein** stretches from the lower edge of the pectoralis major muscle to the external border of the first rib to continue with the subclavian vein. In the axillary cavity the vein passes medially and anteriorly to the artery of the same name. The tributaries of the axillary vein correspond to the branches of the axillary artery (the *thoracoacromial*, *lateral thoracic* and *subscapular veins*, the *anterior*

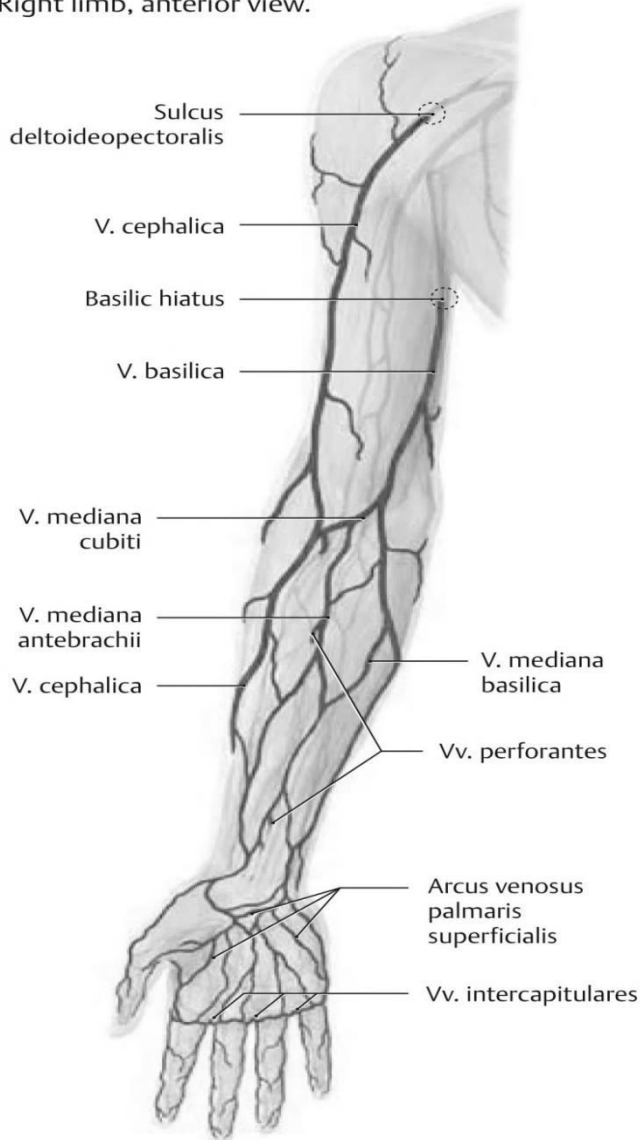
and *posterior circumflex humeral veins*, etc.). It also receives the thoraco-epigastric veins that drain the thoracic and abdominal walls. The thoraco-epigastric veins anastomose with the *superficial epigastric veins* (opened to the femoral vein). These veins form the cava-caval anastomosis.

THE VEINS OF UPPER LIMBS

The veins of upper limb are divided into the superficial and deep veins.

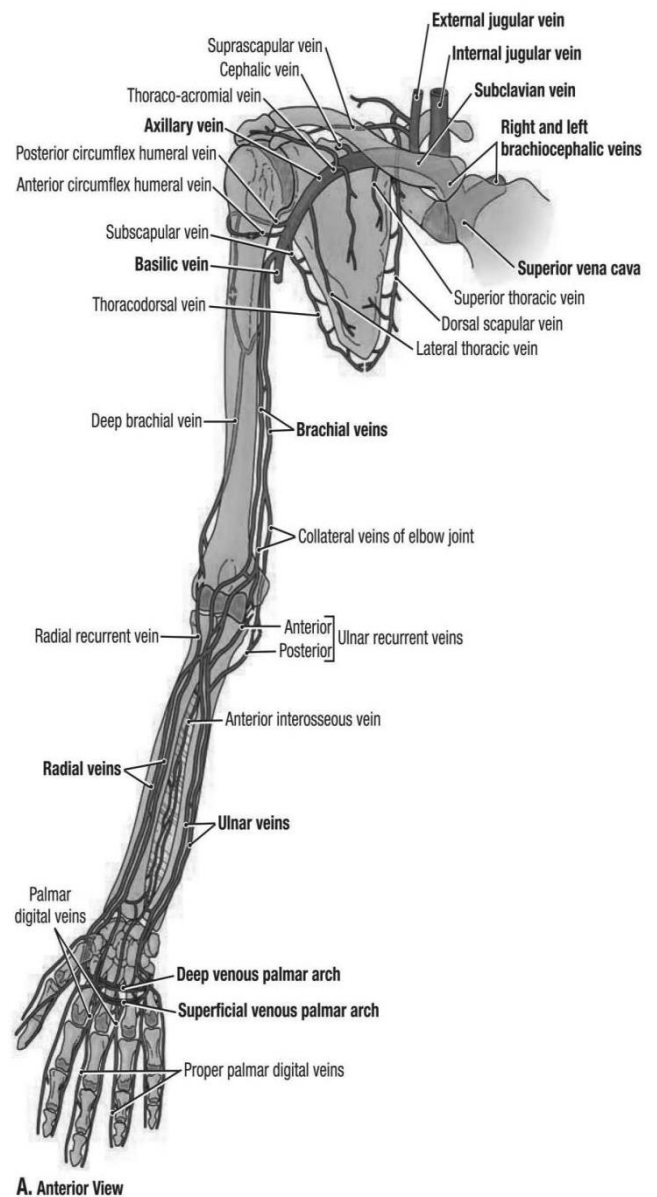
The **superficial veins** anastomose to form a widely looped network which in places has larger trunks. They arise at the dorsal

Right limb, anterior view.



Superficial veins.

Figure 81-The Superficial Veins of Upper Limbs



A. Anterior View

Figure 82-The Deep Veins of Upper Limbs

surface of the hand with the **dorsal venous network** of the hand that drains the fingers. The venous network gives rise to the main superficial veins of the upper limb:

- the **cephalic vein** arises from the radial side of the dorsal venous network of the hand. Along the radial side of the forearm it reaches the elbow where anastomoses with the *basilic vein* and then ascends along the *lateral bicipital* and *deltoideopectoral grooves* and reaches the *clavipectoral triangle*. There it perforates the clavipectoral fascia and drains into the *axillary vein*;

- the **basilic vein** originates on the ulnar side of the dorsal venous network of the hand and passes to the medial segment of the anterior surface of the forearm. There it anastomoses with the cephalic vein through the medial cubital vein. Then it settles into the medial bicipital groove, perforates the brachial fascia in the middle of the arm, and drains into one of the brachial veins;

- the **median cubital vein** is an obliquely located short anastomosis connecting the cephalic and basilic vein in the region of the elbow. The vein communicates with the deep veins of the cubital fossa. It usually receives blood from the median vein of the forearm carried from the palmar side of the hand and forearm. The median cubital vein is practically important in practice as the place of intravenous injections and blood transfusions.

The **deep veins** accompany arteries of the same name, usually two veins for each artery.

The upper limb features are double superficial and deep palmar arches, double ulnar veins, double radial veins. Two brachial veins merge into a single vein in the upper third of the arm. The latter vein joins the basilic vein, which continues with the axillary vein. The deep veins anastomose with each other and with the superficial veins. The veins of the upper limb have numerous valves.

THE AZYGOS VEIN

The **azygos vein** is formed in the abdominal cavity as the longitudinal anastomosis (the **right ascending lumbar vein**) that joins the right lumbar veins. The

right ascending lumbar vein passes upward behind the psoas major muscle and branches into the thoracic cavity between the muscular bundles of the right crus of diaphragm together with the right splanchnic nerve and the right sympathetic trunk.

In the thoracic cavity the azygos vein rises along the right lateral side of the vertebral column, posterior to the esophagus, and to the right to the thoracic duct and aorta. At the level of Th4, the vein rounds the right principal bronchus and drains into the *superior vena cava*. The vein accepts the parietal and visceral tributaries.

The parietal tributaries of the azygos vein:

- the **posterior intercostal veins** (9 right lower veins) accompany the respective arteries within the costal grooves of the ribs. They drain the vertebral plexuses and the thoracic wall;

- the **right superior intercostal vein** created by the merger of three right superior posterior intercostal veins;

- the **superior phrenic veins** drain the diaphragm.

The visceral tributaries of the azygos vein

The **visceral tributaries of the azygos vein** are the *esophageal veins*, *bronchial veins*, *pericardial veins*, and *mediastinal veins*. The esophageal veins anastomose with the *gastric veins* that carry blood to the *hepatic portal vein* (the porta-caval anastomosis).

THE HEMI – AZYGOS VEIN

The **hemi azygos vein** arises in the abdominal cavity as the azygos vein but with the **left ascending lumbar vein**.

In the thoracic cavity the hemi-azygos vein lies on the left lateral surface of the vertebral bodies behind the descending aorta. It ascends only up to the Th7 or Th8, then turns right and passing obliquely upward over the anterior surface of the vertebral column behind the thoracic aorta and thoracic duct, drains into the *azygos vein*. The hemi-azygos vein receives 4–5 left lower **posterior intercostal veins**. The left upper posterior

intercostal veins merge to form the **accessory hemi azygos vein**, which descends on the left lateral surface of the vertebral bodies and drains either into the hemi-azygos or directly into the azygos vein.

The azygos and hemi-azygos vein which are the tributaries of the superior vena cava, and the right and left lumbar veins which are the tributaries of the inferior vena cava form a large *cava-caval anastomosis*.

The veins of the vertebral column

The **veins of the vertebral column** form the plexuses located along the vertebral column. There are the *external* and *internal* vertebral plexuses.

The **anterior** and **posterior internal venous vertebral plexuses** are located within the epidural space of the vertebral canal. They consist of a row of venous rings, one for each

vertebra. The vertebral veins, the spinal veins and the meningeal veins drain into the internal venous vertebral plexuses.

The **anterior** and **posterior external venous vertebral plexuses** are located on the anterior surface of the vertebral bodies and on the arches of the vertebrae respectively. Blood from the vertebral plexuses is drained through the *intervertebral veins* into the *posterior intercostal veins* (in the thoracic region), into the *vertebral veins* (in the cervical region), into the *lumbar veins* (in the lumbar region), and into the *sacral veins* (in the sacral region). The plexuses join the systems of the superior and inferior venae cavae forming a large *cava-caval anastomosis*.

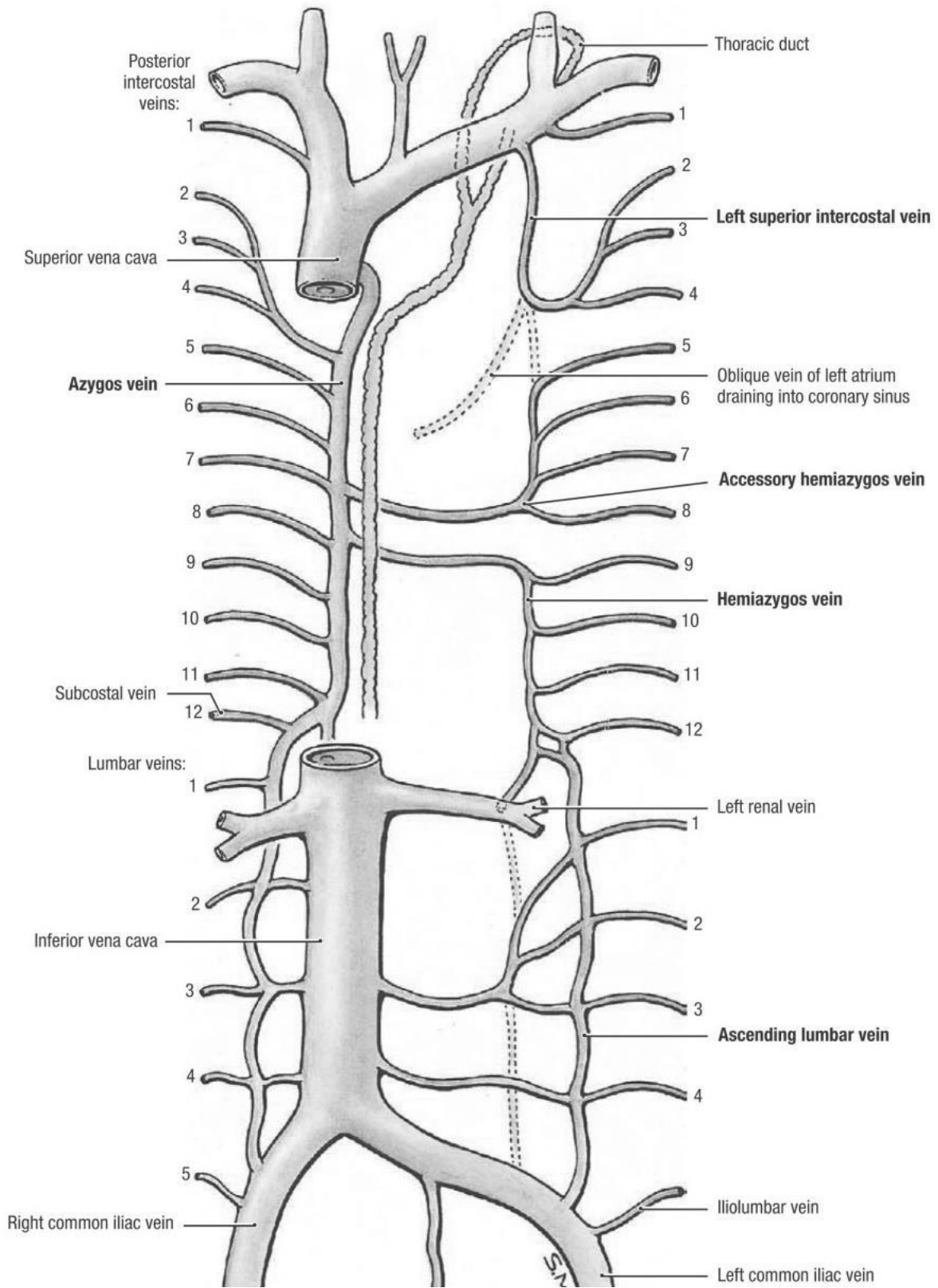


Figure 83-The Veins of the Vertebral Column

THE INFERIOR VENA CAVA

The **inferior vena cava** is the thickest venous trunk in the body. It is formed at the level of L5 by the merge of two common iliac veins below and to the right of the aortic bifurcation and posterior to the right common iliac artery. The inferior vena cava ascends on the right sides of the bodies of the L3 – L5 vertebrae and on the right psoas major muscle to the right of the aorta. Lying in the *groove for vena cava* on the visceral surface of the liver, the inferior vena cava then passes through the *caval opening* in the central tendon of the diaphragm (the level of Th8) into the thoracic cavity and immediately drains into the right atrium of the heart.

The vein receives parietal and visceral tributaries.

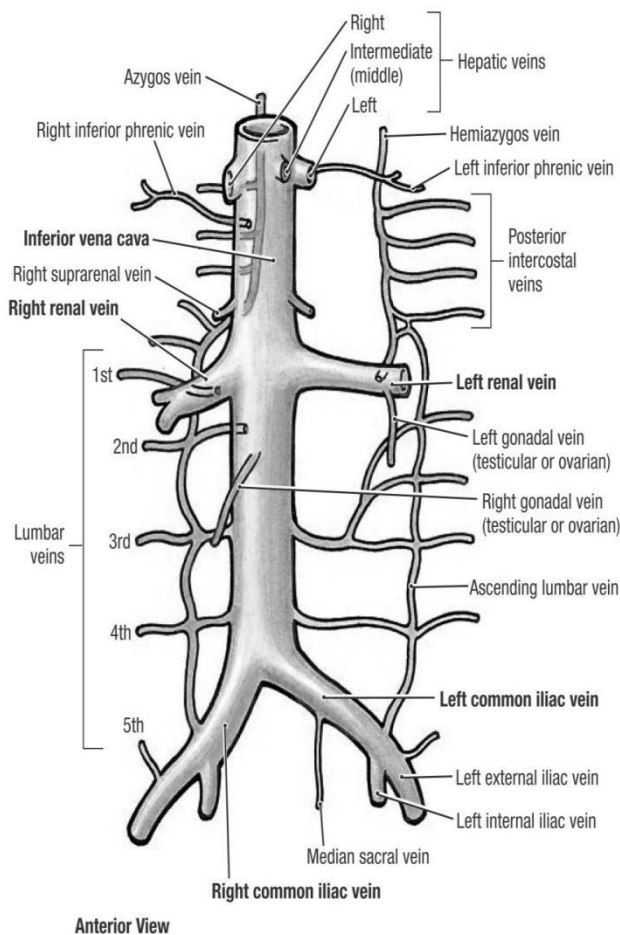


Figure 84-The Tributaries of the Inferior Vena Cava

The parietal tributaries of the inferior vena cava:

- the **lumbar veins** (4 on each side) correspond to the arteries of the same name. They drain the vertebral plexuses and the abdominal wall. The lumbar veins are joined by longitudinal trunks on each side (the *ascending lumbar veins*), which give rise to the azygos and hemi azygos veins;
- the **inferior phrenic veins** accompany the respective arteries and drain into the inferior vena cava where it passes in the sulcus of the liver.

The visceral tributaries of the inferior vena cava:

- the **hepatic veins** (3 veins: the superior, intermediate and inferior) drain the liver. They empty into the inferior vena cava segment related to the groove for vena cava. All veins are located in parenchyma of the liver and one can see their openings after dissecting the posterior wall of the inferior vena cava;

- the **renal veins** pass in front of the renal arteries. Both veins run medially to join the inferior vena cava. The left renal vein is longer than the right one; it crosses the aorta. The *left renal vein* receives the *left testicular (or ovarian)* and the *left suprarenal veins*;

- the **right suprarenal vein** drains into the inferior vena cava immediately above the right renal vein; the left suprarenal vein drains into the left renal vein in front of the aorta;

- the **right testicular (ovarian) vein** opens directly into the inferior vena cava at an acute angle; the left vein empties into the left renal vein at a right angle. This right angle prevents the flow of blood and causes more frequent occurrence of varicocele in the left spermatic cord as compared to the right. In males both veins originate in the region of the testis and form plexuses (the *pampiniform plexus*) located within the spermatic cord. In females ovarian vein begins in the hilum of the ovary.

THE COMMON ILIAC VEIN

The **common iliac vein** arises from the merger of the external and internal iliac veins at the level of the sacroiliac joint. The right vein is located behind the artery of the same name; the left vein lies medially and behind the respective artery. Both veins run medially and merge to form the inferior vena cava. The left common iliac vein receives the *middle sacral vein*.

THE INTERNAL ILIAC VEIN

The **internal iliac vein** is the principal venous collector of the lesser pelvis. It is a short but thick trunk located behind the internal iliac artery. At the level of the sacroiliac joint the vein joins the *external iliac vein* to give rise to the *common iliac vein*. The internal iliac vein drains the walls of the lesser pelvis and all retaining viscera. It receives the parietal and visceral tributaries. The visceral tributaries form the venous plexuses around the pelvic viscera.

The double **parietal tributaries** accompany the respective arteries. They are as follows: the **iliolumbar veins**, the **superior gluteal veins**, the **inferior gluteal veins**, the **obturator veins**, and the **lateral sacral veins**.

The venous plexuses of the lesser pelvis and visceral tributaries of the internal iliac vein

A number of venous plexuses, which anastomose with one another are formed among the branches of the internal iliac vein.

The **uterine venous plexus** in females is located in the *broad ligament* along the sides of the uterus. The blood from it drains mainly through the *uterine veins* into the internal iliac vein, although a part of it is also drained through the *ovarian vein* (the pampiniform plexus).

The **vaginal venous plexus** in females surrounds the vagina. The plexus is drained

by the *vesical*, *uterine* and the *middle rectal veins*.

The **prostatic venous plexus** in males is located between the urinary bladder and the pubic symphysis, encompassing the prostate and the seminal vesicles. The plexus is drained by the *vesical* and *middle rectal veins*.

The **vesical venous plexus** is located in the region of the fundus of the urinary bladder. The blood from the plexus is drained into the internal iliac vein through the *vesical veins*.

The **rectal venous plexus** is the plexus in the walls of the rectum. There are three plexuses which can be distinguished: there submucous, subfascial, and subcutaneous. The *submucous* or *internal plexus* in the region of the lower ends of the rectal columns consists of several venous nodules arranged in the shape of a ring. The abducent veins of this plexus penetrate into the muscular coat of the rectum and merge with the veins of the *subfascial* or *external plexus*. The veins arising from the external plexus are the *superior rectal vein* and *middle rectal vein*, accompanying arteries of the same name. The *superior rectal vein* joins the *inferior mesenteric vein* (which belongs to the portal venous system). The *middle rectal veins* empty into the system of the inferior vena cava through the *internal iliac veins*. The third (*subcutaneous*) plexus is formed in the region of the external anal sphincter, which constitutes the *inferior rectal veins* draining into the *internal pudendal veins* (the tributaries of the internal iliac veins).

The rectal venous plexus communicates the inferior vena cava with the portal venous system and thus constitutes the *portacaval anastomosis*.

The perineum and external genitalia are drained by the **internal pudendal vein** that opens into the *internal iliac vein*. Its tributaries correspond to the branches of the internal pudendal artery.

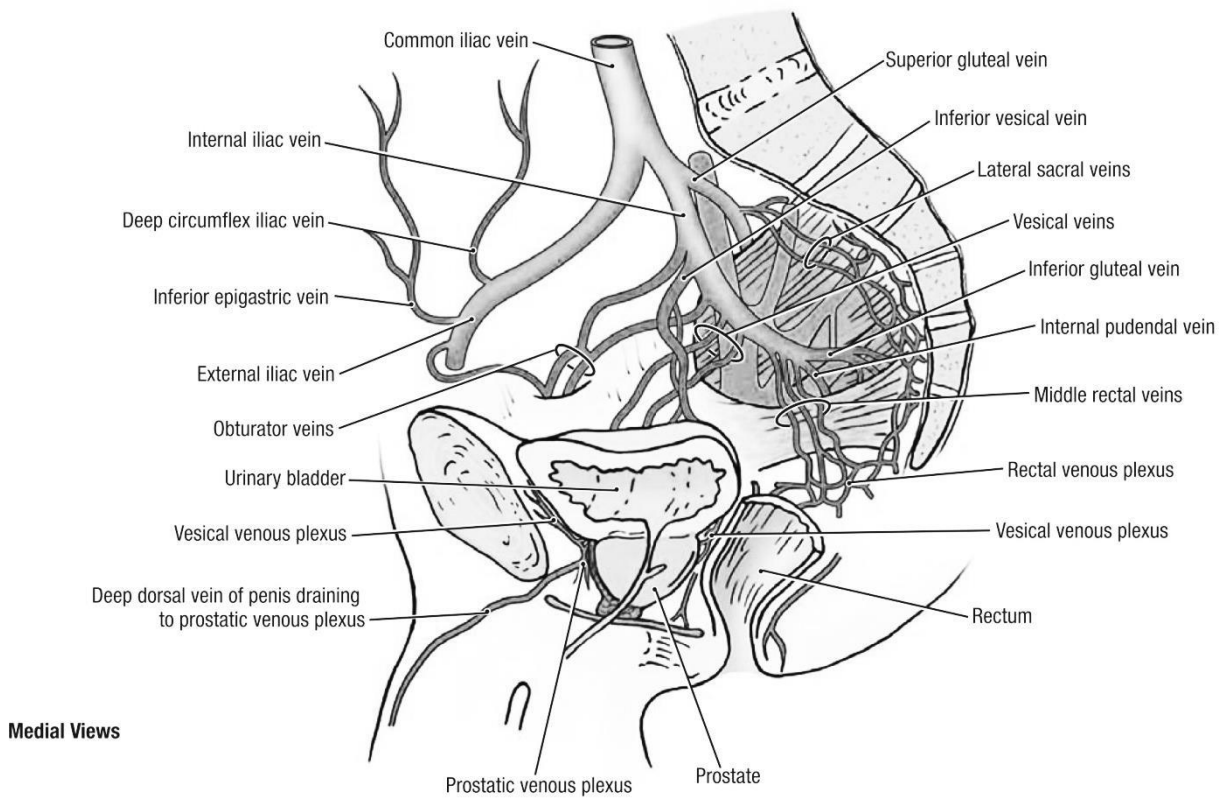


Figure 85-Venous Outflow From the Male Pelvic Organs

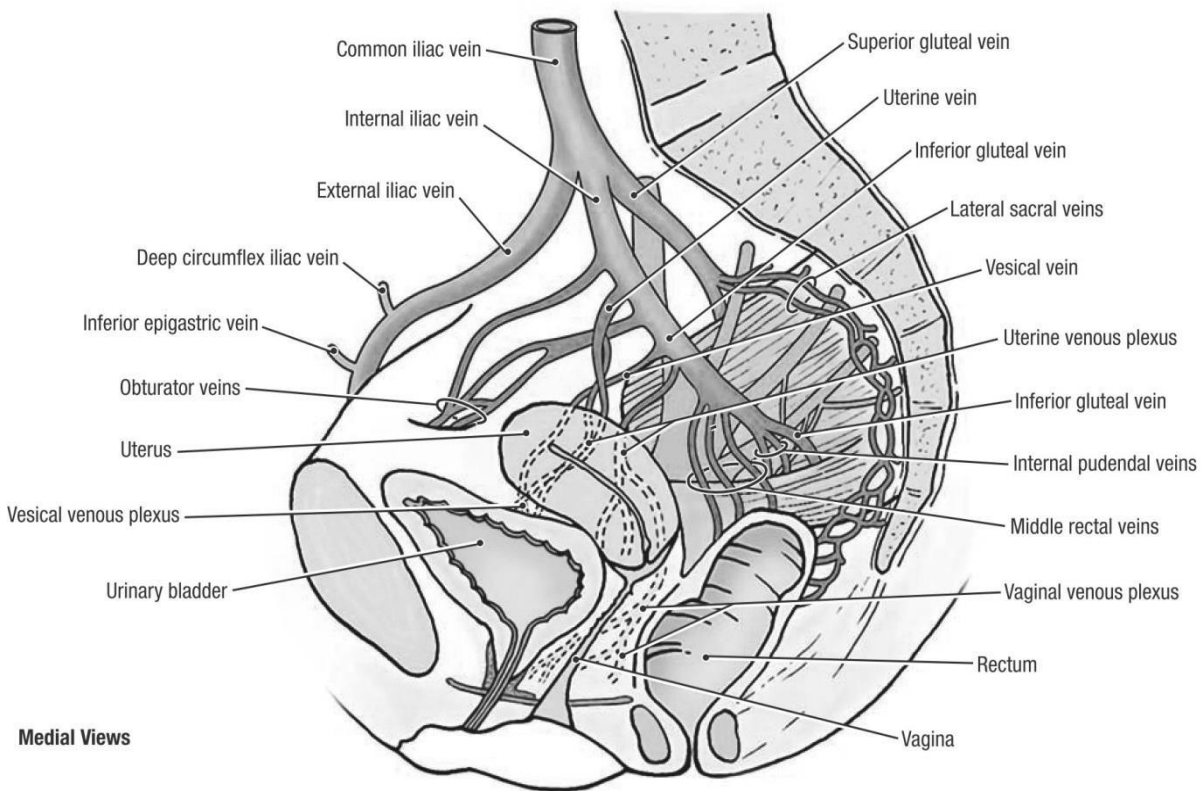


Figure 86-Venous Outflow From the Female Pelvic Organs

THE EXTERNAL ILIAC VEIN

The **external iliac vein** is a direct continuation of the femoral vein, which after passing under the inguinal ligament is determined as the external iliac vein. Passing medially and posteriorly to the artery, the external iliac vein joins with the *internal iliac vein* in the region of the sacroiliac joint to form the *common iliac vein*.

The external iliac vein drains two veins:

- the **inferior epigastric vein** arises within the umbilical area. There it anastomoses with the *superior epigastric* and *para umbilical veins*. These interconnections give rise to the *cava-caval* and *portacaval anastomoses*. Descending along the inferior epigastric artery, the vein drains the anterior abdominal wall and anastomoses with the *obturator vein*;
- the **deep circumflex iliac vein** accompanies the artery of the same name and drains the respective area.

THE HEPATIC PORTAL VEIN

The **hepatic portal vein** collects blood from all unpaired organs of the abdominal cavity with the exception of the liver. Nutrients carried in the blood and absorbed in the gastrointestinal tract are carried by the hepatic portal vein to the liver where they are neutralized and glycogen is deposited. Blood from the pancreas, which supplies insulin for regulation of sugar metabolism, and from the spleen, which produces the products of disintegration of blood elements used by the liver to secrete bile is also carried by the hepatic portal vein.

The hepatic portal vein is a thick venous trunk located in the *hepatoduodenal ligament* with the proper hepatic artery and the common bile duct (from the right to the left DVA). The portal vein is formed behind the head of the pancreas by the union of splenic vein, superior and inferior mesenteric veins.

The **superior mesenteric vein** runs within the mesentery of the small intestine

near the mesenteric artery. Passing behind the head of the pancreas, it joins the inferior mesenteric vein. Its tributaries correspond to the branches of the superior mesenteric artery. These tributaries are the *intestinal veins*, the **right gastro omental vein**, the **pancreaticoduodenal veins**, the **iliocolic vein** (with the **appendicular vein**), the **right colic vein**, and the **middle colic vein**.

The **inferior mesenteric vein** originates from the venous plexus of the rectum by the **superior rectal vein**. Passing upward, the vein receives branches from the sigmoid colon (the **sigmoid veins**), the descending colon (the **left colic vein**), and from the left half of the transverse colon. The inferior mesenteric vein then merges with the superior mesenteric vein behind the head of the pancreas either together with the splenic vein or independently.

The **splenic vein** carries blood from the spleen, pancreas, along the upper edge of which it passes posteriorly and below the splenic artery (the **pancreatic veins**), the stomach (through the **short gastric veins** and the **left gastroepiploic veins**). Behind the head of the pancreas the splenic vein joins the superior mesenteric vein.

The tributaries of the main trunk of the hepatic portal vein

The main trunk of the hepatic portal vein receives the tributaries as follows: the **right gastric vein**, the **left gastric vein**, the **cystic vein**, the **prepyloric vein** and the **para-umbilical veins**.

The paraumbilical veins are the small vessels that occupy the *round ligament of the liver*. The veins anastomose with the *superior* and *inferior epigastric veins* and with the subcutaneous veins (the *thoraco-epigastric veins* and the *superficial epigastric veins*) in the umbilical area. In portal obstruction, the para-umbilical veins become distended because they provide collateral circulation for blocked portal system.

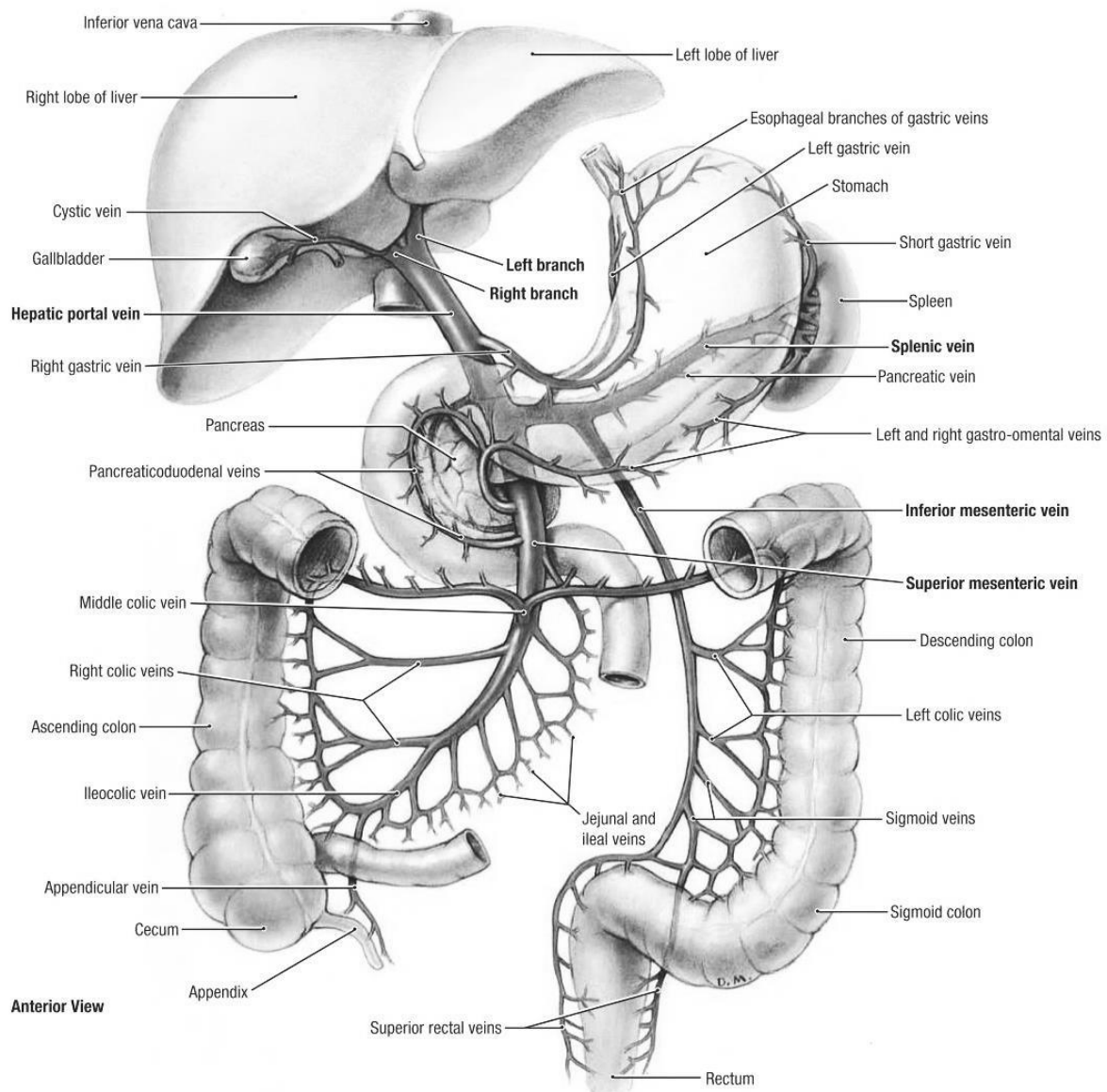


Figure 87-The Hepatic Portal Vein

THE INTERNAL VASCULATURE OF THE LIVER

In addition to the arterial blood, the liver also receives venous blood. The proper hepatic artery and the portal vein enter the parenchyma of the liver through the porta hepatis. On entering the porta, the portal vein carrying blood from the unpaired abdominal organs is divided into the right and left branches which, in turn, are split into the segmental branches. They branch out gradually to form the finest branches lying between the lobules (the interlobular veins). The latter give off radiating broad *capillaries* (the *sinusoids*) to the center of hepatic lobules. The capillaries merge into the *central*

veins (they occupy the center of each lobule) that leaves the lobule and form the sublobular veins which join to form the *hepatic veins*.

Three or four large hepatic veins leave the liver on its lower surface within the groove for vena cava and drain into the inferior vena cava. Thus, the portal vein receives capillaries which pass through the lobules and merge to form the central vein on exit. This type of circulation is called the *rete mirabile*.

Branches of the proper hepatic artery correspond to the branches of the hepatic portal vein. They also branch into the capillaries which join the lobular capillaries (the sinusoids).

THE VEINS OF THE LOWER LIMB

The **veins of the lower limb** are divided into deep and superficial or subcutaneous. The **superficial veins** run below the skin and pass independently of the arteries. The superficial veins arise from the **dorsal and plantar venous networks of the foot**:

- the **great saphenous vein** originates on the dorsal surface of the foot from the medial portion of the dorsal venous network and ascends along the medial aspect of the leg and thigh. In the upper one third of the thigh it runs along the anterior surface to reach the *saphenous opening*. On passing the saphenous opening, the vein drains into the *femoral vein*. On its way, the great saphenous vein receives numerous tributaries that anastomose with each other and with the tributaries of the small saphenous vein and deep veins of the lower limb. At the saphenous opening, the vein receives the **external pudendal veins**, the **superficial circumflex iliac vein**, and the **superficial epigastric vein**;

- the **small saphenous vein** originates on the lateral side of the dorsal surface of the foot, passes below and behind the lateral malleolus, and then rises along the posterior surface of the leg between the heads of the gastrocnemius muscle. When it reaches the lower angle of the popliteal fossa, the small saphenous vein drains into the *popliteal vein*. The small saphenous vein receives numerous tributaries that anastomose with the tributaries of the great saphenous vein and deep veins of the lower limb.

The **deep veins** of the foot and leg are binary and accompany arteries of the same name. Two **anterior tibial veins** accompany the anterior tibial artery, two **posterior tibial veins** accompany the posterior tibial artery, etc. The **popliteal vein** comprises all deep veins of the leg and constitutes a single trunk lying in the *popliteal fossa* posteriorly and laterally to the artery of the same name; the tibial nerve is located superficially (NVA from superficial to deep). The popliteal vein ascends to the *adductor canal* and becomes continuous with the **femoral vein**. It is located within the *femoral triangle* medially from the femoral artery. From this position the femoral vein runs under the inguinal

ligament into the *vascular space* and becomes continuous with the external ilac vein. The greatest tributary of the femoral vein is the **deep vein of the thigh**. The veins flowing into the femoral vein are binary.

The deep veins anastomose with each other and with the superficial veins. All of them have numerous valves.

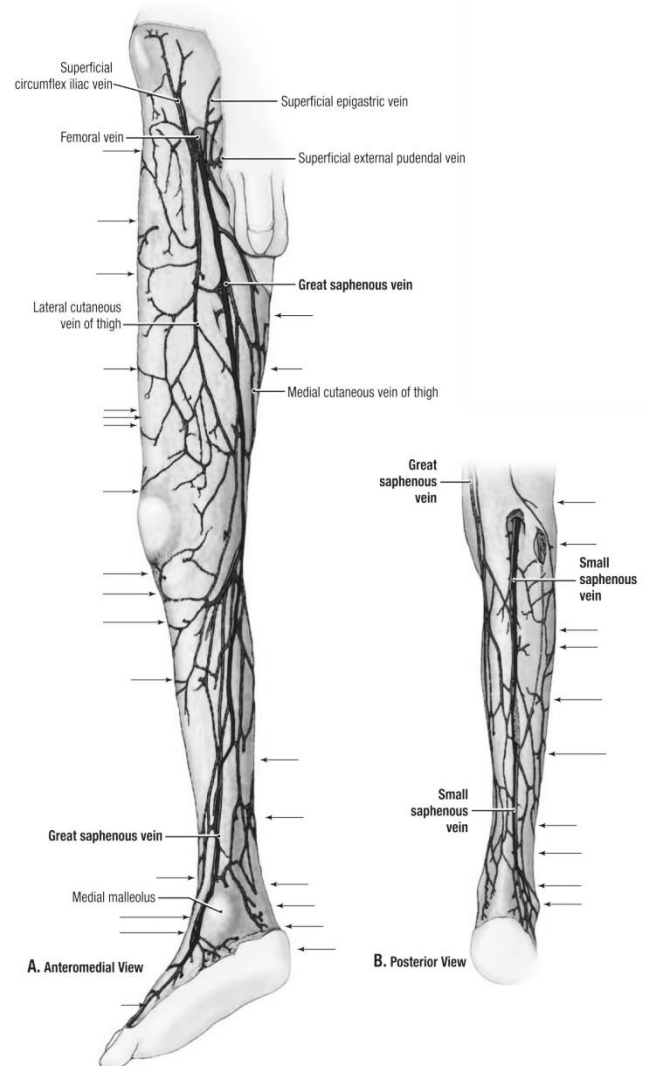
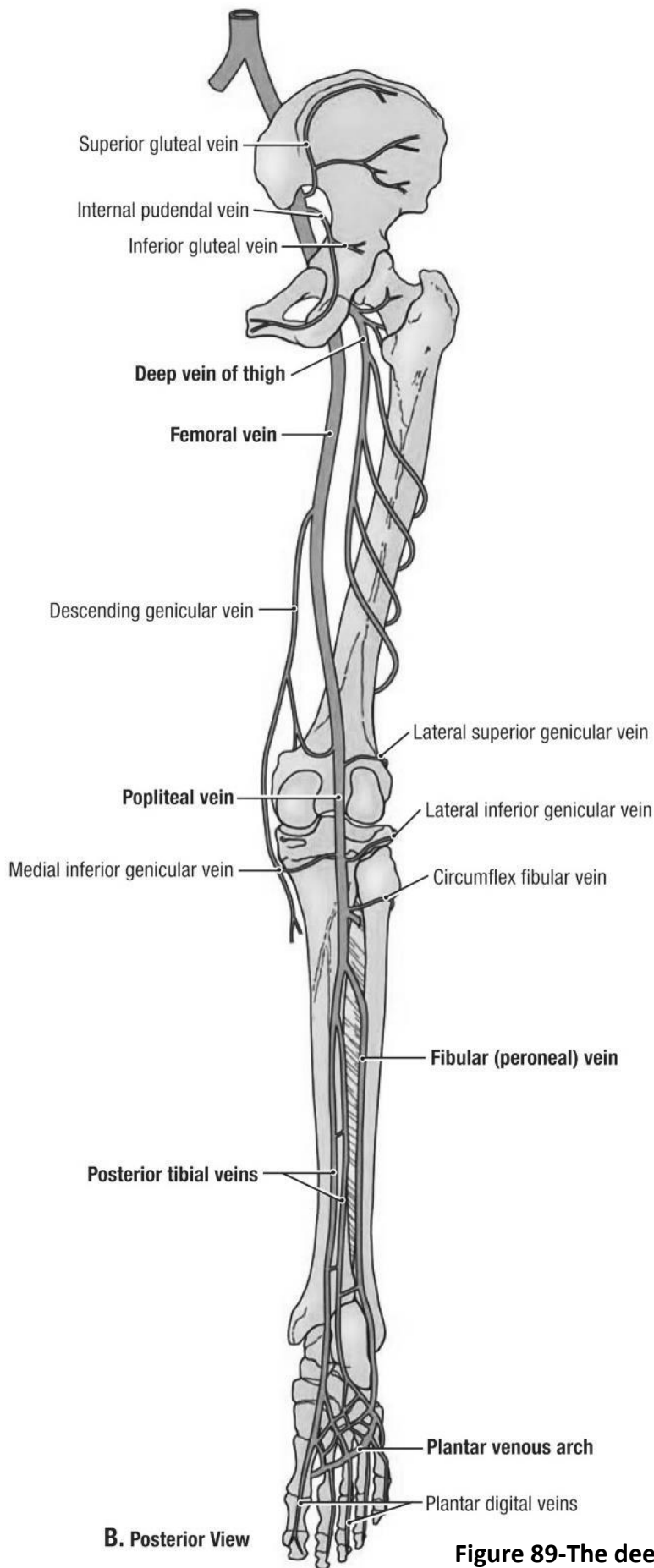


Figure 88-The Superficial Veins of the Lower Limb



B. Posterior View

Figure 89-The deep veins of the lower limb (posterior view)

THE CAVA-CAVAL ANASTOMOSES

The **cava-caval anastomoses** associate the systems of the **superior vena cava (SVC)** and **inferior vena cava (IVC)**.

1. There are anastomoses between the *vertebral venous plexuses* and the roots of the SVC and IVC posteriorly along the vertebral column.

The *sacral* and *lumbar veins* (the tributaries of the IVC) drain the plexuses in the sacral and lumbar regions. The *vertebral, azygos* and *hemiazygos veins* (the tributaries of the IVC) drain the plexuses in the cervical and thoracic regions.

The azygos and hemiazygos veins carry blood to the SVC. Their roots (the **right** and **left ascending lumbar veins**) are connected with the paired lumbar veins, which are the roots of the IVC.

2. There are anastomoses between the **superior epigastric vein** which is the tributary of the *internal thoracic vein* (from the system of SVC) and the **inferior epigastric vein** which joins the *external iliac vein* (from the system of IVC) on the anterior abdominal wall.

The superficial veins also anastomose in the region of the navel. These anastomoses are formed by the **thoraco-epigastric veins**

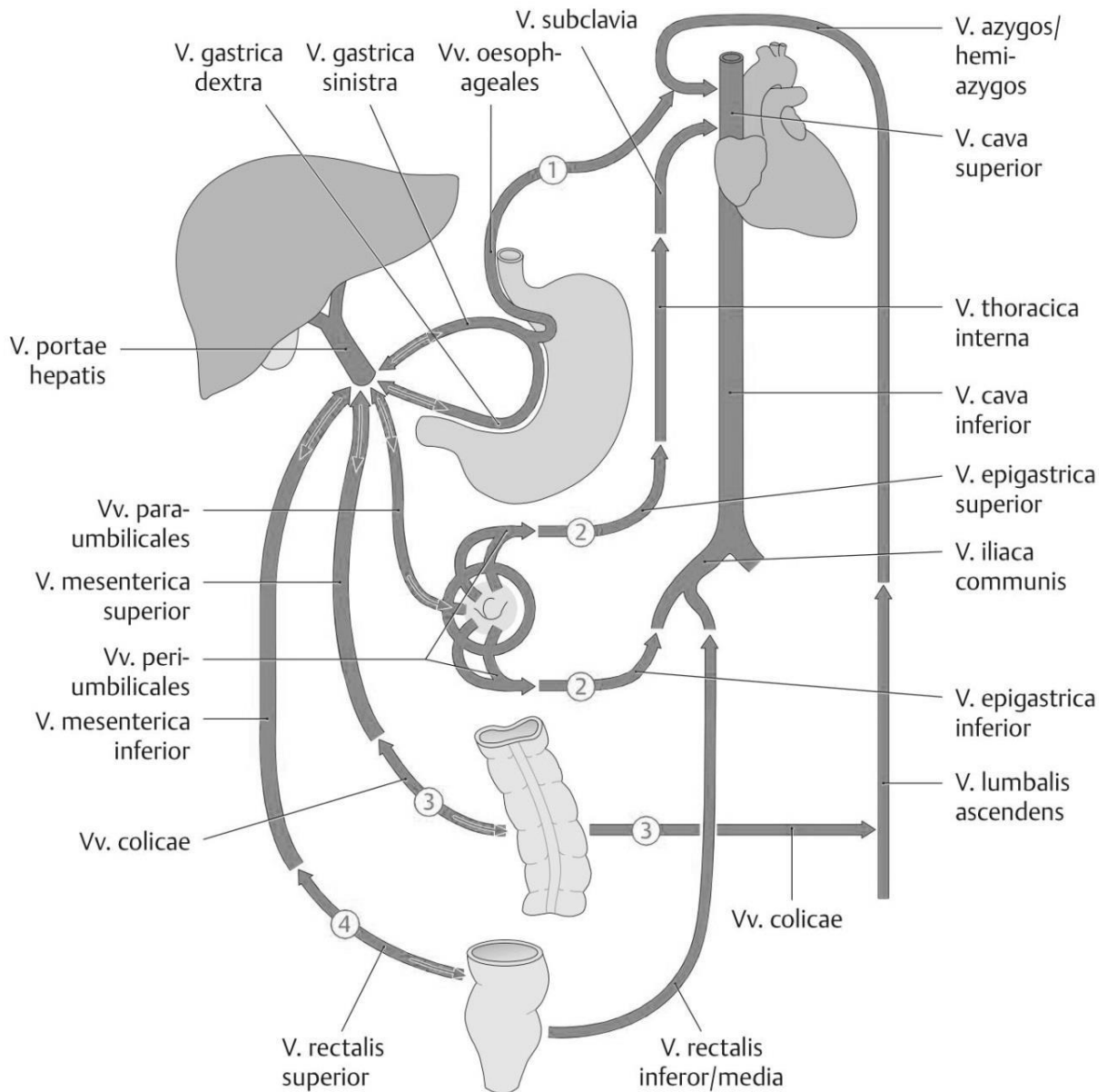


Figure 90-The Cava-caval and Portacaval Anastomoses

that join the *axillary vein* (from the system of the SVC) and the *superficial epigastric vein* and empty into the *femoral vein* (from the system of the IVC).

THE PORTACAVAL ANASTOMOSES

The roots of the **hepatic portal vein** (HPV) anastomose with the roots of veins from the systems of the **superior vena cava** and **inferior vena cava**, forming so called **portacaval anastomoses**, which are of practical significance. If we imagine the abdominal cavity in the shape of a cube, these anastomoses are located on all sides of the cube:

- on the top, in the abdominal part of the esophagus between the roots of the *left gastric vein*, which empties into the *hepatic portal vein* (HPV), and the *esophageal veins*, which drain into the *azygos* and *hemiazygos veins* and further into *superior vena cava* (SVC);
- on the bottom, in the lower part of the rectum between the *superior rectal vein*, which drains through the *inferior mesenteric vein* into the *hepatic portal vein* (HPV), and the *middle rectal vein* (flowing into *internal iliac vein*) and the *inferior rectal vein* (flowing into the *internal pudendal vein*), which together drain into the *internal iliac vein* and further into the *common iliac vein* from the system of the inferior vena cava (IVC);
- at the front, in the region of the navel where the branches of the *paraumbilical veins* (passing through the thickness of the *round ligament of the liver* to the *hepatic portal vein* (HPV), *superior epigastric vein* (from the system of the *superior vena cava* (SVC)), *internal thoracic vein*, *brachiocephalic vein* and the *inferior epigastric vein* (from the system of the *inferior vena cava* (IVC)), *external iliac vein*, *common iliac vein* anastomose.

Portacaval and cava-caval anastomoses within the anterior abdominal wall, provide a bypass for the drainage of blood when obstacles appear in the liver (e. g. at cirrhosis). In such cases the veins around the navel dilate and acquire a typical

appearance known as Medusa's head;

- from the back, in the lumbar region between the roots of the veins of the mesoperitoneal segments of the large intestine (the *right* and *left colic veins* that drain into the *hepatic portal vein* HPV) and the parietal *lumbar veins* (from the system of the inferior vena cava). All these anastomoses form known Retzius system.

SPECIFIC FEATURES OF BLOOD CIRCULATION OF THE FETUS

The fetus is supplied with oxygen and nutrients from the blood of mother through the placenta. **Placental circulation** originates in the following way. Arterial blood enriched by oxygen and nutrients flows from the mother's placenta into the **umbilical vein** which enters the body of the fetus in the region of the navel and passes upward to the left longitudinal sulcus of the liver. At the level of the porta hepatis, the umbilical vein divides into two branches, one of which drains immediately into the hepatic portal vein, while the *venous duct* (*ductus Arantii*), passes along the inferior surface of the liver to its posterior edge where it empties into the trunk of the *inferior vena cava*.

The supply of pure arterial blood from one of the branches of the umbilical vein through the hepatic portal vein allows the liver to reach its relatively large size. The large size of the liver is connected with function of haemopoiesis performed by the liver. Present in the developing organism, haemopoiesis predominates in the foetus and decreases after birth. After passing through the liver the blood flows through the *hepatic veins* into the *inferior vena cava*.

Thus, all the blood from the umbilical vein drains directly (through the *venous duct*) or indirectly (through the *hepatic veins*) into the **inferior vena cava** where it is mixed with the venous blood flowing through the hepatic veins from the lower half of the body of the fetus. The mixed (venous and arterial) blood flows along the inferior vena cava into the **right atrium** of the heart. From the right atrium it is directed by the *valve of the inferior vena cava* via the **ovale foramen**

(located in the *interatrial septum*) into the **left atrium** of the heart of fetus. From the left atrium the mixed blood flows to the **left ventricle** and then into the **aorta**, bypassing the pulmonary circulatory system, which is not functioning yet. The areas supplied directly from the aortic arch (the heart, head, neck and upper limbs) initially receive more oxygenated blood. This explains relatively greater size of the upper portion of the body of the fetus.

Besides blood from the inferior vena cava, blood from the **superior vena cava** and the **coronary (venous) sinus** of the heart also flows into the right atrium. Venous blood draining into the superior vena cava from the upper half of the body of the fetus flows further into the **right ventricle** and from there into the **pulmonary trunk**. As the lungs are not yet functioning as a respiratory organ, only an insignificant part of the blood reaches

the parenchyma of the lungs and from there flows along the *pulmonary veins* to the **left atrium**. The greater part of the blood from the pulmonary trunk flows along the **ductus arteriosus (Botallo's duct)** into the descending aorta and from there to the lower part of the body of the fetus and lower extremities. The aortic segment below the ductus arteriosus receives some venous blood, which reduces portion of oxygen. The lower portion of the body is supplied with low blood oxygen although it is enough for normal development of the fetus.

Paired **umbilical arteries** in fetus arise from the *internal iliac artery*. They ascend along the anterior abdominal wall and leave the abdominal cavity through the umbilical ring. Outside the body, they occupy the **umbilical cord**. The twisted arteries reach the placenta and are divided into the capillary network.

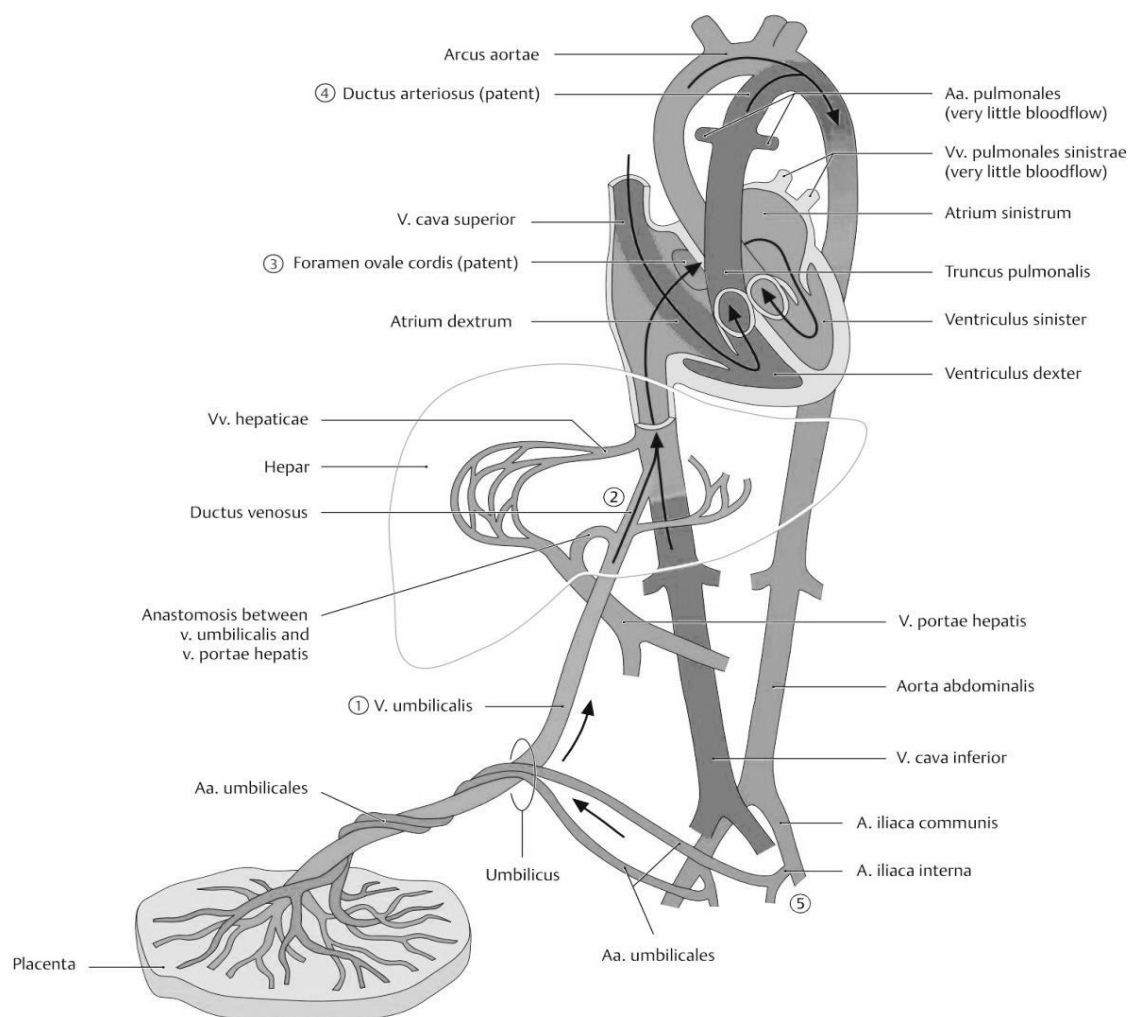


Figure 91-Specific Features of Blood Circulation of the Fetus

The umbilical arteries carry mixed (both oxygenated and deoxygenated) blood away from the body of the fetus.

The oxygenated blood runs back to fetus via a single umbilical vein. It also occupies the umbilical cord and enters the body of the fetus through the same umbilical ring.

During birth a sharp transition takes place from *placental* to *pulmonary* circulation. With the first breath and expansion of the lungs with air, the pulmonary vessels greatly dilate and are filled with blood. The ductus arteriosus then collapses and closes within the first eight-ten days transforming into the **ligamentum arteriosum**.

The umbilical arteries grow over during the first two-three days of life, and transform into the *medial umbilical ligaments* on the

inner surface of the anterior abdominal wall. The umbilical vein closes on the sixth-seventh days, transforms into peritoneum-enfolded *round ligament of the liver*. The ductus venosus transforms into the *ligamentum venosum* that occupies the fissure on the visceral surface of the liver.

The flow of the blood from the right into the left atrium through the foramen ovale stops immediately after birth because the left atrium fills with blood from the lungs and the blood pressure between the left and right atria levels out. The closure of the foramen ovale occurs much later and in many cases it is preserved throughout the first year of life.

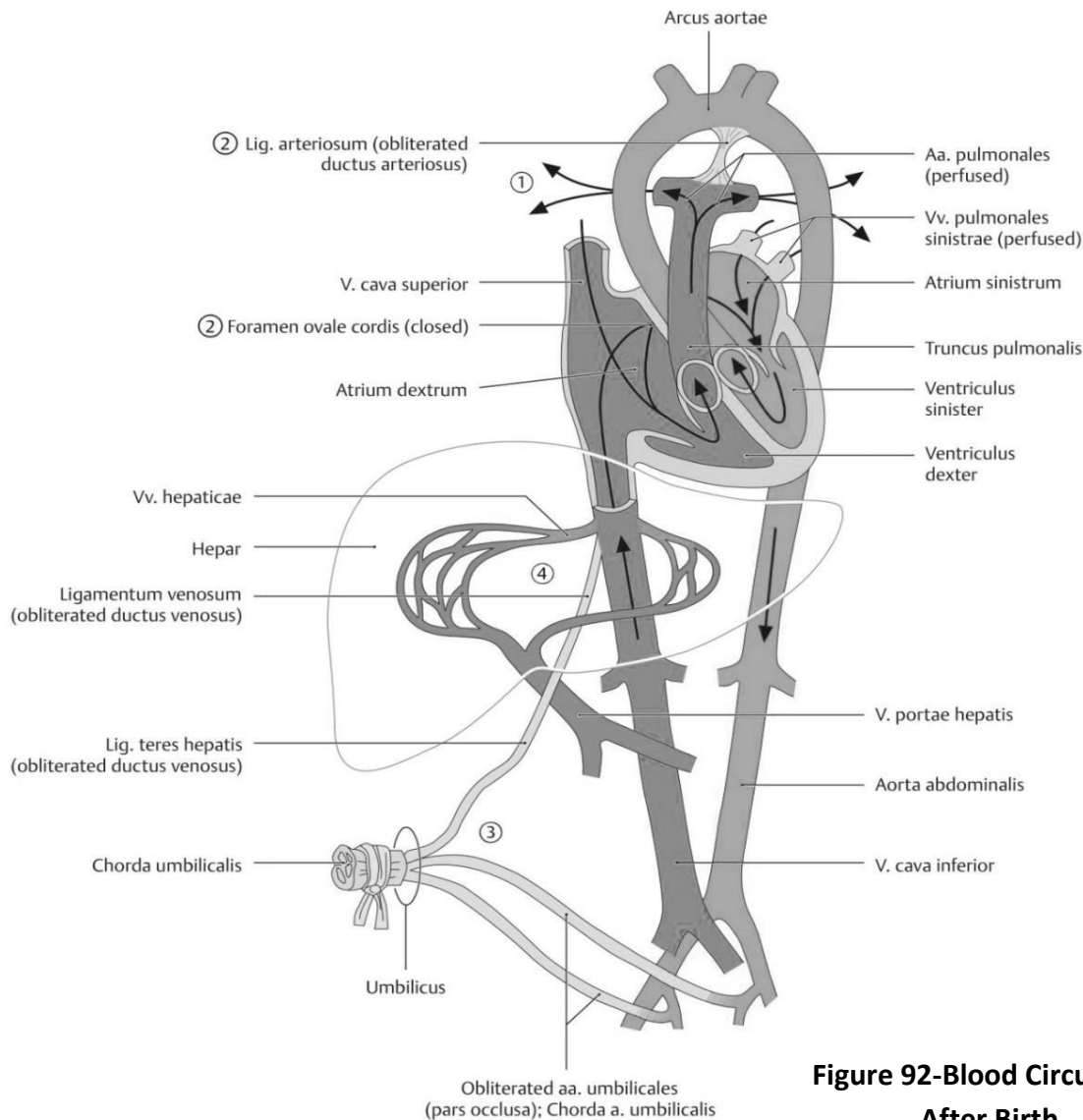


Figure 92-Blood Circulation After Birth

THE LYMPH DRAINAGE OF ORGANS

The mammary gland

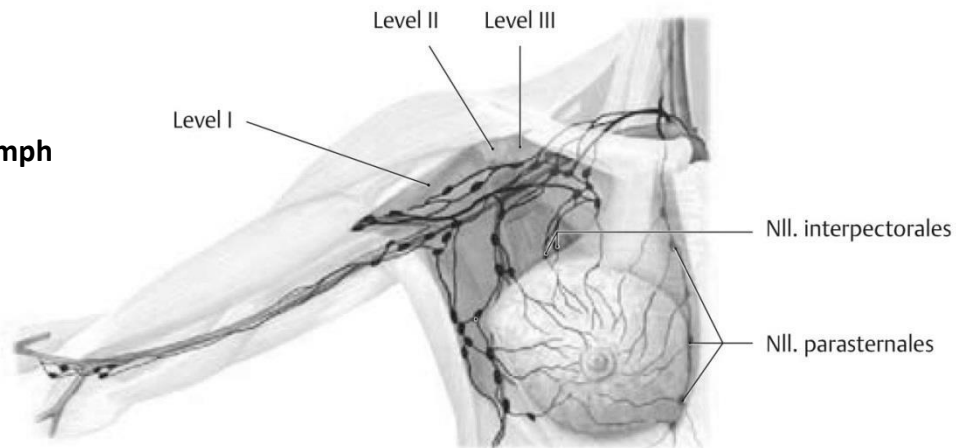
The *superolateral quadrant* – axillary (medial, inferior and apical group), deep lateral cervical and parasternal lymph nodes.

The *superomedial quadrant* – parasternal, anterior mediastinal and axillary lymph nodes.

The *inferolateral quadrant* – axillary lymph nodes (medial, inferior), parasternal lymph nodes.

The *inferomedial quadrant* – axillary and parasternal lymph nodes.

Figure 93-The Lymph Drainage of the Mammary Gland



Lymphatic drainage of the breast.

The right lung

The *upper lobe* – bronchopulmonary (right), superior tracheobronchial and anterior mediastinal lymph nodes.

The *middle lobe* – bronchopulmonary (right), superior and inferior tracheobronchial lymph nodes.

The *lower lobe* – bronchopulmonary (right), inferior tracheobronchial and posterior mediastinal lymph nodes.

The left lung

The *upper lobe* – bronchopulmonary (left), superior tracheobronchial, anterior mediastinal lymph nodes.

The *lower lobe* – bronchopulmonary (left), inferior tracheobronchial, anterior and posterior mediastinal lymph nodes.

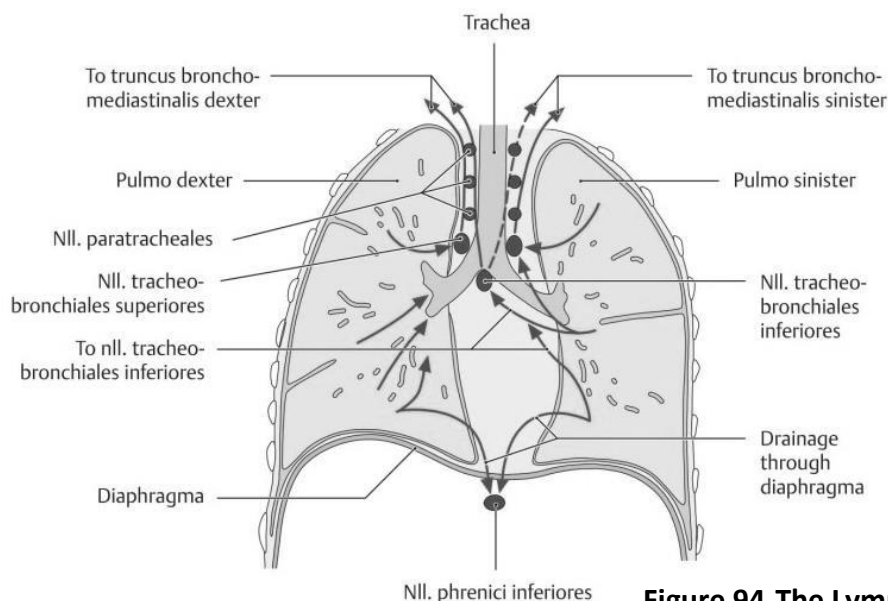


Figure 94-The Lymph Drainage of the Lung

The stomach

The **cardial part** – the cardiac ring (cardial nodes).

The **lesser curvature** – left gastric lymph nodes.

The **pyloric part** – pyloric, right gastric

and hepatic lymph nodes.

The **greater curvature** – right and left gastroepiploic lymph nodes.

The **region of the fundus** – splenic lymph nodes.

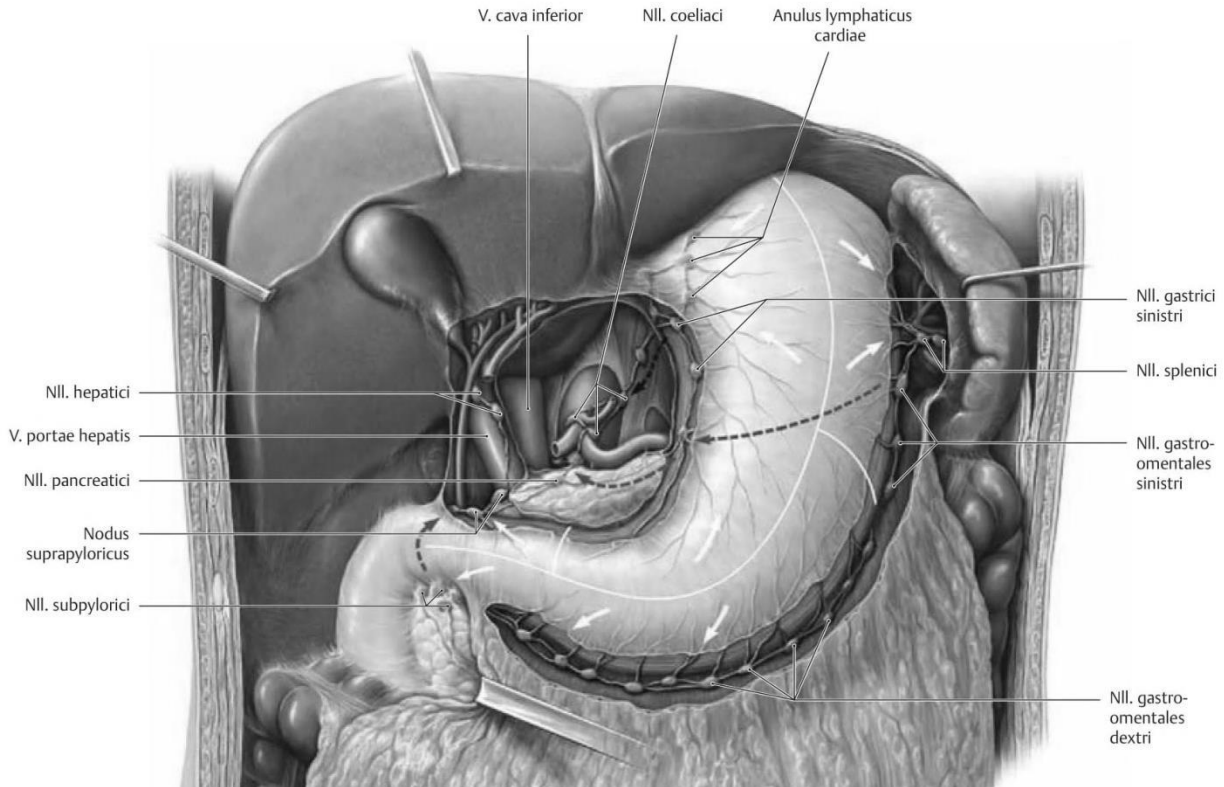


Figure 95-The Lymph Drainage of the Stomach

The uterus

The **uterus** – internal and external iliac, anorectal and lumbar (from the fundus) lymph nodes.

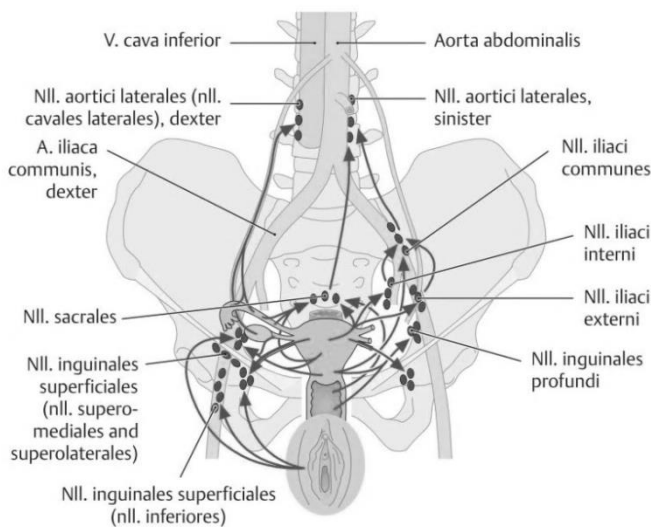


Figure 96-The Lymph Drainage of the Mammary Uterus

The rectum

The **inferior portion** – anorectal and superficial inguinal lymph nodes.

The **ampulla** – anorectal, internal iliac and sacral lymph nodes.

The **superior portion** – superior rectal, inferior mesenteric and lumbar lymph nodes.

THE LYMPHATIC SYSTEM

Being the part of immune system lymphatic system is also the system of:

- lymphatic capillaries (lymphocapillaries), (lymphocapillary net works);
- lymphatic vessels;
- trunks;
- ducts, branched throughout organs and tissues.

Lymph nodes lie on the way of lymphatic vessels directions and function as biological filters for lymph (tissue fluid) coming through them (Fig. 39).

Function: to filter tissue fluid withdrawing foreign matters:

- + ruined cells and other tissue elements,
- + cell - mutants,
- + microorganisms and their vital activity products,
- + dust particles.

The following may be distinguished in the lymphatic system:

1) Lymphatic capillaries:

function: to absorb tissue fluid together with the matters contained in it.

2) Lymphatic vessels:

function: lymph flows from capillaries toward regional lymph nodes and large lymphatic collector trunks.

Large lymphatic collectors - trunks:

- jugular;
- intestinal;
- bronchomediastinal;
- subclavian;
- lumbar.

3) Ducts:

- thoracic,
- right lymphatic

function: lymph passes into veins.

4) lymph nodes:

function: filtering, lymphocytopoietic, immunocytopoietic

LYMPHATIC CAPILLARIES

Localization:

- in each organ and tissues of the human body except the brain, spinal cord and their

membranes, cartilages, organs, of immune system, and placenta;

- on the plane parallel to their surface.

The diameter of a lymphatic capillary is bigger than that of the blood capillary (up to 0.2 mm),

The contours are uneven, sometimes with protrusions and extensions (lacunae) at the points of confluences.

Lymphatic capillaries connecting with each other form isolated **lymphocapillary networks**.

Superficial lymphatic vessels are formed of lymphatic capillaries of skin and subcutaneous fat. In movable parts of the body lymphatic vessels bifurcate, branch out and unite again composing collateral ways which provide continuous lymph flow in the joints during movement.

Lymph nodes are widespread but especially concentrated in the following locations:

- *Cervical lymph nodes* occur in deep and superficial groups in the neck, and monitor lymph coming from the head and neck.

- *Axillary lymph nodes* are concentrated in the armpit (axilla) and receive lymph from the upper limb and female breast (fig. 22.13a).

- *Thoracic lymph nodes* occur in the thoracic cavity and receive lymph from the lungs, airway, and mediastinum.

- *Abdominal lymph nodes* monitor lymph from the urinary and reproductive systems.

- *Intestinal and mesenteric lymph nodes* monitor lymph from the digestive tract (fig. 22.13b).

- *Inguinal lymph nodes* occur in the groin (see fig. 22.11) and receive lymph from the whole lower limb.

- *Popliteal lymph nodes* occur at the back of the knee and receive lymph from the leg proper.

LYMPHATIC VESSELS AND REGIONAL LYMPH NODES OF THE BODY REGIONS

Superficial lymphatic vessels - are located over superficial fasciae.

Deep lymphatic vessels lying beside blood vessels (arteries and veins) in depth, as well as popliteal and inguinal lymph nodes can be defined in a lower extremity.

There are numerous *anastomoses* perforating superficial fasciae between the superficial and deep lymphatic vessels of lower extremity.

LYMPHATIC VESSELS AND LYMPH NODES OF LOWER EXTREMITIES

Superficial lymphatic vessels of the lower extremity are **composed** of lymphocapillary network of skin and subcutaneous fat and are directed toward

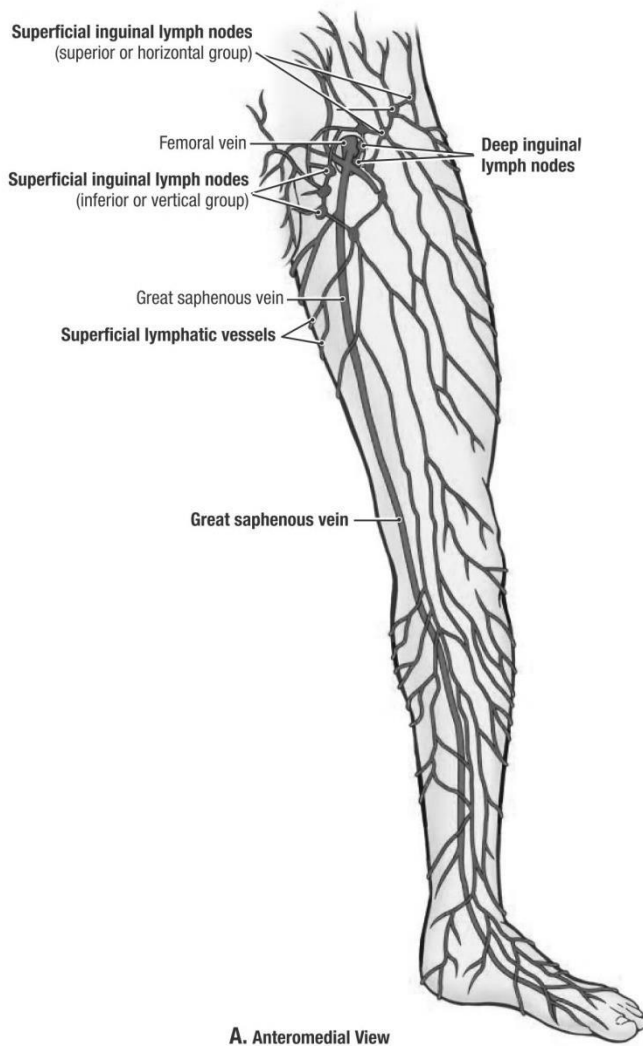
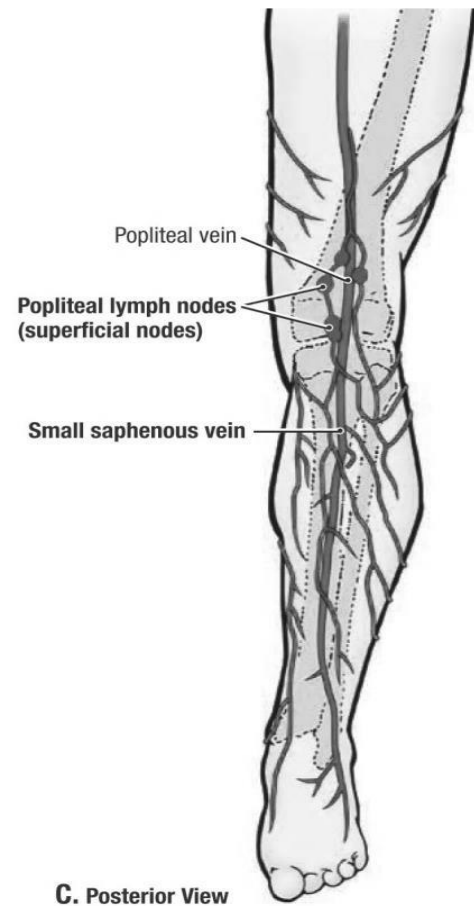


Figure 97-Lymphatic Vessels and Lymph Nodes of a Lower Extremities (along great saphenous vein)

Figure 98-Lymphatic Vessels and Lymph Nodes of a Lower Extremities (along small saphenous vein)



popliteal and superficial inguinal lymph nodes.

Groups of superficial lymphatic vessels:

- **medial**- collect lymph from the I, II, III toes;
- **lateral** - begin in the skin and subcutaneous fat of the IV and V toes, the lateral part of the back foot and the lateral part of the cms;
- **posterior** - collect lymph from the medial margin of a foot, medial, and posterior - medial surfaces of a cms.

Deep lymphatic vessels collect lymph from muscles, joints, synovial bursae, and sheaths of bones and nerves, accompany large arteries veins, and thigh. These vessels enter popliteal and deep inguinal lymph nodes.

Inguinal lymph nodes:

- superficial inguinal lymph nodes;
- deep inguinal lymph nodes (Fig. 43).

Superficial inguinal lymph nodes (4 – 20) lie on the superficial plate of the thigh broad

fascia in the form of a chain along the inguinal fold (ligament).

Deep inguinal lymph nodes (1– 7) are arranged in the iliopectineal sulcus near the thigh arteries and veins. The most superior of all these nodes (Pirogov's node) is found in the deep femoral ring, on the medial semi - circumference of the femoral vein.

LYMPHATIC VESSELS AND LYMPH NODES OF PELVIS

Visceral (inner, nodi viscerates) iliac lymph vessels lie close to organs of pelvis (parauterine, paravesical, pararectal).

Parietal (parietal, nodi parietals) iliac lymph vessels are in the form of chains near large blood vessels (external and internal iliac).

Function: take lymph from organs lying around and pelvic walls are found in the pelvis and its walls.

Efferent lymphatic vessels of the right and left common iliac lymph nodes are directed toward lumbar nodes lying beside abdominal aorta and inferior vena cava.

Lumbar lymph nodes

- parietal nodes:
 - + posterior (*lumbar*);
 - + anterior (*inferior epigastric, nodi lymphatici epigastrici inferiores*);
 - + inferior (*collect lymph from muscles and skin, parietal peritoneum lining and subperitoneal fat anterior abdominal wall*)
- visceral nodes:

Efferent lymphatic vessels of lumbar lymph nodes give rise to lumbar trunks.

LYMPHATIC VESSELS AND LYMPH NODES OF ABDOMINAL CAVITY

Lymphatic vessels

Localization: near unpaired visceral rami of abdominal aorta and their branches (*superior and inferior mesenterial arteries, celiac trunk, hepatic, gastric, splenic arteries*).

Function: take lymph from regional lymph nodes of the stomach, pancreas, liver, kidneys.

Lymph nodes

Localization: in the mesentery of small intestine along rami of superior mesenteric artery.

Function: take lymph from jejunum and ileum.

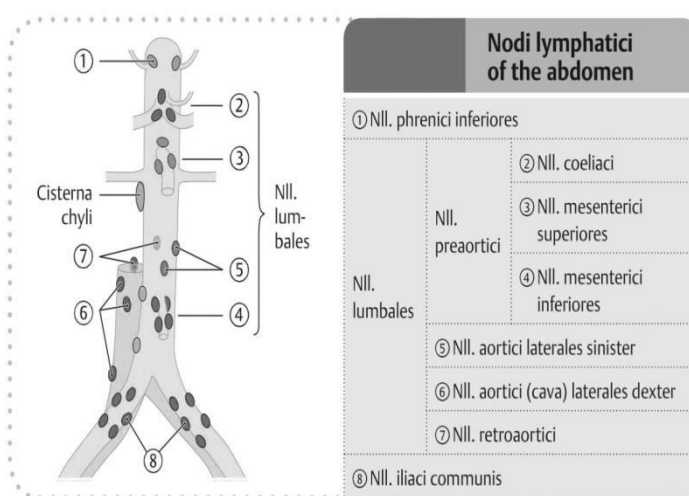


Figure 99-Lymphatic Vessels and Lymph Nodes of Pelvis and Abdomen

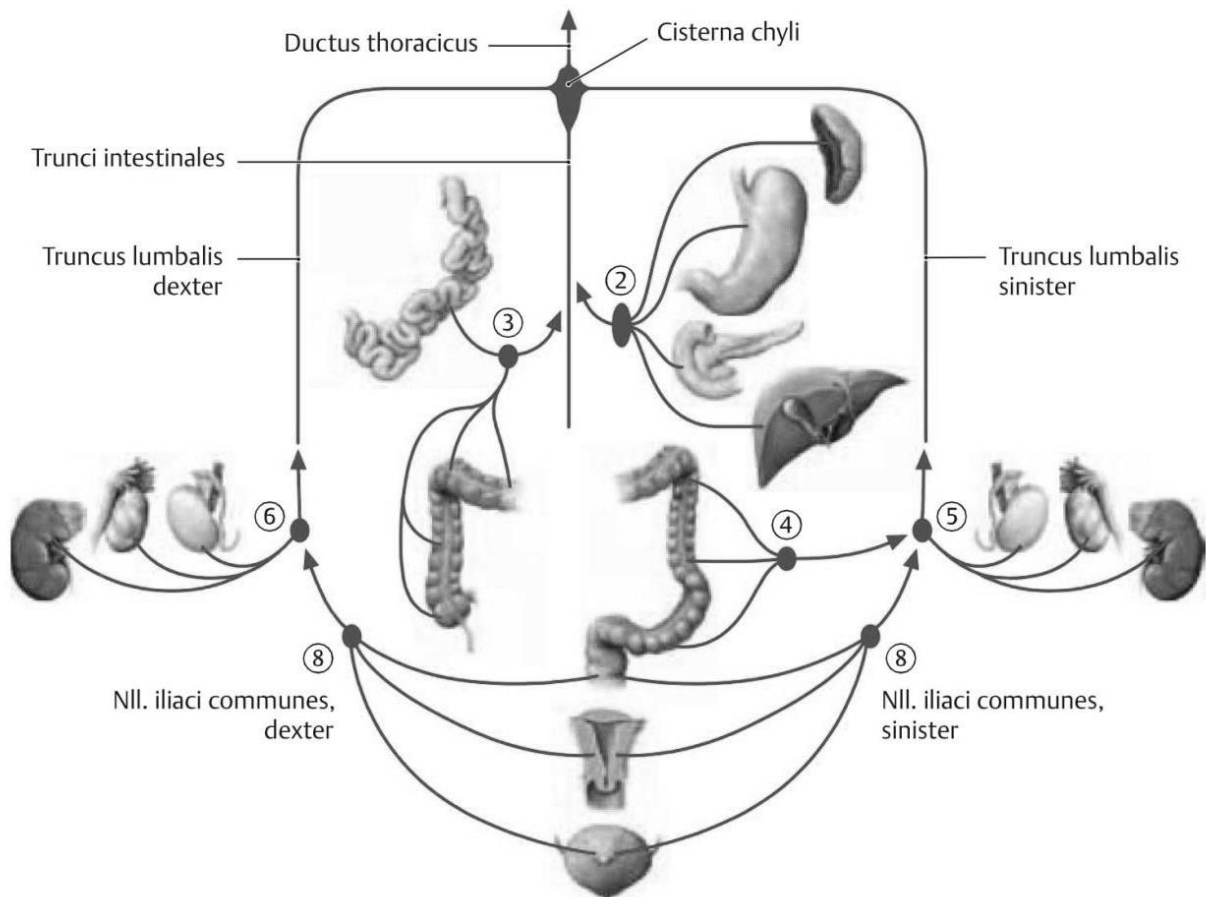


Figure 100-Lymphatic Vessels and Lymph Nodes of Pelvis and Abdomen (lymphatic drainage scheme)

| Nodi lymphatici of the abdomen | | |
|--|-----------------------------------|-------------------------------|
| ① Nll. phrenici inferiores | | |
| Nll. lumbales | Nll. preaortici | ② Nll. coeliaci |
| | | ③ Nll. mesenterici superiores |
| | ④ Nll. mesenterici inferiores | |
| | ⑤ Nll. aortici laterales sinister | |
| ⑥ Nll. aortici (cava) laterales dexter | | |
| ⑦ Nll. retroaortici | | |
| ⑧ Nll. iliaci communis | | |

LYMPHATIC VESSELS AND LYMPH NODES OF THORACIC CAVITY

Localization: on the walls of the cavity and visceral ones lying close to organs are found both in thoracic cavity and abdominal cavity.

Parietal lymph nodes

(parasternal, intercostal, superior diaphragmatic, lateral pericardial, prepericardial)

Function: take lymph from tissues of thoracic cavity walls, diaphragm, pleura, pericardium, mammary gland and diaphragmatic surface of the liver.

Visceral lymph nodes

Function: take lymph from organs of thoracic cavity.

Anterior mediastinal lymph nodes.

Localization: in the superior mediastinum on the anterior surface of upper vena cava and aortic arch, and on the vessels branching out of it.

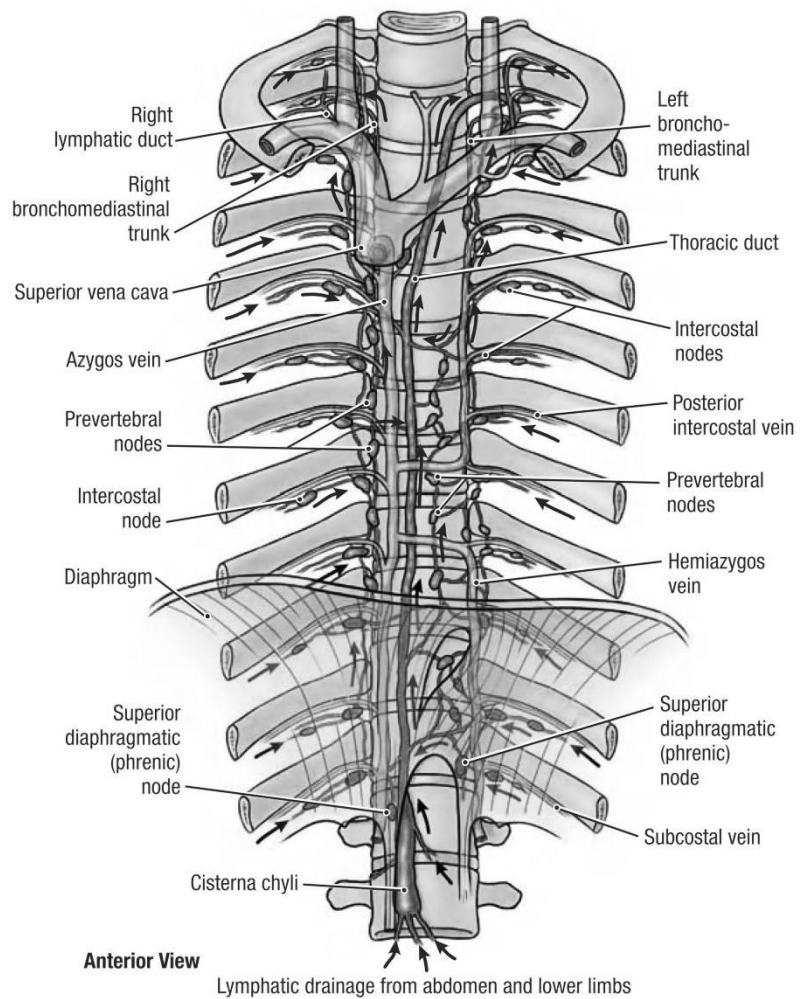


Figure 102-Lymphatic Vessels and Lymph Nodes of Thoracic Cavity

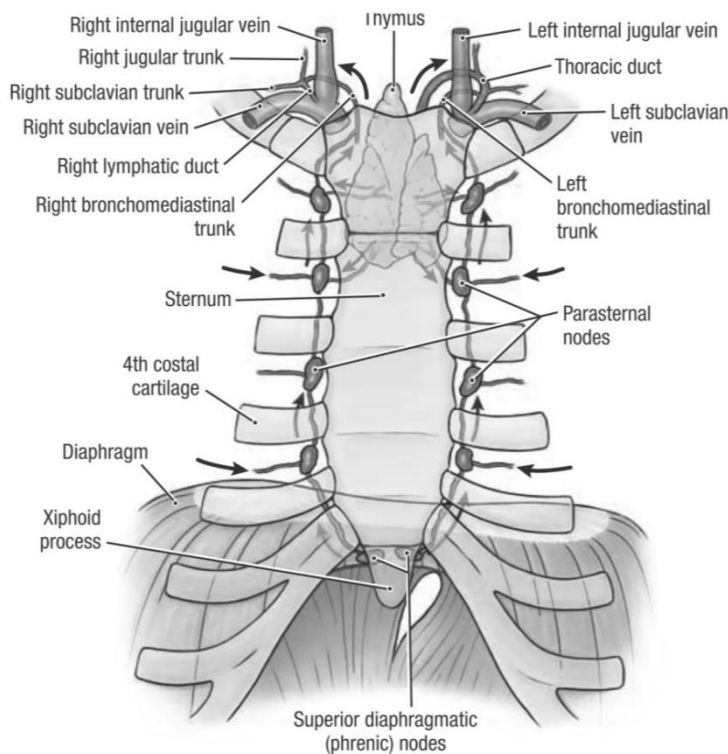


Figure 101-Parietal Lymph Nodes (Parasternal)

Posterior mediastinal lymph nodes.

Localization: are arranged next to esophagus and thoracic portion of aorta. Lymphatic vessels of heart, pericardium, efferent vessels of bronchopulmonary and tracheobronchial lymph nodes, to which lymph from the lungs flows are directed toward mediastinal lymph nodes.

LYMPHATIC VESSELS AND LYMPH NODES OF HEAD AND NECK

Localization: in groups at the point of joint of head and neck (occipital, parotid, retropharyngeal, buccinator, mandibular, lingual, submental).

Superficial lymph nodes

Localization: on the surface plate of cervical fasciae and deep ones located below.

Deep cervical lymph nodes.

Localization: close to organs (prelaryngeal, thyroid, pretracheal and paratracheal) and near internal jugular vein (lateral deep cervical nodes).

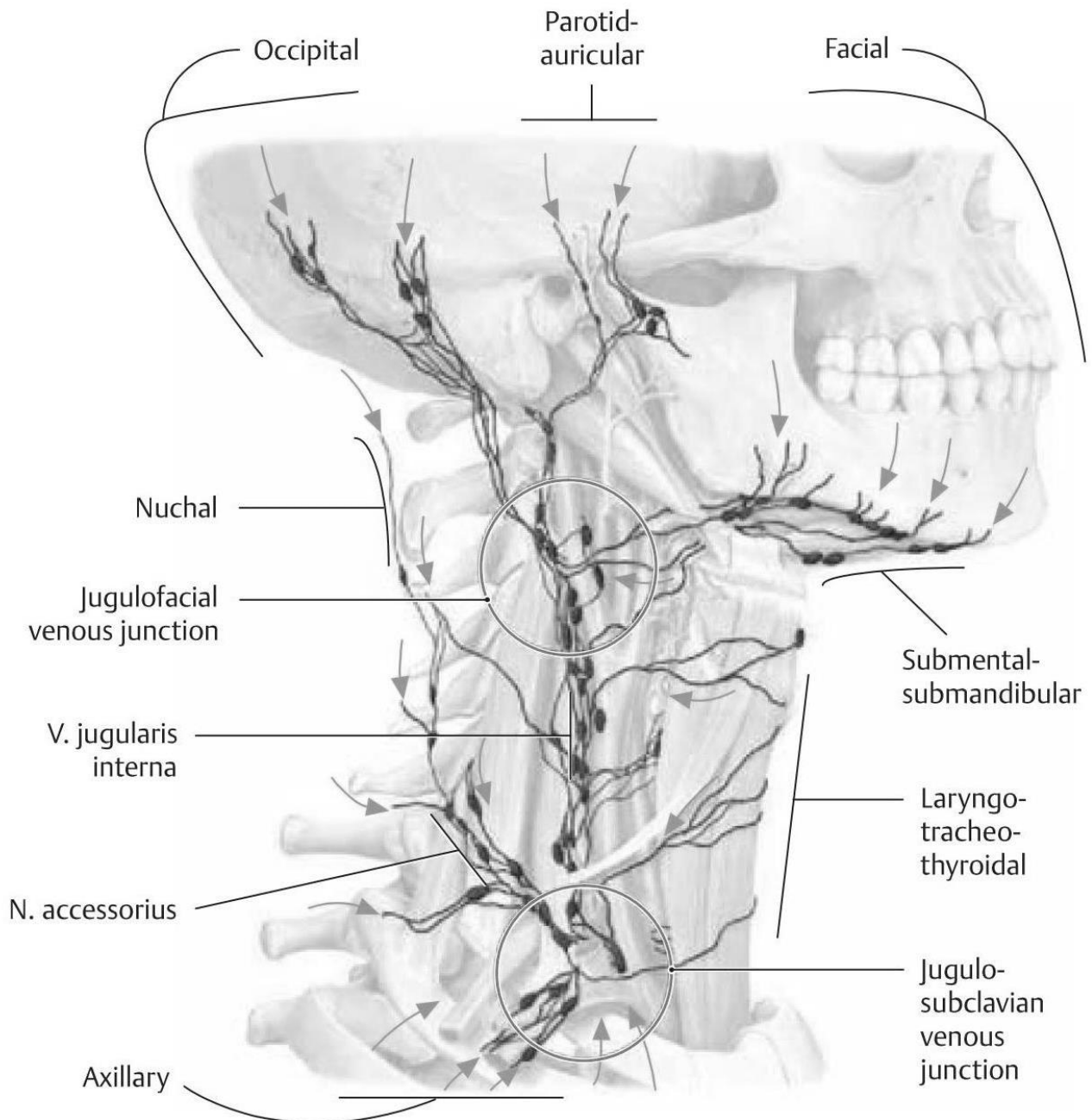


Figure 103-Lymphatic Vessels and Lymph Nodes of Head and Neck

LYMPHATIC VESSELS AND LYMPH NODES OF THE UPPER EXTREMITY

The upper extremity has:

- superficial lymph nodes;
- deep lymph nodes.

The directing to cubital and axillary lymph nodes.

SUPERFICIAL LYMPH NODES

Lateral group

Function: collects lymph from skin and subcutaneous layer of the I-III fingers, lateral margin of the hand, forearm, and shoulder. Vessels go upward and flow into axillary lymph nodes.

Medial group

Function: collects lymph from anterior (palmar) part of the wrist and forearm, goes upward along the anteriomedial part of the arm and flow into cubital and axillary lymph nodes.

Middle group vessels

Function: collects lymph from anterior (palmar) part of the wrist and forearm, passes upward along intermediate vein of forearm to cubital and axillary lymph nodes.

Deep lymphatic vessels

Function: collect lymph from muscles, tendons, fasciae, joint capsules and ligaments, periosteum, nerves.

Cubital lymph nodes

Function: take lymph from the hand and forearm.

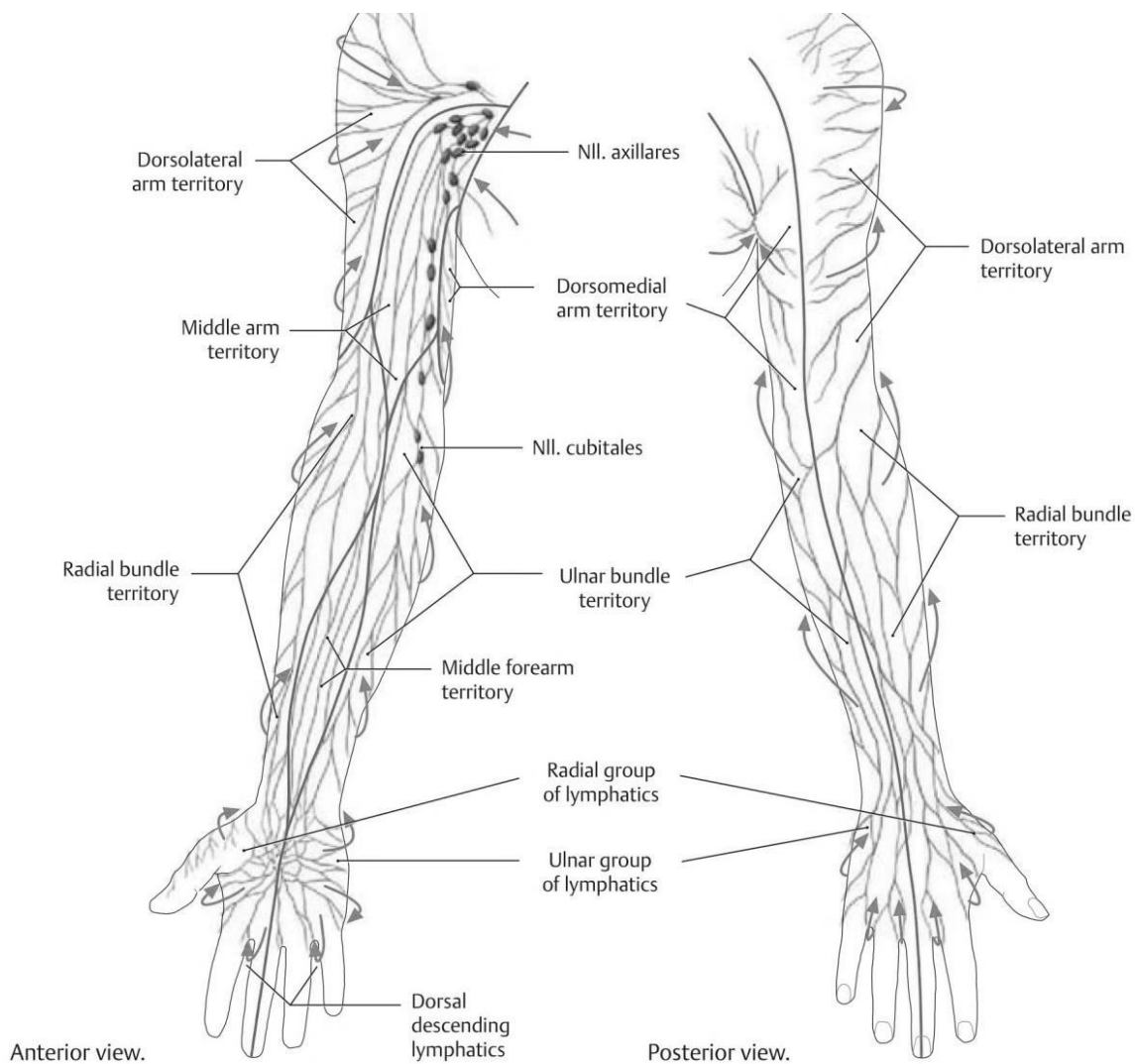


Figure 104-Lymphatic Vessels and Lymph Nodes of the Upper Extremity

Localization: in the cubital fossa on the fascia (superficial), near medial subcutaneous vein, and below (deep) fascia near deep vessel fascicle.

AXILLARY LYMPH NODES (Fig. 46)

Function: take lymph from the upper extremity and the mammary gland

Localization: as five independent groups

in the fat of axillary cavity. Some nodes belong to axillary cavity walls, the others are located near neurovascular fascicle. Lateral medial, or thoracic subscapular or posterior inferior (central) and apical lymph nodes are distinguished.

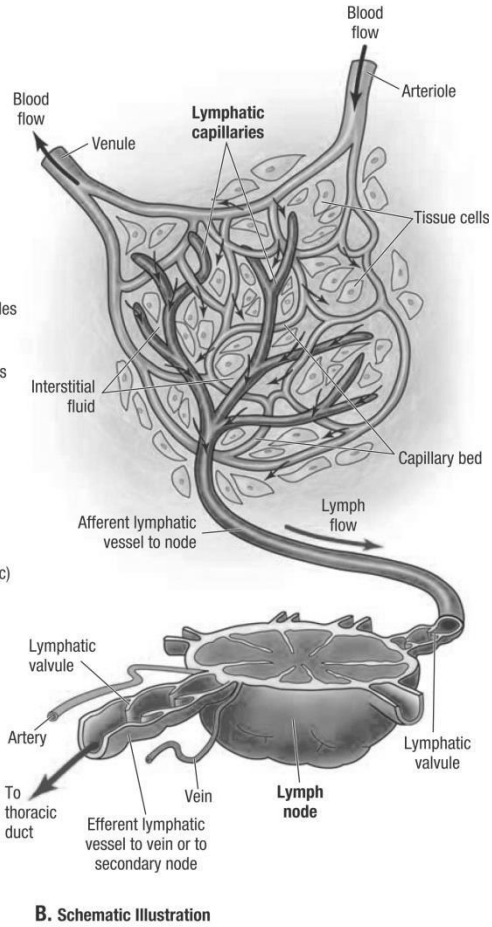
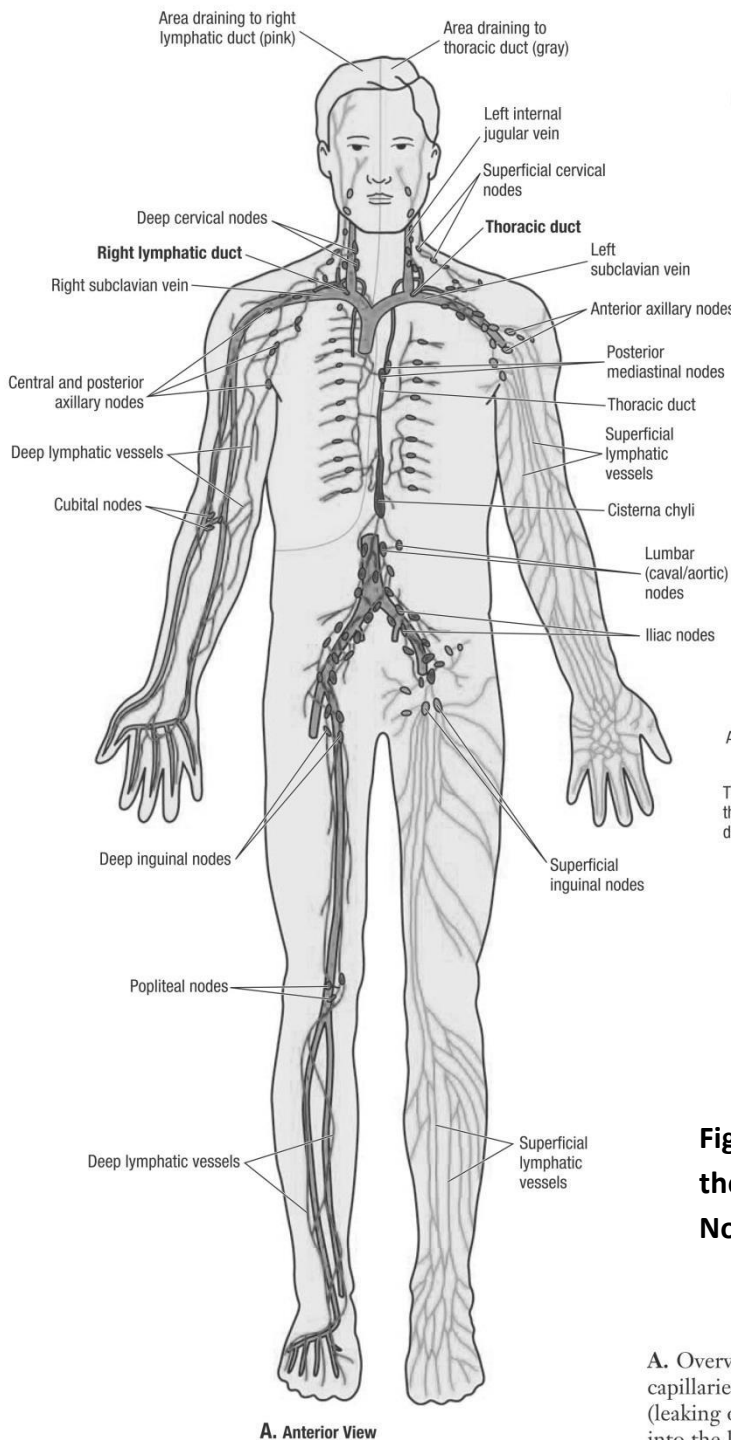


Figure 105-The General Structure of the Lymphatic System and Lymph Node

Lymphatic system

A. Overview of superficial and deep lymphatics. B. Lymphatic capillaries, vessels, and nodes. *Black arrows* indicate the flow (leaking of interstitial fluid out of blood vessels and absorption) into the lymphatic capillaries.

THE ORGANS OF THE IMMUNE SYSTEM

The immune system:

Function: to protect the body from genetically foreign substances.

The lymphatic system consists of:

- *lymph*, the fluid which the system collects from the interstitial spaces of the tissues and returns to the bloodstream;
- *lymphatic vessels*, that transport the lymph;
- *lymphatic tissue*, composed of aggregates of lymphocytes and macrophages that are located in many organs of the body;
- *lymphatic organs*, in which these cells are especially concentrated and which are set off from adjacent organs by connective tissue capsules.

The lymphatic organs

- bone marrow → B- lymphocytes (bursa-dependent)
- Thymus → T- lymphocytes (thymus-dependent);
- spleen;
- tonsils;
- lymph nodes;
- lymphoid nodules;
- vermiform appendix.

Organs of the immune system are located in the human body not chaotically but in certain places.

The central organs lie in the well - protected places

- *bone marrow in the bone cavities*,
- *thymus - in the thoracic cavity behind the manubrium of sternum*.

Peripheral organs are in located the places of possible penetration of foreign substances into a body or on the ways of their research (moving in the body).

Boundary zones, «sentry posts», «filters» containing lymphoid tissue are formed at these places.

Tonsils of the pharyngeal lymphoid ring lie in the walls of the initial department of the digestive tube and the respiratory ways, in fact they surround it.

The aggregated lymphoid nodules (*Peyer's patches*) lie in the walls of the small intestine, mainly in the ileum, near the border of two different compartments of the digestive tube.

The single lymphoid nodules lie in the mucous membrane of digestive organs, respiratory and urinary ways.

Numerous lymph nodes lie on transit ways through which lymph goes from organs and tissues into the venous system to provide the immune control over the blood.

THE THYMUS

Function:

- antigen independent proliferation and differentiation of T-lymphocytes;
- immunogenesis;
- cellular immune reactions.

The thymus consists of two lobes asymmetric in size - the left and the right, one which are connected with each other in the average part or closely adjoined on the level of the middle part .

The thymus is located in the anterior part of the superior mediastinum in the upper intrapleural field between the right and the left mediastinal pleura.

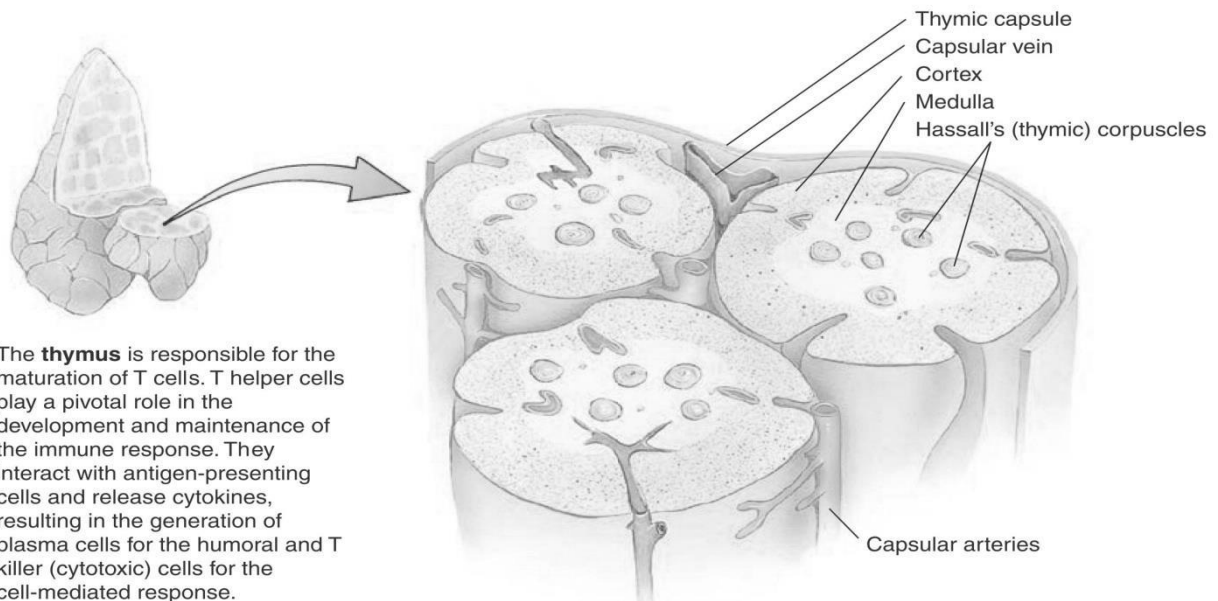
The **upper part** of the thymus often comes into the interior compartments of the pretracheal intrafascial space and lies behind the sternohyoid and sternothyroid muscles.

The anterior surface of the thymus is convex, and connected with the posterior surface of the manubrium and the body of sternum (up to the level of the 4th costal cartilages).

Behind the thymus is the upper part of the pericardium covering from the initial portion of the aorta and the pulmonary trunk, also the aortic arch with large vessels departing it, left brachiocephalic vein and superior vena cava.

STRUCTURE OF THE THYMUS:

1. Stroma:
 - a) rough, capsula thymi and intralobular trabeculae;
 - b) tender (reticular tissue).
2. Parenchyma (lobuli thymi):
 - a) maturing T-cells.



The **thymus** is responsible for the maturation of T cells. T helper cells play a pivotal role in the development and maintenance of the immune response. They interact with antigen-presenting cells and release cytokines, resulting in the generation of plasma cells for the humoral and T killer (cytotoxic) cells for the cell-mediated response.

Figure 106-Lobuli Thyme

Lobuli thymi

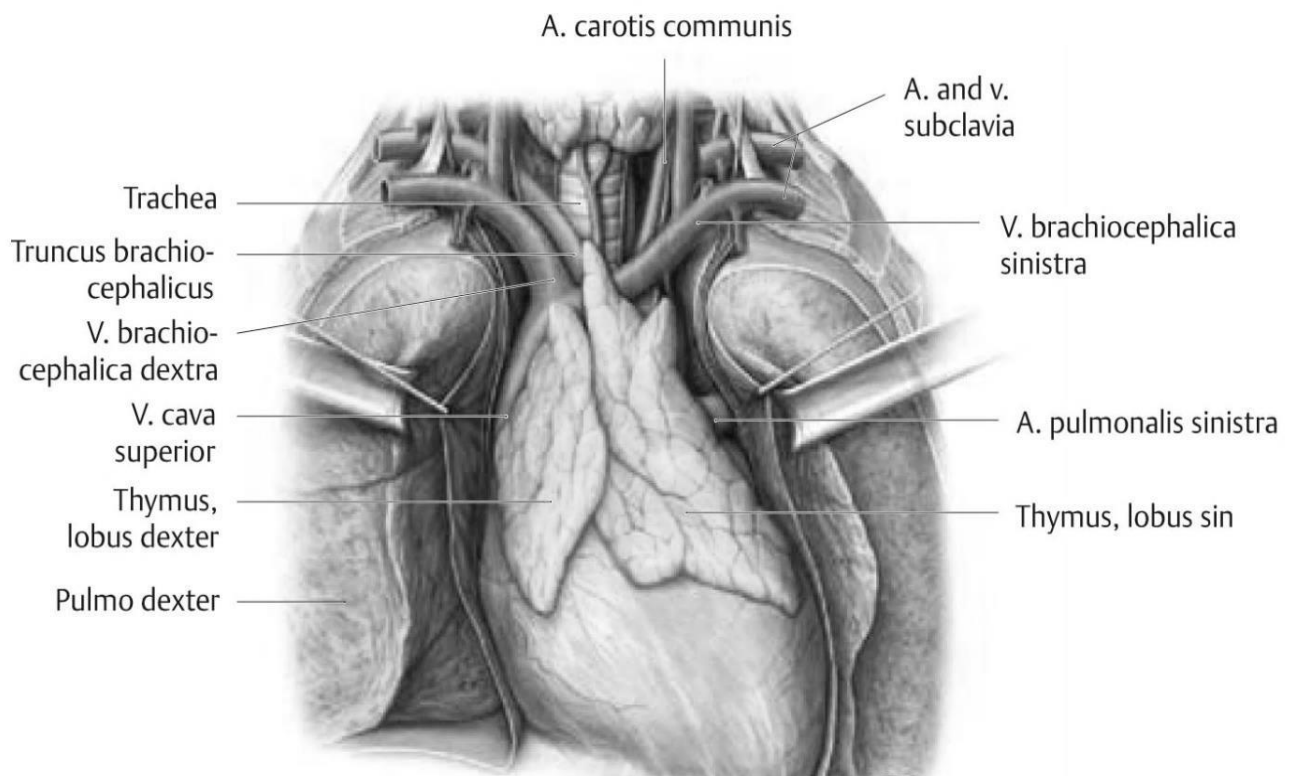
- Cortical substance (cortex thymi) lymphocytes lie more densely than in the medullar substance.
- Medullar substance (medulla thymi) contains Hassall's bodies.

In adult thymus gradually undergoes involutive changes being replaced by adipose tissue, but remains isles of parenchyma. Age involution

The weight of the thymus in elderly and old people is 13– 15 g. After birth (until 10 years) the cortex makes up the majority of the organ's weight. The parenchyma of the thymus

occupies up to 90% of the organ's volume. By the age of 10 the volume of the cortex and the medulla are approximately equal. Then the zone of the cortex gets thinner, the amount of thymocytes decreases. The adipose and the loose fibrous connective tissues progresses and at the age of 50 and more they ccompose up to 90 % of the thymus volume. In spite of that, the parenchyma of the organ does not completely disappear due to age involution, but remains in the form of isles (insulas) surrounded by adipose tissue located behind the sternum.

Figure 107-Localization of the Thymus



THE TONSILS

The tonsils:

- lingual tonsils;
- pharyngeal tonsils;
- palatine tonsils;
- tubal tonsils.

The tonsils are located so that they form some kind of a ring that surrounds the entrance to the nasal and oral parts of the pharynx (pharyngeal lymphoid ring of Pirogov - Valdeier).

The tonsils are built of diffuse lymphoid tissue containing quite a lot of lymphocytes where lymphoid nodules can be found.

THE LINGUAL TONSIL

- single;
- lies under the multi - layered epithelium of the mucous membrane of the tongue root.

Usually the lingual tonsil forms two conglomerations of lymphoid tissue.

- on the surface of the tongue they are divided by the midline groove
- in the depth - by the lingual septum.

The lingual tonsil consists of the lymphoid nodules (*the number of which (60–90) is maximum in childhood, youth and adolescence*).

The lymphoid nodules lie:

- underneath the epithelium in the area of the tongue root;
- near the crypts;
- between the nodes where is a paranodular diffuse lymphoid tissue.

THE PHARYNGEAL TONSIL

The pharyngeal tonsil is located:

- in the area of the fornix;
- on the posterior wall of the pharynx;
- between the left and right pharyngeal pockets (Rosen– Muller fossal).
- Here are 4–6 *obliquely located thick folds* of the mucosa, inside of which there is the lymphoid tissue of the pharyngeal tonsil.
- On the surface of the folds children have numerous *small tubercles*.

- There are sulci between the folds.
- The majority of the lymphoid nodules have *germinal centers*;
- The connective stroma is attached to the pharyngo - basilar fascia of the pharynx.

THE PALATINE TONSIL

The palatine tonsil is a paired organ located:

- in the tonsillar fossa;
- between the palatoglossal arch;
- in front;
- behind the palatopharyngeal arch.
- Above the tonsil there is a triangular supratonsillar fossa which sometimes forms quite a deep sac - like recession.
- The palatine tonsil has an irregular, egg– like shape.
- The medial free surface is covered with multilayered squamous epithelium.
 - There are up to 20 tonsillar pits, into which the tonsillar crypts open (Fig. 34).
- The lateral surface is attached to the connective lamina which is sometimes called a capsule of the tonsil.
- Inside the palatine tonsil are the numerous round dense accumulations of the lymphoid tissue. Most of them have germinal centers.

THE TUBAL TONSIL

The tubal tonsil is a paired organ located

- in the area of the pharyngeal opening of the auditory tube. It consists of diffuse lymphoid tissue and lymphoid nodules. They are not numerous.

THE APPENDIX

The appendix contains:

- numerous lymphoid nodules;
- internodular lymphoid tissue between them in its mucous;
- submucous coat.

THE LYMPHOID PATCHES OF THE SMALL INTESTINE

The aggregated lymphoid nodules - *Peyer's patches* are nodular conglomerations of lymphoid tissue, located in the walls of the small intestine, mostly in its final part – the ileum.

- They lie in the mucous membrane and submucous coat.
- They are mostly oval or round in shape
- They are built of lymphoid nodules lying one by one.
- Their number varies from 5-10 to 100-150 and more
- Their sizes vary between 0,5 and 2 mm.
- The central part of the nodules is usually occupied by a large germinal center.

THE SOLITARY LYMPHOID NODULES

The solitary lymphoid nodules are found in the mucous and submucous layers of:

- pharynx;
- stomach;
- small and large intestine;

- larynx;
- trachea;
- main, lobar and segmental bronchi;
- walls of urethra;
- bladder;
- urethra.

In the walls of the small intestine of **children** the number of the lymphoid nodules varies between 1200 and 11000 (on average):

- in the large intestine - between 2000 and 9000;
- in the trachea - between 100 and 180;
- in the bladder - between 80 and 530.

In childhood and in youth :

- in the mucous membrane of the duodenum for 1 square cm² -9,
- in the ileum – 18;
- in the cecum – 22;
- in the colon – 35;
- in the rectum - 21.

The diffuse lymphoid tissue can also be found in the mucosa of all the organs of the digestive, respiratory and urogenital tracts.

(a) Locations of the tonsils

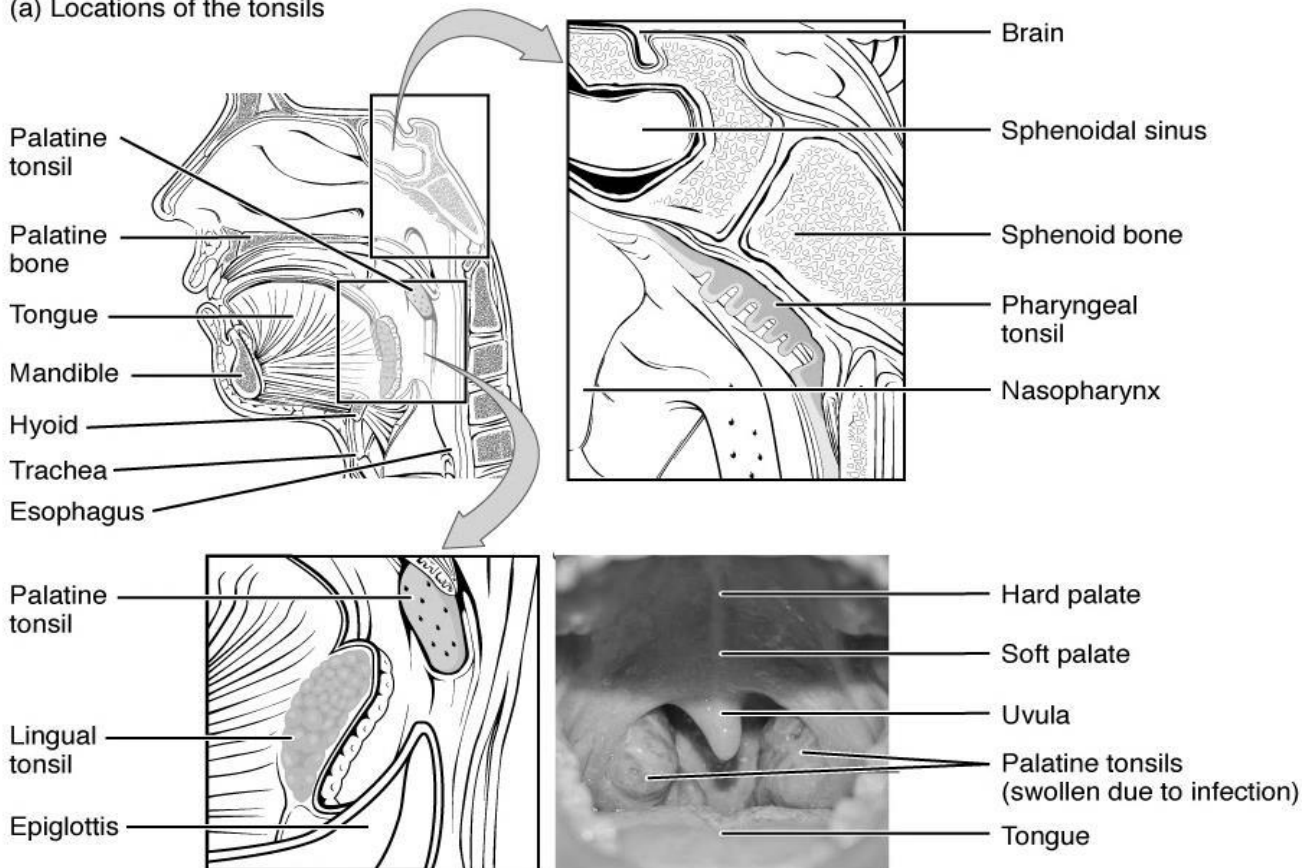


Figure 108-The Tonsils

THE LYMPH NODES

The lymph nodes are the most numerous organs of the immune system.

- **Function:**
 - * barrier - filtration (for lymph and products of metabolism);
 - * immune.
- They lie on the ways of the lymph flow from the organs and tissues to the lymphatic ducts and trunks which are open into the blood stream in the lower parts of the neck.
- They are grayish - rose.
- Their forms widely vary.

Structure of the lymph node:

1. Stroma

Outside:

- a) connective capsule (*capsule*);
- b) capsular trabeculae (*trabeculae*).

Inside:

- a) reticular stroma (*in between its trabeculae*)

2. Parenchyma

Cortex:

- is closer to the capsule;
- occupies the peripheral parts of the node;
- is darker (tightly lying cells);

Paracortical (T- dependent) zone;

- T-lymphocytes;
- postcapillar venules.

Medulla:

- is closer to the hilum of the lymph node;
- is formed of medullary cords;
- is forms the B – dependent zone;
- + perforated by **lymphatic sinuses** (*lymph coming to the node flows from the marginal (subcapsular) sinus to the hilar sinus*);
- + **medullary sinuses**.

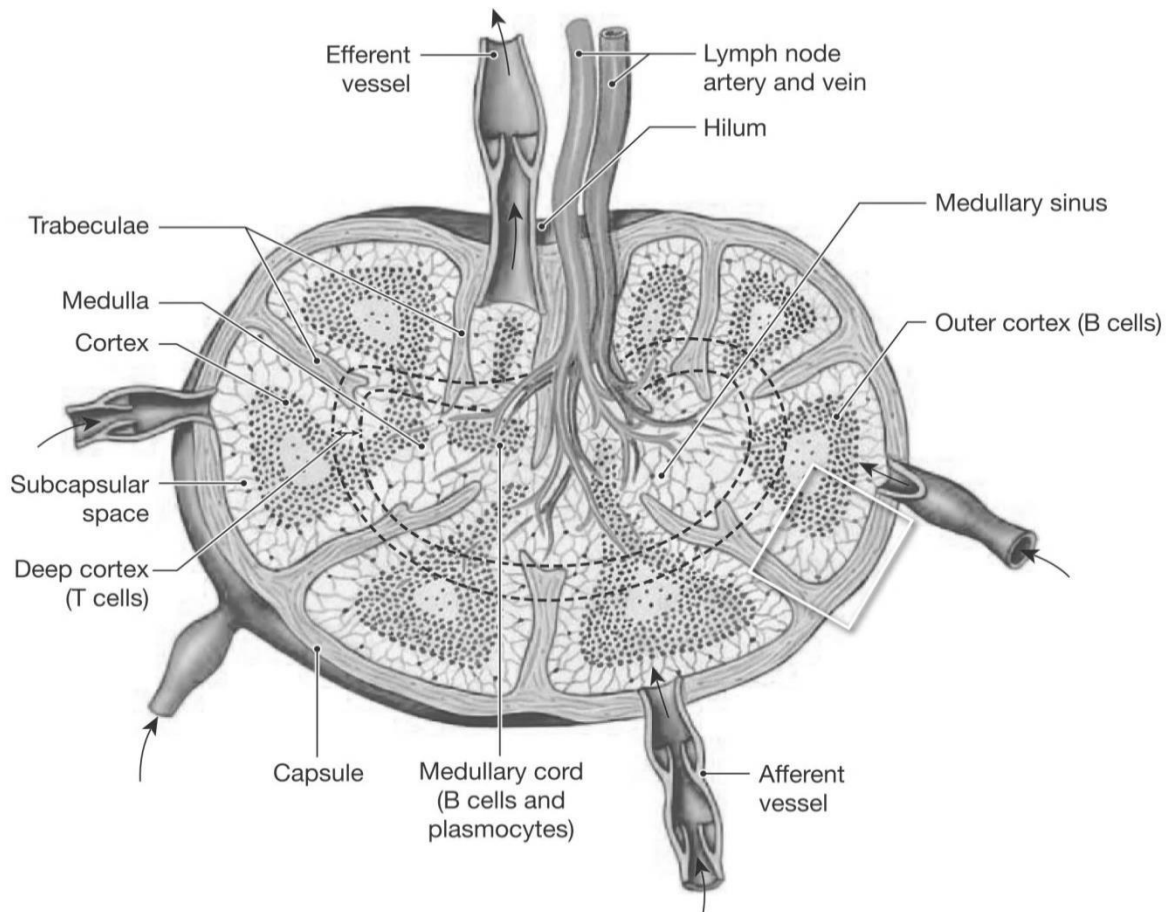


Figure 109-The Lymph Nodes

THE SPLEEN

Function: the immune control over blood

Localization: abdominal cavity, in the left sub - costal region, on the level of the IX - XI ribs.

Mass: 192 g in men and 153 g in women (20 – 40 years).

Length: 10– 14 cm,

Weight: 6– 10 cm

Thickness: 3– 4 cm.

Shape: flattened and lengthened hemisphere.

Colour: dark–red.

Surfaces: *and up*, diaphragmatic (*turned laterally towards the diaphragm*),

- visceral (anterio - medially);
- + lumpy gastric impression – touches the fornix of the stomach;
- + renal impression – touches the top of the left kidney;
- + colic impression – touches the left flexure of the colon;
- + pancreatic impression – touches the pancreas.

Poles:

- **anterior extremity;**
- **posterior extremity** (*extremitas posterior*) is rounded, turned backwards and up;
- **inferior extremity** (*extremitas inferior*)

is sharper, protrudes from the front and is a little higher than the transverse colon.

The spleen is covered with peritoneum, which is attached to its fibrous capsule. They form its ligaments - gastrosplenic, gastro - lienale and phrenicosplenic. The changes in position of the diaphragm, fullness or emptiness of the stomach affects its position.

Structure of the spleen:

1. Stroma

- a) fibrous capsule (*capsule*);
- b) capsular trabeculae (*trabeculae splenicae*).

2. Parenchyma (*between the trabecules*)

- a) red pulp-pulp cords
consists of loops of reticular tissue filled with erythrocytes, leukocytes, lymphocytes and macrophages;
- b) white pulp
 - *periarterial lymphoid muffs (ellipsoids) consisting of lymphocytes and other cells of the lymphoid tissue;*
 - *lymphoid nodules;*
 - *macrophage.*

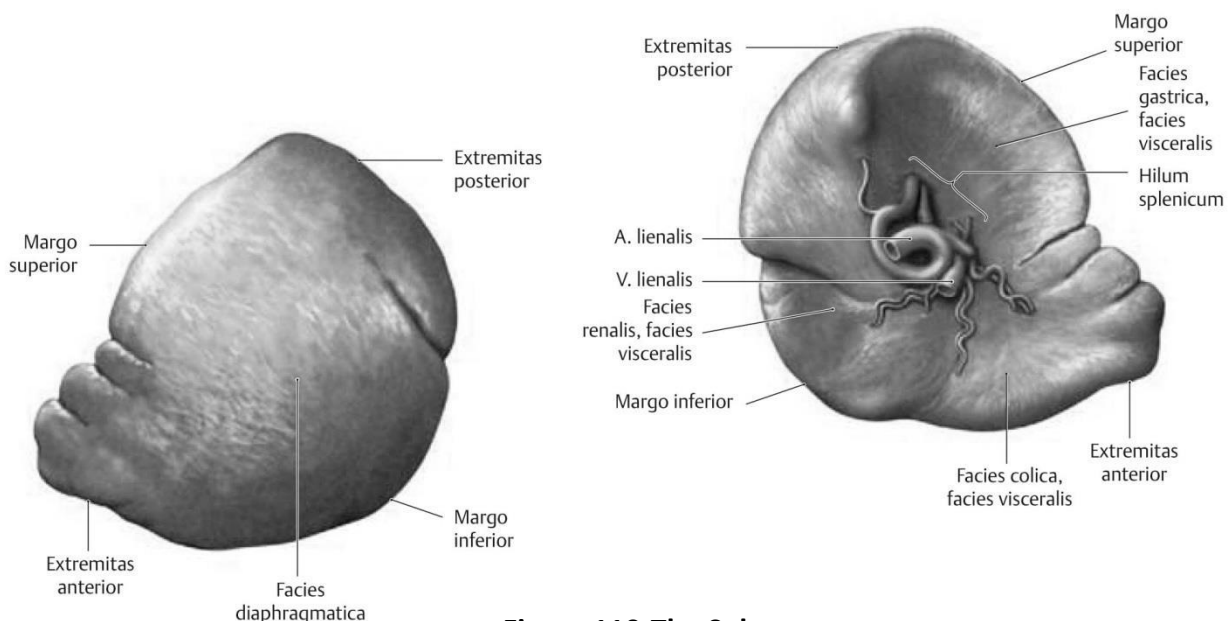


Figure 110-The Spleen

TESTS

LIST OF QUESTIONS OF KROK – 1

1. The parents of new born child addressed to a pediatricist with complaints of urine excretions from the navel. What congenital abnormality did the child get?

- + Non closed urachus.
- Meckel's diverticulum.
- Urethral splitting.
- Umbilical cyst.
- Inguinal cyst.

2. The damage of kidney parenchyma was caused by devascularization in the system of segmental artery. How many segmental arteries are in the right kidney in the norm?

- + 5.
- 4.
- 3.
- 7.
- 6.

3. The damage of kidney parenchyma was caused by devascularization in the system of arteries passing through the renal column. Name these arteries.

- + Interlobar.
- Segmental.
- Interlobular.
- Arcuate.
- Renal.

4. A patient died from acute edema of kidney parenchyma. What capsule of the kidney will be hardly separated from renal parenchyma during pathoanatomical autopsy?

- + Fibrous capsule.
- Renal fascia.
- Adipose capsule.
- Retroperitoneal fascia.
- Preperitoneal fascia.

5. During the operation a stone with 3 horn shaped processes was removed from the renal pelvis. What anatomical formations do these processes correspond?

- + Greater calyces.
- Lesser calyces.
- Nephrons.
- Renal pelvis.
- Lobules.

6. The radiograph of left kidney shows a renal pelvis into which lesser calyces drain, greater calices are absent. Specify the type of excretory ways of the kidney.

- + Embryonal.
- Phylogenetic.
- Foetal.
- Mature.
- Ontogenetic.

7. A doctor diagnosed falling of right kidney at the patient with an acute weight loss. Which of the fixation apparatus of kidneys becomes weaker?

- + Capsula adiposa.
- Arteria et vena renalis.
- Capsula fibrosa.
- Perinephrium.
- Fascia endoabdominalis.

8. A pathologist performed the autopsy revealed congenital absence of one kidney. What did the doctor diagnose?

- + Agenesia renis.
- Ren duplex.
- Distopia renis.
- Ren arcuata.
- Ren anularis.

9. During a surgical operation it is necessary to press a renal artery. What is the sequence of the elements of renal stalk in its hilus from posterior to anterior one?

- + Ureter, artery, vein.
- Artery, vein, ureter.
- Artery, ureter, vein.
- Vein, ureter, artery.
- Vein, artery, ureter.

10. The falling of left kidney (nephroptosis) is observed at the patient.

What is the normal position of the left kidney according to the 12th rib?

- + 12 th rib crosses a kidney in the middle.
- 12 th rib is projected on the superior pole.
- 12 th rib crosses a kidney in the superior third.
- 12 th rib crosses a kidney in the inferior third.
- 12 th rib is projected on the inferior pole.

11. A patient has the right abnormal kidney descent (nephroptosis). What is the normal position of the right kidney according to the 12th rib?

- + The 12th rib crosses a kidney in the superior third.
- The 12th rib crosses a kidney in the inferior third.
- The 12th rib crosses a kidney in the middle.
- The 12th rib is projected on the superior pole.
- The 12th rib is projected on the inferior pole.

12. A patient has left floating kidney (ren mobile). At what level is the left kidney related to a vertebral column in the norm?

- + From the middle of the 11th thoracic vertebra to the superior edge of the 3rd lumbar one.
- From inferior edge of the 12th thoracic vertebra to the superior edge of the 2 nd lumbar one.
- From inferior edge of the 11th thoracic vertebra to the middle of the 4th lumbar one.
- From the middle of the 11th thoracic vertebra to the superior edge of the 4th lumbar one.
- From inferior edge of the 12th thoracic vertebra to the middle of the 3rd lumbar one.

13. A patient has right floating kidney (ren mobile). At what level is the right kidney related to a vertebral column in the norm?

- + From inferior edge of the 11 th thoracic vertebra to the middle of the 3 nd lumbar vertebra.
- From inferior edge of the 12 th thoracic to the middle of the 4 th lumbar one.
- From inferior edge of 11 thoracic to the superior edge of 1 lumbar one.
- From inferior edge of the 12 th thoracic vertebra to the superior edge of the 2 nd lumbar one.
- From the middle of the 11 th thoracic vertebra to the superior edge of the 3 rd lumbar one.

14. During removing the concrement (stone) from the right ureter a surgeon cut the wall of ureter. What anatomical formation will the urine get in?

- + Retroperitoneal space.
- Right mesenteric sinus.
- Rectovesical excavation.
- Prevesical space.
- Right paracolic gutter.

15. During operation of the left ureter it was revealed that the tumor extended to the mesentery of small intestine. What part of ureter is affected with the tumor?

- + Abdominal.
- Intraorganic.
- Pelvic.
- Intrarenal.
- Diaphragmatic.

16. The stone at the place of transition of the left renal pelvis into ureter was revealed. What structure is located anteriorly to the initial part of the left ureter?

- + Duodenojejunal flexure .
- Sigmoid colon.
- Stomach.
- Ileum.
- Spleen.

17. During removing right ovary a surgeon instead of ovarian artery bandaged organ adjacent. Which one?

- + Ureter.
- Thoracic duct.
- Aorta.
- Common iliac artery.
- Internal iliac artery.

18. The patient has obstruction of right ureter by stone between its abdominal and pelvic parts. What is anatomical border between these two parts?

- + Linea terminalis.
- Linea semilunaris.
- Linea arcuata.
- Linea transversa.
- Linea inguinalis.

19. Urolithiasis was complicated with the exit of the stone from the kidney. At what level of ureter can it stop?

- + On the border between abdominal and pelvic parts.
- 2 cm superiorly to the inflow into the urinary bladder.
- In the renal pelvis.
- In middle abdominal part.
- 5 cm superiorly to pelvic part.

20. The patient has the stone at the place of transition of right renal pelvis into the ureter. Behind what structure is the initial part of the right ureter located?

- + Pars descendens duodeni.
- Colon ascendens.
- Flexura coli dextra.
- Pars superior duodeni.
- Pars horizontalis duodeni

21. During the cystoscopy a doctor revealed changes of mucous membrane of urinary bladder at the place of triangle. In what part of urinary bladder is this triangle located?

- + Fundus.
- Body.
- Isthmus.
- Apex.
- Column.

22. During the operation it was revealed that the tumor of prostate grew into urinary bladder. What compartment of urinary bladder is damaged?

- + Neck.
- Apex.
- Fundus.
- Body.
- Triangle.

23. A man has tumor of posterior wall of urinary bladder. What organs can be engaged into the process?

- + Rectum, seminal vesicles, ampule of ductus deferens.
- Rectum, prostate gland.
- Prostate gland.
- Male urethra.
- Cowper's (bulbourethral) glands.

24. The examination of the patient revealed the obstruction of urethra which was caused by pathology of organ surrounding it. What is this organ?

- + Prostate gland.
- Spermatic cord.
- Testicles.
- Seminal vesicles.
- Epididymis.

25. During the operation it was revealed that tumor from the prostate grew into to the middle compartment of urethra. What is this compartment?

- + Membranous.
- Lacunar.
- Prostatic.
- Spongy.
- Cavernous.

26. During the examination of a newborn boy it was revealed that the external urethral orifice is in the lower surface of penis. What is developmental anomaly is it?

- + Hypospadias.
- Hermaphroditism.

- Epispadias.
 - Monorchism.
 - Cryptorchism.
27. During the examination of a man it was revealed that the external urethral orifice is located above the anterior surface of penis. What developmental anomaly is it?
- + Epispadias.
 - Paraphimosis.
 - Phimosis.
 - Hermaphroditism.
 - Hypospadias.
28. A doctor made the bacterial inoculation from the male urethra and took mucus from the navicular fossa. In what part of urethra is this fossa located?
- + Spongy.
 - Cavernous.
 - Prostatic.
 - Membranous.
 - Bulbar.
29. During the catheterization of male urethra the mucous membrane was injured. What part of urethra was injured?
- + Pars membranacea.
 - Pars cavernosa.
 - Pars spongiosa.
 - Pars prostatica.
 - Pars bulbaris.
30. The catheterization of urinary bladder was indicated to the patient with adenoma of prostate. What is the sequence of passing catheter through the parts of urethra?
- + Spongy, membranous, prostatic.
 - Membranous, prostatic, spongy.
 - Spongy, prostatic, membranous.
 - Membranous, spongy, prostatic.
 - Prostatic, membranous, spongy.
31. At the 2 years old boy a scrotal hernia was diagnosed. What testicular membrane abnormality caused this pathology?
- + Tunica vaginalis testis.
 - Tunica dartos.
 - Fascia cremasterica.
 - Fascia spermatica externa.
 - Fascia spermatica interna.
32. At the man the spermatogenic epithelium of testes is damaged; as a result the sperm cells are absent in a semen. What compartment of semen excretory ways is damaged?
- + Convoluted seminiferous tubules.
 - Straight seminiferous tubules.
 - Rete testis.
 - Ductus epididymis.
 - Ductus deferens.
33. At a man the inflammation of testes was complicated by hydrocele. Which of testes coats will a surgeon cut the last during an operation?
- + Lamina parietalis tunicae vaginalis testis.
 - Fascia spermatica interna.
 - Tunica dartos.
 - Musculus cremaster.
 - Fascia spermatica externa.
34. At examination of a newborn a surgeon revealed the absence of the left testis in a scrotum (monorchism). At what age are the testes in the scrotum in a norm?
- + To the moment of birth.
 - Till one year.
 - Till three years.
 - Till five years.
 - Till seven years.
35. A doctor revealed hydrocele of the left testis at the patient. Where does a serous liquid accumulate at this disease?
- + Between the parietal and visceral lamina of vaginal tunic.
 - Between external spermatic fascia and fascia of cremaster muscle.
 - Between skin and tunica dartos.

- Between tunica dartos and external spermatic fascia.
 - Between internal spermatic fascia and vaginal tunic.
36. At a newborn a testis was not found in the right half of the scrotum. What anomaly of development is it?
- + Monorchism.
 - Epispadias.
 - Hermaphroditism.
 - Hydroceles.
 - Hypospadias.
37. After trauma of testis the convoluted seminiferous tubules of parenchyma of testis are damaged. What function of testis is disturbed?
- + Spermatogenesis.
 - Erection of penis.
 - Excretion of sperm.
 - Production of liquid part of seminal fluid.
 - All the above - mentioned.
38. At the man after a wound of perineal region involuntary urination is present. Which of muscles is damaged?
- + M. sphincter urethrae.
 - M. ischiocavernosus.
 - M. bulbospongiosus.
 - M. transversus perinei superficialis.
 - M. transversus perinei profundus.
39. At the patient the phenomena of impotence was developed after trauma of perineal region. What muscle was damaged?
- + M. ischiocavernosus.
 - M. levator ani.
 - M. sphincter urethrae internus.
 - M. sphincter urethrae externus.
 - M. bulbospongiosus.
40. The ultrasonic examination of organs of lesser pelvis is carried out at a full urinary bladder. What perineal muscle retains the urine?
- + M. sphincter urethrae.
 - M. bulbospongiosus.
 - M. ischiocavernosus.
 - M. transversus perinei superficialis.
 - M. transversus perinei profundus.
41. An obstetrician usually makes the section of vaginal opening at base of labia majora during difficult exit of fetal head. What perineal muscle is here dissected?
- + M. bulbospongiosus.
 - M. transversus perinei superficialis.
 - M. ischiocavernosus.
 - M. sphincter ani externus.
 - M. transversus perinei profundus.
42. A patient has inflammation of bulbourethral glands. Between what perineal fasciae are these organs located?
- + Fasciae diaphragmatis urogenitalis superior et inferior.
 - Fasciae diaphragmatis pelvis inferior et superior.
 - Fasciae perinei superficialis et diaphragmatis urogenitalis inferior.
 - Fasciae diaphragmatis urogenitalis superior et diaphragmatis pelvis inferior.
 - Fasciae perinei superficialis et diaphragmatis pelvis inferior.
43. During removal of ovary a gynaecologist bandaged suspensory ovary ligament. What vessels were bandaged by a doctor in this ligament?
- + Ovarian artery and vein.
 - Uterine artery and vein.
 - Internal iliac vein.
 - Tubular artery and vein.
 - Internal iliac artery.
44. During the operation the ovary vessels were bandaged in the area of hilus of the ovary. Where was this manipulation carried out?
- + Margo mesovaricus.
 - Facies lateralis.
 - Margo liber.
 - Facies medialis.

- Extremitas uterina.
45. At a woman the tumor of ovary was revealed. What ligament must a surgeon cut to separate the ovary from uterus?
- + Lig. ovarii proprium.
 - Broad ligament of uterus.
 - Lig. suspensorium ovarium.
 - Lig. umbilicalis lateralis.
 - Round ligament of uterus.
46. At a woman extra uterine pregnancy was found out. In what organ did the fertilization of the secondary oocyte and its development happen?
- + In a salpinx.
 - Vagina.
 - In an ovary.
 - In the body of uterus.
 - In the neck of uterus.
47. A woman was delivered to the obstetric department with a suspicion on extra uterine pregnancy. Where is blood accumulated at the rupture of salpinx?
- + In the rectouterine pouch.
 - In the vesicouterine pouch.
 - In the rectovesical pouch.
 - In the right lateral canal.
 - In the left lateral canal.
48. X– ray research of uterus with introduction of contrast medium is provided to a woman. What shape does shadow of uterine cavity have on a radiograph in a norm?
- + Triangle with concave sides.
 - Form of Latin letter "V".
 - Oval.
 - Triangle with protuberant sides.
 - Piriform (pear shaped).
49. On a radiograph with the contrast medium a uterus with two horns is seen. It is the reason of woman sterility. This congenital defect is a result of:
- + Disorder of paramesonephral ducts joint.
 - The "cellular death" in the area of fundus uteri.
 - Disorder of mesonephral ducts joint.
 - Formation of septum in the area of fundus uteri.
 - Disorder of recanalization process.
50. During the operation of removing uterus doctor bandaged a uterine artery. It is necessary to remember that ureter passes near uterine artery, where exactly?
- + Behind.
 - Above.
 - In front.
 - Below.
 - Laterally.
51. At vaginal examination of woman a gynecologist examines the external os of uterus. What anatomical structures does it form?
- + Anterior and posterior labia of neck of uterus.
 - Body of uterus and anterior wall of vagina.
 - Cervix uteri and anterior wall of vagina.
 - Anterior and posterior walls of vagina.
 - Cervix uteri and posterior wall of vagina.
52. During the examination a woman was diagnosed with endometritis. What part of uterine wall is involved into inflammatory process?
- + Mucous.
 - Muscular.
 - Adventitia.
 - Serous.
 - Parametrium.
53. The inflammatory process of fat around the cervix of uterus caused an intensive pain symptom. What was the pathological process of genitals established by a doctor?
- + Parametritis.
 - Mesometritis.
 - Myometritis.
 - Endometritis.
 - Perimetritis.

54. After complete removal of uterus the urination was stopped and the urinary bladder did not contain urine. What part of the urinary system was damaged?

- + Ureter.
- Kidney.
- Pelvis renalis.
- Urethra.
- Vesica urinaria.

55. During the gynecological examination of woman endometritis was diagnosed. What layer of uterine wall is involved into the inflammatory process?

- + Mucous.
- Muscular.
- Adventitia.
- Serous.
- Parametrium.

56. During insertion of intrauterine device cavity of the uterus was infected. What type of inflammation will develop at a woman most probably?

- + Endometritis.
- Perirectitis.
- Idiometritis.
- Parametritis.
- Metroperitonitis.

57. At vaginal examination of a woman a gynecologist examined the anterior fornix of vagina. What anatomic structures do it form?

- + Cervix of uterus and anterior wall of vagina.
- Anterior and posterior walls of vagina.
- Cervix of uterus and posterior wall of vagina.
- Anterior and posterior labia of neck of uterus.
- Body of uterus and anterior wall of vagina.

58. At the examination of pudendum a gynecologist revealed the inflammation of Bartholin's glands. Where does the pathological process take place?

- + Greater vestibular glands.
- Lesser vestibular glands.
- Vestibular bulb.
- Urethral glands.
- Lacunae urethrales.

59. A woman was admitted to the gynecological department with suspicion on the internal bleeding. What structure is used for puncture for the urgent diagnostic of bleeding?

- + Posterior fornix of vagina.
- Uterine orifice.
- Anterior fornix of vagina.
- Cervix uteri.
- Anterior wall of vagina.

60. At a woman with extra uterine pregnancy the puncture of posterior fornix of vagina is performed. What anatomic formation of peritoneum must be reached with a needle?

- + Rectouterine pouch.
- Left mesenteric sinus.
- Right mesenteric sinus.
- Right lateral canal.
- Vesicouterine pouch.

61. At a newborn the size of prepuce opening is narrowed and the glans penis can not go out through such opening. How is this called?

- + Fimosis.
- Hermaphroditism.
- Epispadias.
- Hypospadias.
- Parafimosis.

62. The presence of male and female genital glands at the masculine type of structure of external genital organs is established at the patient. What type of anomaly is it?

- + True hermaphroditism.
- Additional ovary.
- Male false hermaphroditism.
- Female false hermaphroditism.

– Ectopia of testes.

63. The woman has the massive swelling of left labia minora and a purulent excretion in a vestibule of vagina. What female genital gland become inflamed?

- + Greater vestibular gland (Bartholin's).
- Bulbourethral glands (Cowper's).
- Prostate.
- Lesser vestibular glands.
- Cervical.

64. After trauma of testes with hemorrhage into parenchyma the convoluted seminiferous tubules are damaged in the patient. What function of testes is damaged?

- + Production of spermatozoa.
- All above mentioned.
- Erection of penis.
- Conduction of sperm.
- Production of liquid part of sperm.

65. At the 10 years old girl the signs of premature pubescence are revealed. What function could the endocrine gland decrease to cause this phenomenon?

- + Epiphysis.
- Thyroid gland.
- Parathyroid glands.
- Thymus gland.
- Medulla of adrenal glands.

66. At the 13-years-old boy the signs of cretinism are revealed (nanism, excretion of genital organs and mental deficiency). What caused development of this pathology?

- + Thyroid hypofunction.
- Thyroid hyperfunction.
- Hypofunction of parathyroid glands.
- Hyperfunction of parathyroid glands.
- Hypofunction of posterior lobe of hypophysis.

67. A man complains of the female sexual signs appeared in him. What gland tumor caused this pathological condition?

- + Glandula suprarenalis.
- Insulae pancreaticae.
- Glandula thyroidea.
- Glandula parathyroidea.
- Glandula pinealis.

68. At X-ray photograph of thorax of the 2 years old child the thymic shadow was revealed. Till what age is such phenomenon considered as a norm?

- + Till 3 years.
- Till 10 years.
- Till 5 years.
- Till 7 years.
- Till 17 years.

69. At a laboratory examination the increase of blood sugar level to 10 mmol/l in the blood is revealed. What disease of endocrine gland is in the patient?

- + Pancreas.
- Sexual.
- Thyroid.
- Suprarenal.
- Epiphysis.

70. The 12-years-old boy has growth 180 cm and weight 68 kg. During the last 3 months he became taller at 15 cm. What endocrine gland hypersecretion is it?

- + Hypophysis.
- Epiphysis.
- Thyroid.
- Sexual.
- Suprarenal.

71. After the resection of thyroid gland the cramps appeared in a patient. What structure was injured during the operation?

- + Glandula parathyroidea.
- Nervus laryngeus inferior.
- Arteria laryngea inferior.
- Nervus vagus.
- Truncus sympathicus.

72. At examination of a man the increase of hands, feet, mandible and hormonal

disorders were revealed. At what gland hyperfunction are such symptoms revealed?

- + Anterior lobe of pituitary gland.
- Suprarenal.
- Pineal body.
- Thyroid.
- Sexual.

73. At X-ray photograph of bones of cranial base the destruction of different parts of the Turkish saddle is revealed. What endocrine gland tumor did it cause?

- + Hypophysis.
- Epiphysis.
- Thymus gland.
- Thyroid gland.
- Suprarenal gland.

74. The Basedow's disease was revealed in the patient (the exophthalmia, skin dryness, frequent pulse, fingers shaking). What gland hyperfunction did it cause?

- + Thyroid.
- Inferior parathyroid.
- Suprarenal.
- Superior parathyroid.
- Hypophysis.

75. There is the insufficient hormone secretion of yellow body at the pregnant woman. What hormone is it?

- + Progesteron.
- Oestriol.
- Estradiol.
- Gonadotropin.
- Testosterone.

76. Myxedema was diagnosed in the patient (oedema of subcutaneous fat, apathy, fall of temperature). What gland function is disordered?

- + Thyroid.
- Thymus.
- Pancreas.
- Parathyroid.
- Suprarenal.

77. The shock requires a single administration of hormonal medicines which are secreted in the body of a man with cells of zona fasciculata of suprarenal cortex. What are these medicines?

- + Glucocorticoids.
- Mineralocorticoids.
- Prolactin.
- Testosterone.
- Parathormon.

78. The giantism was revealed in a young patient. What endocrine glands hypersecretion caused this pathological condition?

- + Hypophysis.
- Thyroid.
- Epiphysis.
- Thymus.
- Suprarenal.

79. A woman has weakness of labor (weakness of myometrium contraction). What hormone level is decreased?

- + Oxytocin.
- Corticosteroids.
- Parathormon.
- Thyroxin.
- Somatotropin.

80. The tumor is revealed at 1 year old child on the anterior wall of trachea above the jugular notch which descends to mediastinum. What organ presses trachea?

- + Thymus gland.
- Parathyroid glands.
- Thyroid gland.
- Parathyroid lymph nodes.
- Paratracheal lymph nodes.

81. It is necessary to perform tracheotomy to a patient with disorder of respiration. At what level of tracheal rings located the isthmus of thyroid gland?

- + II–III.
- IV–V.
- III–IV.

- I–II.
- V–VI.

82. During the examination of the patient's nasal cavity the curvature of nasal septum was revealed. What parts does a nasal septum have?

- + Membranous, cartilaginous, bony.
- Cutaneous, cartilaginous, membranous.
- Cutaneous, cartilaginous, bony.
- Mucous, cutaneous, membranous.
- Membranous, mucous, bony.

83. The 5-years old boy has disorder of nasal breathing due to increase of pharyngeal tonsil. What openings of nasal cavity are closed in this case?

- + Choanae.
- Nostrils.
- Nasolacrimal duct.
- Pterygopalatine fossa.
- Hiatus.

84. The woman who worked in a chemical laboratory has an atrophy of mucous membrane at the olfactory region of nasal cavity. Where is it?

- + In the area of superior nasal meatus and corresponding part of nasal septum.
- In the area of nasopharyngeal meatus.
- In the area of middle nasal meatus and corresponding part of nasal septum.
- In the area of inferior nasal meatus and corresponding part of nasal septum.
- In the area of common nasal meatus.

85. A patient has inflammation of nasolacrimal duct. In what part of nasal cavity can infection get?

- + Inferior nasal meatus.
- Superior nasal meatus.
- Middle nasal meatus.
- Nasal vestibule.
- Ethmoid-sphenoidal corner.

86. The 1.5 month-old child has nasal breathing disorders. What anatomical features of nasal cavity structure of early

age children prevent from the nasal breathing?

- + Nasal meatuses narrowing.
- Incomplete development of paranasal sinuses.
- Absence of inferior nasal meatus.
- Curvature of nasal meatuses.
- Incomplete development of choanae.

87. In a patient with acute respiratory viral infection left-sided rhinosinoritis is diagnosed. What anatomical formation did the infection spread from?

- + Left middle nasal meatus.
- Common nasal meatus.
- Left superior nasal meatus.
- Left inferior nasal meatus.
- Cribriform plate of ethmoid bone.

88. A woman got a trauma of thyroid and cricoid cartilages of larynx. Moreover the swallowing was disordered. What muscles are suffered as a result of trauma?

- + Inferior constrictor of pharynx.
- Palatopharyngeal muscle.
- Middle constrictor of pharynx.
- Superior constrictor of pharynx.
- Stylopharyngeal muscle.

89. During the examination of laryngeal cavity a doctor revealed the nodal formations of vocal folds. Between which formations are vocal folds located?

- + Arytenoid and thyroid cartilages.
- Arytenoid cartilages.
- Thyroid cartilage and epiglottis.
- Arytenoid cartilages and epiglottis.
- Vocal and muscular processes of arytenoid cartilages.

90. The tumor in boundaries of posterior part of rima vocalis was revealed. During the examination between what cartilages of larynx is this compartment located?

- + Cartilago arytenoidea.
- Cartilago thyroidea.
- Cartilago cricoidea.

- Cartilago corniculata.
 - Cartilago cuneiformis.
91. At the radiograph the presence of foreign body in the area of tracheal bifurcation was revealed. At what level is the foreign body located?
- + Th4 – Th5.
 - C7 – Th1.
 - Th1 – Th2.
 - C6 – C7.
 - Th6 – Th8.
92. A child has tumor on the anterior wall of the trachea in the region of jugular notch of sternum spreading to the anterior mediastinum. What organ can trachea compress?
- + Thymus gland.
 - Thyroid gland.
 - Parathyroid glands.
 - Parathyroid lymph nodes.
 - Paratracheal lymph nodes.
93. The patient was delivered to the hospital after swallowed ground-nut with symptoms of breathing disorders. Where can this foreign body be located most probably?
- + Right main bronchus.
 - Left main bronchus.
 - Trachea.
 - Vestibular folds.
 - Vocal folds.
94. A doctor inserted the bronchoscope into one of the lobar bronchus what divided it into two segmental bronchi. In which lobe of the lung did a doctor provide manipulation?
- + In the middle lobe of the right lung.
 - In the superior lobe of the right lung.
 - In the lower lobe of the right lung.
 - In the superior lobe of the left lung.
 - In the inferior lobe of the left lung.
95. On the radiograph the foreign body was revealed at the level of the 6-th thoracic vertebra on the middle line. Where is this foreign body located?
- + In the esophagus.
 - In the pharynx.
 - In the trachea.
 - In the left main bronchus.
 - In the right main bronchus.
96. The pneumonectomy includes cutting a root of the lung. In what order are structures in a root of the left lung from up to down located?
- + Pulmonary artery, main bronchus, pulmonary veins.
 - Pulmonary artery, pulmonary veins, main bronchus.
 - Main bronchus, pulmonary artery, pulmonary veins.
 - Main bronchus, pulmonary veins, pulmonary artery.
 - Pulmonary veins, main bronchus, pulmonary artery.
97. Lobectomy of superior lobe of the right lung was performed. What segments were removed?
- + Apical, posterior, anterior.
 - Lateral, middle, superior.
 - Middle, basal and lateral basal.
 - Posterior basal, superior and inferior lingular.
 - Posteroapical.
98. Lobectomy of superior lobe of the right lung was performed. How many segments were removed?
- + 3.
 - 4.
 - 5.
 - 2.
 - 0.
99. A patient has tumor of the middle lobe of the right lung. How many segments can be removed during the operation?
- + 2.
 - 3.

- 4.
- 5.
- 1.

100. The additional respiratory sound was auscultated at the left side of the back on the level of the VII–X ribs in the patient. In what segment of the lung is the pathological process located?

- + Posterior basal.
- Inferior uvular.
- Medial basal.
- Lateral basal.
- Anterior basal.

101. Lobectomy of the middle lobe of the right lung was performed to the 3 years-old child. What segments were removed?

- + Lateral and medial.
- Medial and anterior.
- Apical, posterior, anterior.
- Posterior and lateral basal.
- Posteroapical.

102. The patient has nidus of tuberculosis in the superior lobe of the left lung. What greatest quantity of segments can be removed from the superior lobe of the left lung?

- + 5.
- 6.
- 3.
- 2.
- 1.

103. During the operation on lungs a surgeon removed blood clot from the horizontal fissure. What lobes of the lung are separated with this fissure?

- + Superior and middle lobes of the right lung.
- Inferior and middle lobes of the right lung.
- Superior and inferior lobes of the right lung.
- Superior and inferior lobes of the left lung.
- Inferior lobes of the right and left lungs.

104. The lower margin of the right lung on the midclavicular line raised to the level of

the III rib was revealed at the patient. Where must it be in a normal condition?

- + VI rib.
- Vrib.
- VII rib.
- VIII rib.
- IX rib.

105. A doctor made a conclusion tht there was a destruction of the alveolar tree in the left lower segment. What anatomical structure doesn't belong to the alveolar tree?

- + Intrasegmental bronchi.
- Alveolar saccules.
- Alveolar ducts.
- Alveolae.
- Respiratory bronchioles.

106. The "vesicular breathing" is a normal sound which appears in the broncial tree. What anatomical structures do not concern elements of a bronchial tree?

- + Respiratory bronchioles.
- Terminal bronchioles.
- Lobular bronchi.
- Lobar bronchi.
- Segmental bronchi.

107. In the sick child sicr with RDS (respiratory distress syndrome) connected with disturbances of surfactant production was revealed. The surfactant covers:

- + Alveolar walls.
- Walls of larynx.
- Walls of trachea.
- Bronchi.
- Bronchioles.

108. A patient has exudation in the pleural cavity. To prevent injuring intercostal arteries the puncture of pleural cavity should be performed:

- + In the upper edge of the subjacent rib.
- In the place of transition of the bone part of the rib into cartilaginous bone.
- On the lower edge of overlying rib.

- In the middle point between the ribs.
- At the head of the rib.

109. The patient has tumor of the lower third of esophagus. What serous layer of thoracic cavity can be damaged during the operation in this area?

- + Right mediastinal pleura.
- Diaphragmatic pleura.
- Left mediastinal pleura.
- Right costal pleura.
- Left costal pleura.

110. A patient has the left-sided exudative pleuritis (pleurisy). In what anatomical formation of pleura will the inflammatory exudates be collected?

- + Costodiaphragmatic sinus.
- Costomediastinal sinus.
- Phrenicomediastinal sinus.
- All the above mentioned.
- Cupula of the pleura.

111. The patient had sinus tachycardia" (150 beats/min). It is known that this pathology occurs at increased stimulation of action of the sinoatrial node. Where is it located?

- + In the wall of the right atrium.
- In the interventricular septum.
- In the left atrium.
- In the left ventricle.
- In the right ventricle.

112. The patient has the heart rate 55 beats/min, ECG indicates the sinus rhythm. What part of the cardiac conduction system was affected in this case?

- + Sinoatrial node.
- Atrioventricular node.
- Right leg of the His bundle.
- Left leg of the His bundle.
- Sinoatrial bundle.

113. In the patient the disease of the mitral valve is developed as a result of rheumatism. Where will the pathological

sound (heart murmur) be heard during the auscultation?

- + On the apex of the heart.
- In the 2nd intercostal space to the left from breastbone.
- In the 2nd intercostal space to the right from the breastbone.
- In the area of the xiphoid process of the breastbone.
- In the 3rd intercostal space to the right from breastbone.

114. In the patient His bundle blockade was revealed. Where is it located?

- + In the interventricular septum.
- In the cusps of the mitral valve.
- In the interatrial septum.
- In the cusps of the tricuspid valve.
- On the apex of the heart.

115. In the patient insufficiency of mitral valve was revealed. Where is this valve located?

- + Between the left atrium and left ventricle.
- Between the right atrium and right ventricle.
- Between the left and right atriums.
- Between the left and right ventricle.
- In the place of output of the aorta.

116. At the examination of the child it was revealed that the heart oval opening of the heart is not obliterated. Where is this opening located?

- + Between the left and right atriums.
- Between the right atrium and right ventricle.
- Between the left atrium and left ventricle.
- Between the left and right ventricles.
- In the area of mitral valve.

117. The enlargement of shadow of heart contour in its lower compartment was revealed in X-ray photograph. What compartment of the heart is enlarged?

- + Left ventricle.
- Auricle of the left atrium.
- Right ventricle.

- Left atrium.
- Right atrium.

118. In the patient the heart attack of myocardium of the anterior wall if the left ventricle is diagnosed. What artery of the heart is injured?

- + Anterior interventricular branch of the left coronary artery.
- Right coronary artery.
- Posterior interventricular branch of the right coronary artery.
- Circumflex branch of the left coronary artery.
- Musculophrenic artery.

119. At the patient the devascularization of the posterior part of interventricular septum was diagnosed. What artery was injured?

- + Posterior interventricular.
- Left coronary artery.
- Anterior interventricular artery.
- Circumflex artery
- Right coronary artery.

120. A doctor revealed worsening of venous blood flow in the vein passing in the anterior interventricular groove of the heart. What is this vein?

- + V. cordis magna.
- V. cordis media.
- V. cordis parva.
- V. posterior ventriculi sinistri.
- V. obliqua atrii sinistri.

121. At the patient heart attack of the right ventricle posterior wall was diagnosed. What artery supplies this area of the heart?

- + Right coronary artery.
- Left coronary artery.
- Circumflex.
- Anterior interventricular.
- Pulmonary artery.

122. A forensic doctor revealed the injuri of coronary sinus during the examination of the heart. Define the place of inflow of the injured anatomic formation.

- + Right atrium.
- Superior vena cava.
- Inferior vena cava.
- Right ventricle.
- Left atrium.

123. At a patient with pericarditis the accumulation of serous fluid in the sinuses of pericardium is revealed. What are sinuses are in a norm?

- + Sinus transversus pericardii et sinus obliquus pericardii.
- Sinus transversus et sinus verticalis.
- Sinus dexter et sinus sinister pericardii.
- Sinus transversus pericardii et sinus rectus.
- Sinus obliquus pericardii et sinus superior.

124. What artery hemorrhage can the paralysis of cardiovascular and respiratory center cause?

- + Arteria cerebri posterior.
- Arteria cerebri anterior.
- Arteria cerebri media.
- Arteria communicans anterior.
- Arteria communicans posterior.

125. At a patient with cancer of the tongue was the strong bleeding because of destruction of dorsal artery. What vessel must a doctor bandage to stop bleeding?

- + Lingual artery.
- Arteria profunda linguae.
- Arteria dorsalis linguae.
- Facial artery.
- A. pharyngea ascendens.

126. A dentist diagnosed the sphenoiditis in the patient. All possible was done to prevent the process of involvement of artery which lies in the cavernous sinus. What is this artery?

- + A. carotis interna.
- A. carotis externa.
- A. ophthalmica.
- A. supraorbitalis.
- A. infraorbitalis.

127. Removing tumour near the ala of the nose a surgeon injured a vessel that resulted to formation of subcutaneous haematoma. What vessel is injured?

- + A. facialis.
- A. maxillaris.
- A. supraorbitalis.
- A. infraraorbitalis.
- A. angularis.

128. A doctor revealed that patient had the injury of squama of temporal bone and subdural haematoma. What injury of the artery resulted to formation of haematoma?

- + A. meningea media.
- A. maxillaris.
- A. carotis interna.
- A. ophthalmica.
- A. sphenopalatina.

129. During the operation of mastoid process of the temporal bone a doctor can injury facial nerve canal. What artery passes together with the facial nerve in the canal?

- + A. stylomastoidea.
- A. facialis.
- A. maxillaris.
- A. meningea media.
- A. occipitalis.

130. During the examination the subcutaneous haematoma of temporal area was revealed in the patient. What vessel injury resulted to formation of haematoma?

- + A. temporalis superficialis.
- A. maxillaris.
- A. auricularis posterior.
- A. buccalis.
- A. occipitalis.

131. In woman after anaesthesia the subcutaneous haematoma appeared under the eye. What artery was injured during anaesthesia?

- + Maxillary artery.
- Lingual artery.

- Facial artery.
- Superficial temporal artery.
- Ascending esophageal artery.

132. The patient has vision impairment related to pathology of arterial vessels of the eyeball. Which of the enumerated arteries is the main source of the blood supply of the retina?

- + A. centralis retinae.
- Aa. ciliares posteriores longi.
- Aa. conjunctivales.
- Aa. ciliares posteriores breves.
- Aa. episclerales.

133. The patient complains of inflammation of parotid salivary gland. By what artery branches is it supplied with blood in a norm?

- + A. temporalis superficialis.
- A. facialis.
- A. auricularis posterior.
- A. pharyngea ascendens.
- A. meningea media.

134. The patient has inflammation of cells of ethmoid bone (ethmoiditis). What artery branches supply the ethmoidal cells with blood?

- + A. ophthalmica.
- A. cerebri anterior.
- A. infraorbitalis.
- A. facialis.
- A. transversa faciei.

135. In a patient the extension in width of a. communicans posterior of the arterial circle of the brain is revealed. What vessels of this circle does it connect?

- + A. carotis interna et a. cerebri posterior.
- A. cerebri media et a. cerebri posterior.
- A. carotis interna et a. cerebri media.
- A. carotis externa et a. cerebri anterior.
- A. cerebri anterior et a. cerebri media.

136. In a patient at the examination of function of the organ equilibrium devascularizations of the structures of

- internal ear are revealed. What artery branch does a labyrinth belong to?
- + A. basilaris.
 - A. temporalis superficialis.
 - A. cerebri media.
 - A. cerebri anterior.
 - A. cerebri posterior.
137. After extraction of the second molar of the maxilla begins bleeding from the corresponding alveola. From what artery system did bleeding begin?
- + Maxillary.
 - Facial.
 - Ascending esophageal.
 - Inferior alveolar.
 - Mandibular and sublingual.
138. A surgeon-dentist revealed the stone in the submandibular gland in the patient. Removing it he prevented bleeding from the artery:
- + A. facialis.
 - A. submentalis.
 - A. alveolaris inferior.
 - A. labialis inferior.
 - A. lingualis.
139. The patient had hemorrhagic stroke in the area of medial surface of frontal lobe of the right cerebral hemisphere. What artery was injured?
- + A. cerebri anterior.
 - A. cerebri posterior.
 - A. communicans anterior.
 - A. cerebri media.
 - A. communicans posterior.
140. A surgeon-dentist is going to make the operation at lower jaw. He must remember that the lower alveolar artery originates from:
- + Mandibular compartment of the maxillary artery.
 - Pterygopalatine compartment of the maxillary artery.
 - Infratemporal compartment of the maxillary artery.
 - Facial artery.
 - Lingual artery.
141. During MRI investigation a local expansion (aneurysm) of arterial vessel passing in the lateral cerebral sulcus was revealed. What vessel is changed pathologically?
- + A. cerebri media.
 - A. communicans posterior.
 - A. cerebri anterior.
 - A. cerebri posterior.
 - A. communicans anterior.
142. A patient has devascularization of the medial surface of the right cerebral hemisphere. What artery is injured?
- + A. cerebri anterior.
 - A. chorioidea.
 - A. communicans posterior.
 - A. cerebri posterior.
 - A. cerebri media.
143. The patient was delivered to the emergency station with bleeding from the lacerated wound in the corner of the mouth. What artery is injured?
- + Facial.
 - Maxillary.
 - Lingual.
 - Anterior superior alveolar.
 - Infraorbital.
144. The patient has functional violations due to cerebral apoplexy. What artery injury is a result of such pathology?
- + Basilar artery.
 - Median cerebral arteries.
 - Anterior cerebral artery.
 - Internal carotid artery.
 - Posterior cerebral artery.
145. What anatomic landmark serves for establishment of the place of external carotid artery origin on the neck?

- + Superior edge of the thyroid cartilage.
- Jugular notch.
- Angle of the lower jaw.
- Inferior edge of the thyroid cartilage.
- Place of the sternocleidomastoid muscle origin.

146. During the operation the surgeon must separate superior and inferior thyroid arteries which form arterial anastomoses in the gland. What large vessels branches are these arteries belong to?

- + A. carotis externa et a. subclavia.
- A. carotis interna et a. subclavia.
- A. carotis externa et a. carotis interna.
- A. subclavia et truncus thyrocervica– lis.
- A. subclavia et a. transversa colli.

147. The operation of the right lobe of thyroid gland must be carried out in 25 years old patient. What arteries supply the thyroid gland with blood?

- + Superior thyroid, inferior thyroid.
- A. inferior thyroid, occipital, superficial temporal arteries.
- Superior thyroid, inferior thyroid, lingual, facial arteries.
- Inferior thyroid, lingual, facial arteries.
- Superior thyroid, lingual, superficial temporal arteries.

148. During the operation of the middle mediastinum a surgeon must separate a. pericardiophrenica. What arterial vessel branch does it belong to?

- + A. thoracica interna.
- A. truncus thyrocervicalis.
- A. vertebralis.
- A. transversa colli.
- Truncus costocervicalis.

149. During the examination of the patient with acute pancreatitis the devascularization of the pancreas was revealed. By what large arterial branches vessels is it supplied?

- + Truncus coeliacus and a. mesenterica superior.

- A. lienalis and a. mesenterica inferior.
- Truncus coeliacus and a. mesenterica inferior.
- A. mesenterica superior and inferior.
- A. lienalis and a. mesenterica superior.

150. The resection of the ascending colon is appointed for the patient. Specify the major source of the blood supply of the right half of the colon.

- + A. right colic artery.
- Inferior mesenteric artery.
- Right internal iliac artery.
- Left internal iliac artery.
- Middle colic artery.

151. The operation of the descending colon is appointed for the patient with cancer. Specify the major source of its blood supply.

- + Inferior mesenteric artery.
- Superior mesenteric artery.
- Truncus coeliacus.
- Middle colic artery.
- Splenic artery.

152. After a motor– car accident the victim's spleen is injured as result a plenty of hemorrhages are revealed. What artery supplies the spleen?

- + Coeliac trunk.
- Superior mesenteric artery.
- Aorta.
- Hepatic artery.
- Inferior mesenteric artery.

153. The operation of the stomach was carried out. Specify arteries which provide blood supply of the lesser curvature of stomach?

- + Left and right gastric arteries.
- Short gastric arteries.
- Left gastroepiploic artery.
- Right gastroepiploic artery.
- Gastroduodenal artery.

CAVITY OF THE MOUTH

1. By what is the diaphragm (floor) of the mouth formed?

- + By the paired mylohyoid muscles.
- By the paired stylohyoid muscles.
- By the paired omohyoid muscles.
- By the genioglossus and hyoglossus muscles.

2. What forms the lateral walls of the vestibule of the mouth?

- + Cheeks.
- Lips.
- Teeth.
- Palatoglossal arches.

3. By what is the vestibule of the mouth bounded anteriorly?

- + By lips.
- By cheeks.
- By palate.
- By teeth.

4. The cavity of the mouth is divided into the vestibule of the mouth and cavity of the mouth proper by means of:

- + Gums and teeth.
- Gums and tongue.
- Palate.
- Lips.

5. The vestibule of the mouth is bounded externally by:

- + Lips and cheeks.
- Gums and teeth.
- Soft palate.
- Palatopharyngeal arches.

6. By means of the fauces the oral cavity communicates with:

- + Pharynx.
- Esophagus.
- Nasal cavity.
- External environment.

7. The cavity of the mouth is divided into two parts:

- +The vestibule of the mouth and the cavity of the mouth proper.
- The vestibule of the mouth and the fauces.
- The oropharynx and the cavity of the mouth proper.
- The oropharynx and the fauces.

8. The oral fissure is bounded by:

- + Lips.
- Cheeks.
- Teeth.
- Gums.

9. The base of the lips is formed by:

- + The orbicularis oris muscle.
- The orbicularis oculi muscle.
- The buccinator muscle.
- The zygomaticus major muscle.

10. The lips are covered from outside by:

- +The skin.
- The mucous membrane.
- The serous membrane.
- The loose areolar tissue.

11. The vestibule of the mouth opens into the external environment by means of:

- +The oral fissure (rima oris).
- The fauces.
- The labial commissures.
- The cavity of the mouth proper.

12. What forms the partition between the oral and nasal cavities?

- + Palate.
- Diaphragm of the mouth.
- Lips.
- Gums.

13. What muscle is located in the cheek?

- + The buccinator muscle.
- The orbicularis oris muscle.
- The orbicularis oculi muscle.

– The muscle of uvula.

14. The patient has fat in the thickness of the cheek (corpus adiposum buccae). Where exactly is it located?

- + Between the skin and the buccinator muscle.
- Between the skin and the mucous membrane.
- Between the buccinator muscle and the mucous membrane.
- Between the mucous membrane and gums.

15. What opens into the vestibule of the oral cavity?

- + The parotid ducts.
- The fauces.
- The uvula.
- The lesser sublingual ducts.

**THE ORGANS OF THE ORAL CAVITY:
THE PALATE, THE TEETH, THE
TONGUE, SALIVARY GLANDS,
PHARYNX, OESOPHAGUS**

1. The oral cavity communicates with the pharynx by:

- + Fauces.
- Oral fissure (rima oris).
- Choanae.
- Velum palatinum.

2. Three parts are distinguished in the tongue:

- + Body, tip and root.
- Base, tip and root.
- Root, body and base.
- Tip, body and neck.

3. The convex superior surface of the tongue is called:

- + Back (dorsum).
- Fundus.
- Apex.
- Margin.

4. The median sulcus of the tongue passes along:

- + Dorsum of the tongue.
- Inferior surface of the tongue.
- Margin of the tongue.
- Root of the tongue.

5. The foramen cecum linguae is located:

- + Between the root and the body.
- Between the apex and the body.
- Between the apex and the root.
- Between the body and the margin.

6. The terminal sulcus of the tongue lies between:

- + Body and the root.
- Body and the apex.
- Apex and the root.
- Body and the margins.

7. The lingual taste papillae which are supplied with taste buds are as follows:

- + Fungiform, vallate, foliate papillae.
- Foliate, fungiform, filiform papillae.
- Foliate, vallate, filiform.
- Vallate, filiform, conicae.

8. Where are the vallate papillae located?

- + In front of the terminal sulcus.
- Behind the terminal sulcus.
- On the margins of the tongue.
- On the apex of the tongue.

9. Where are the foliate papillae located?

- + On the margins of the tongue.
- On the back of the tongue.
- In front of the terminal sulcus.
- Behind the terminal sulcus.

10. What is located on the root of the tongue?

- + Lingual tonsil.
- Vallate papillae.
- Medline groove of the tongue.
- Palatine tonsil.

11. Which papillae of the tongue serve for reception of tactile and pain sensations?
- + The filiform and the conical papillae.
 - The vallate and the conical papillae.
 - The filiform and the foliate papillae.
 - The fungiform and the vallate papillae.
12. The mucosa extending from the floor of the mouth to the inferior surface of the tip of the tongue forms on the midline:
- + The frenulum of the tongue.
 - The frenulum of the inferior lip.
 - The frenulum of the superior lip.
 - The lingual septum.
13. There is eminence on each side of the frenulum of the tongue. What is it?
- + Sublingual caruncle.
 - Vallate papillae.
 - Lingual septum.
 - Foramen caecum.
14. Which muscles of the tongue are the intrinsic muscles?
- + The superior longitudinal, inferior longitudinal, transverse and vertical muscles.
 - The superior longitudinal, transverse, vertical and genioglossus muscles.
 - The transverse, vertical, genioglossus and styloglossus muscles.
 - The genioglossus, hyoglossus, styloglossus muscles.
15. The extrinsic (skeletal) muscles of the tongue are:
- + The genioglossus, hyoglossus and styloglossus muscles.
 - The genioglossus, transverse and hyoglossus muscles.
 - The transverse, vertical and styloglossus muscles.
 - The superior longitudinal, inferior longitudinal and vertical muscles.
16. The muscles of the tongue are divided into:
- + Intrinsic and extrinsic (skeletal).
 - Smooth and striated.
 - Smooth and intrinsic.
 - Smooth and extrinsic (skeletal).
17. Which muscle pulls the tip of the tongue upwards?
- + The superior longitudinal muscle.
 - The inferior longitudinal muscle.
 - The styloglossus muscle.
 - The genioglossus muscle.
18. Which muscle pulls the tip of the tongue downwards?
- + The inferior longitudinal muscle.
 - The superior longitudinal muscle.
 - The styloglossus muscle.
 - The hyoglossus muscle.
19. Which muscle shortens and thickens the tongue?
- + The transverse muscle.
 - The vertical muscle.
 - The superior longitudinal muscle.
 - The hyoglossus muscle.
20. Which muscle flattens and broadens the tongue?
- + The vertical muscle.
 - The transverse muscle.
 - The styloglossus muscle.
 - The hyoglossus muscle.
21. Which muscle pulls the tongue back and downwards?
- + The hyoglossus muscle.
 - The styloglossus muscle.
 - The genioglossus muscle.
 - The transverse muscle.
22. Which muscle pulls the tongue back and upwards?
- + The styloglossus muscle (contracts bilaterally).
 - The genioglossus muscle (contracts unilaterally).

- The hyoglossus muscle.
- The transverse muscle.

23. Which muscle pulls the tongue anteriorly and downwards?

- + The genioglossus muscle.
- The styloglossus muscle.
- The hyoglossus muscle.
- The vertical muscle.

24. The palate forms the upper wall of the oral cavity and is divided into:

- +The hard palate and soft palate.
- The bony palate and hard palate.
- The muscular palate and soft palate.
- The superior palate and inferior palate.

25. By what is the hard palate formed?

- + Palatine processes of the maxillae and the horizontal plates of the palatine bones.
- Palatine processes of the maxilla and the perpendicular plates of the palatine bones.
- Alveolar processes of the maxilla and the horizontal plates of the palatine bones.
- Palatine and alveolar processes of the maxilla.

26. The soft palate consists of the following structures:

- + The veil of palate, the uvula, the palatoglossal arch and the palatopharyngeal arch.
- The veil of palate, the uvula, the fornix and the palatine tonsils.
- The pharyngeal tonsils, the uvula and the veil of palate.
- The palatoglossal arches, the palatopharyngeal arches and the pharyngeal tonsils.

27. What does the tonsillar sinus contain?

- +The palatine tonsil.
- The lingual tonsil.
- The pharyngeal tonsil.
- The uvula.

28. The soft palate consists of the following muscles:

- +The tensor veli palatini, the levator veli palatini, the musculus uvulae, the palatopharyngeus and the palatoglossus muscles.
- The tensor veli palatini, the flexor veli palatini, the extensor veli palatini, the musculus uvulae.
- The extensor veli palatini, the flexor veli palatini, the palatoglossus and palatopharyngeus muscles.
- The levator veli palatini, the depressor veli palatini, the musculus uvulae, the palatoglossus and palatopharyngeus muscles.

29. Which muscles of the soft palate narrow the oropharyngeal passage?

- +The palatoglossus and the palatopharyngeus muscles.
- The palatoglossus and the levator veli palatini muscles.
- The palatopharyngeus and the tensor veli palatini muscles.
- The levator veli palatini and the tensor veli palatini muscles.

30. Which muscles of the soft palate increase the opening of the oropharyngeal passage?

- +The levator veli palatini and the tensor veli palatini muscles.
- The palatoglossus and the palatopharyngeus muscles.
- The palatoglossus and the levator veli palatini muscles.
- The uvulae and the palatopharyngeus muscles.

31. What ducts are on the top of the sublingual caruncle?

- + The major sublingual duct and the submandibular duct.
- The submandibular duct and the parotid duct.
- The parotid duct and the minor sublingual ducts.
- The minor sublingual ducts.

32. Each tooth consists of:
- + The crown, the neck, the root.
 - The body, the neck, the root.
 - The crown, the isthmus, the root.
 - The head, the neck, the root.
33. What surfaces are distinguished in each tooth?
- + The vestibular, the lingual, the occlusal, the approximal surfaces.
 - The lingual, the palatine, the occlusal, the masticating surfaces.
 - The lingual, the vestibular, the palatine, the labial surfaces.
 - The vestibular, the labial, the buccal, the lingual surfaces.
34. The root of the tooth sits in the dental alveolus and terminates in:
- + Apex.
 - Fornix.
 - Fundus.
 - Cupola.
35. The hard material of the tooth consists of:
- + Dentine, enamel, cement.
 - Dentine, pulp, connective tissue.
 - Enamel, cement, elastic tissue.
 - Dentine, cement, pulp.
36. The dental crown is coated with:
- + Enamel.
 - Dentine.
 - Cement.
 - The gums.
37. The root of the tooth is covered with:
- + Cement.
 - Dentine.
 - Enamel.
 - Connective tissue.
38. The root canal of the tooth opens at:
- + The apex of the root.
 - The base of the root.
 - The crown of the tooth.
 - The neck of the tooth.
39. Eruption (cutting) of the deciduous teeth begins at:
- + 6–7th months of age.
 - 1st–3rd months of age.
 - 9–10th months of age.
 - 1st year of life.
40. The deciduous teeth are replaced by the permanent teeth after the age of:
- + 5–7 years.
 - 3–4 years.
 - 13–14 years.
 - 9–10 years.
41. Which teeth are only the permanent teeth?
- + The premolar teeth.
 - The molar teeth.
 - The incisor teeth.
 - The canine teeth.
42. How many deciduous teeth do humans have?
- + 20.
 - 32.
 - 26.
 - 30.
43. How many permanent teeth do humans have?
- + 32.
 - 30.
 - 20.
 - 22.
44. The deciduous teeth are arranged in the sequence from one side of the jaw:
- + The incisors, the canines, the molars.
 - The incisors, the canines, the premolars.
 - The canine, the incisors, the molars.
 - The incisors, the canines, the premolar, the molars.

45. The permanent teeth are arranged in the sequence from one side of the jaw:

- + The incisors, the canines, the premolars, the molars.
- The incisors, the premolars, the canines, the molars.
- The premolars, the canines, the incisors, the molars.
- The canines, the incisors, the molars, the premolars.

46. What deciduous teeth erupt first?

- + The incisors.
- The canines.
- The molars.
- The premolars.

47. What permanent teeth erupt first?

- + The molars.
- The premolars.
- The canines.
- The incisors.

48. The cavity of the tooth is filled with:

- + The tooth pulp.
- Dentine.
- Cement.
- Periodontium.

49. The dental formula of the deciduous teeth for one side of the jaw is as follows:

- + 2.1.0.2.
- 2.1.2.3.
- 2.0.1.2.
- 3.2.1.2.

50. The human dental formula for one side of the jaw is:

- + 2.1.2.3.
- 3.2.1.2.
- 2.1.0.3.
- 2.1.3.0.

51. The major salivary glands are:

- + The parotid gland, the submandibular gland, the sublingual gland.
- The parotid gland, the sublingual gland, the buccal gland.
- The sublingual gland, the submandibular gland, the palatine gland.
- The parotid gland, the lingual gland, the molar gland.

52. The minor salivary glands are:

- + The labial glands, the buccal glands, the palatine glands, the lingual glands.
- The labial glands, the buccal glands, the palatine glands, the parotid gland.
- The sublingual gland, the buccal glands, the submandibular gland.
- The submandibular gland, the palatine glands, the lingual glands.

53. Where is the parotid gland located?

- + On the lateral side of the face in the retromandibular fossa.
- In the submandibular trigone.
- On the floor of the oral cavity.
- In the lingual trigone.

54. What type of glands does the parotid gland refer to?

- + Compound alveolar glands.
- Compound tubuloacinar glands.
- Compound tubular glands.
- Simple alveolar glands.

55. What type of secretion does the parotid gland produce?

- + The serous secretion.
- The mucous secretion.
- The mixed secretion.
- The endocrine secretion.

56. Where does the parotid duct open?

- + Into the vestibule of the mouth opposite to the 2nd upper molar.
- Into the vestibule of the mouth opposite to the 2nd lower molar.
- On the sublingual caruncle.

– Into the oral cavity along the sublingual fold.

57. Where is the submandibular gland located?

- + In the submandibular trigone.
- In the lingual trigone.
- On the floor of the oral cavity.
- On the lateral side of the face in the retromandibular fossa.

58. What type of glands does the submandibular gland belong to?

- + Compound tubuloacinar glands.
- Simple tubuloacinar glands.
- Compound alveolar glands.
- Compound tubular glands.

59. What type of secretion does the submandibular gland produce?

- + The mixed secretion.
- The serous secretion.
- The mucous secretion.
- The endocrine secretion.

60. Where does the submandibular duct open?

- + On the sublingual caruncle.
- Into the vestibule of the mouth opposite to the second upper molar.
- On the frenulum of tongue.
- Into the oral cavity along the sublingual fold.

61. Where is the sublingual gland located?

- + On the floor of the oral cavity under to the mucous membrane.
- In the sublingual triangle.
- On the root of the tongue.
- In the submandibular triangle.

62. What type of secretion does the sublingual gland produce?

- + The mucous secretion.
- The serous secretion.
- The endocrine secretion.

– The mixed secretion.

63. What type of glands does the sublingual gland belong to?

- + Compound tubuloacinar glands.
- Simple tubuloacinar glands.
- Simple alveolar glands.
- Compound alveolar glands.

64. Where does the major sublingual duct open?

- + On the sublingual caruncle.
- On mucosa around sublingual fold.
- Into the oral vestibule opposite to the upper 2nd molar.
- On the foramen caecum linguae.

65. Where do the minor sublingual ducts open?

- + On the mucosa around sublingual fold.
- Into the oral vestibule opposite to the upper 2nd molar.
- On the sublingual caruncle.
- On the foramen caecum linguae.

66. Which of the salivary glands belongs to compound alveolar gland?

- + The parotid gland.
- The sublingual gland.
- The submandibular gland.
- The palatine gland.

67. The salivary gland producing serous secretion is:

- + The parotid gland.
- The sublingual gland.
- The submandibular gland.
- The lingual gland.

68. What salivary duct opens into the oral vestibule on the buccal mucosa opposite to the upper 2nd molar?

- + The parotid duct.
- The sublingual duct.
- The submandibular duct.
- The labial glands.

69. What salivary gland lies in the submandibular triangle?

- + The submandibular gland.
- The sublingual gland.
- The parotid gland.
- The lingual gland.

70. What salivary glands belong to compound tubuloacinar glands?

- + The submandibular gland, the sublingual gland.
- The sublingual gland, the parotid gland.
- The submandibular gland, the parotid gland.
- The parotid gland, the palatine gland.

71. What salivary glands produce mixed secretion?

- + The submandibular gland.
- The sublingual gland.
- The parotid gland.
- The lingual gland.

72. What ducts of salivary gland open in the sublingual caruncle?

- +The sublingual duct, the submandibular duct.
- The parotid duct, the sublingual duct.
- The sublingual duct, the labial ducts.
- The lingual duct, the labial ducts.

73. What salivary gland does the sublingual fold form between the tongue and the inner surface of the mandible?

- +The sublingual gland.
- The submandibular gland.
- The parotid gland.
- The buccal gland.

74. The pharynx is located:

- + From the base of the skull to the 6th – 7th cervical vertebrae.
- From the base of the skull to the 4th – 6th cervical vertebrae.
- From the 4th to the 6th cervical vertebrae.

– From the 6th cervical vertebra to the 6th thoracic vertebra.

75. At the level of the 6th – 7th cervical vertebrae the pharynx becomes continuous with:

- + The esophagus.
- The larynx.
- The trachea.
- The stomach.

76. The lower portion of the pharynx becomes continuous with the esophagus at the level of:

- + The 6th–7th cervical vertebrae.
- The 4th–6th cervical vertebrae.
- The 7th cervical vertebra–2nd thoracic vertebra.
- The 9th–10th thoracic vertebrae.

77. The nasal cavity opens into the pharynx by means of:

- + The choanae.
- The fauces.
- The laryngeal inlet.
- The nostrils.

78. The oral cavity opens into the pharynx by means of:

- + The fauces.
- The choanae.
- The oral fissure.
- The esophageal inlet.

79. Posterior to the pharynx is located:

- + Retropharyngeal (retrovisceral) space.
- Pretracheal (previsceral) space.
- Suprasternal space.
- Prepharyngeal space.

80. By means of fauces the pharynx communicates with:

- + The oral cavity.
- The nasal cavity.
- The laryngeal cavity.
- The esophagus.

81. The superior wall of the pharynx is called:

- + The vault (fornix) of pharynx.
- The floor (fundus) of pharynx.
- The body of pharynx.
- The apex of pharynx.

82. In accordance with the organs located in front of the pharynx, 3 parts can be distinguished in it:

- + The nasal part, the oral part, the laryngeal part.
- The nasal part, the oral part, the cervical part.
- The nasal part, the oral part, the bony part.
- The oral part, the laryngeal part, the cervical part.

83. By means of pharyngeal opening of auditory tube the pharynx communicates with:

- + The tympanic cavity (part of the middle ear).
- The nasal cavity.
- The oral cavity.
- The laryngeal cavity.

84. Where is the pharyngeal opening of auditory tube located?

- + On the lateral wall of the nasopharynx.
- On the anterior wall of the nasopharynx.
- On the posterior wall of the nasopharynx.
- On the inferior wall of the nasopharynx.

85. Where is the pharyngeal tonsil (adenoid) located?

- + At the junction of the superior and posterior pharyngeal walls.
- At the junction of the superior and anterior pharyngeal walls.
- On the lateral pharyngeal wall.
- In the tonsillar sinus (fossa).

86. Where is the tubal tonsil (paired) located?

- + Between the pharyngeal opening of auditory tube and the soft palate.
- In the tonsillar sinus (fossa).
- On the lateral wall of the pharynx.
- In the piriform fossa (recess).

87. Almost complete ring of lymphoid structure is revealed at the entry into the pharynx:

- + The lingual tonsil, two palatine tonsils, two tubal tonsils, the pharyngeal tonsil.
- Two palatine tonsils, two tubal tonsils, the pharyngeal tonsil, the laryngeal tonsil.
- Two tubal tonsils, the pharyngeal tonsil, the lingual tonsil, two oral tonsils.
- The pharyngeal tonsil, the lingual tonsil, two laryngeal tonsils, two palatine tonsils.

88. Where are the piriform fossae located?

- + In the laryngopharynx.
- In the oropharynx.
- In the nasopharynx.
- In the oral cavity.

89. The basis of the pharynx located under the mucosa of the upper part of it is:

- + The pharyngobasilar fascia.
- The lymphoid tissue.
- The loose connective tissue.
- The palatine aponeurosis.

90. There are two groups of pharyngeal muscles according to action:

- + Constrictors and elevators.
- Elevators and tensors.
- Constrictors and depressors.
- Depressors and tensors.

91. The constrictor muscles of the pharynx are:

- + The superior, middle and inferior constrictors.
- The superior, medial and lateral constrictors.
- The lateral, medial and middle constrictors.
- The lateral, medial and inferior constrictors.

92. The longitudinal muscles of the pharynx (elevators) are as follows:

- + The stylopharyngeus, the palatopharyngeus.
- The salpingopharyngeus, styloglossus.
- The palatopharyngeus, genioglossus.
- The stylopharyngeus, styloglossus.

93. The esophagus is located at the level:

- + From the 6th–7th cervical vertebrae to the 10th–11th thoracic vertebrae.
- From the 4th–6th cervical vertebrae to the 10th – 11th thoracic vertebrae.
- From the 5th–7th cervical vertebrae to the 8th – 9th thoracic vertebrae.
- From the 7th cervical vertebra to the 12th thoracic vertebra.

94. The esophagus begins at the level of:

- + The 6th–7th cervical vertebrae.
- The 4th–6th cervical vertebrae.
- The 7th cervical – the 1st thoracic vertebrae.
- The 1st–2nd thoracic vertebrae.

95. The esophagus ends at the level of:

- +The 10th–11th thoracic vertebrae.
- The 11th –12th thoracic vertebrae.
- The 12th thoracic–the 1st lumbar vertebrae.
- The 8th–9th thoracic vertebrae.

96. The esophagus has parts (from the top):

- + Cervical, thoracic, abdominal.
- Thoracic, abdominal, pelvic.
- Cranial, cervical, thoracic.
- Superior, middle, inferior.

97. The pharyngo– esophageal constriction of the esophagus is located at the level of:

- + The C6–C7.
- The C4–C6.
- The Th1.
- The Th4–Th5.

98. What esophageal constriction is located at the level of the C6–C7 vertebrae?

- +The pharyngo-esophageal constriction.
- The laryngeal constriction.
- The aortic constriction.
- The diaphragmatic constriction.

99. The broncho-aortic constriction of the esophagus is located at the level of:

- + The Th4–Th5.
- The C6–C7.
- The Th6–Th7.
- The C4–C5.

100. What esophageal constriction is located at the level of the Th4–Th5 vertebrae?

- + The broncho-aortic constriction.
- The pharyngo-esophageal constriction.
- The diaphragmatic constriction.
- The pyloric constriction.

101. The diaphragmatic constriction of the esophagus is located at the level of:

- + The Th9–Th10.
- The Th4–Th5.
- The Th6–Th7.
- The Th12–L1.

102. What esophageal constriction is located at the level of the Th9–Th10 vertebrae?

- +The diaphragmatic constriction.
- The broncho– aortic constriction.
- The pharyngo– esophageal constriction.
- The pyloric constriction.

103. What muscle fibers does the upper third of the esophageal wall contain?

- + The striated muscle fibers.
- The smooth muscle fibers.
- The striated and smooth muscle fibers.
- The smooth muscle fibers and loose connective tissue.

104. What muscle tissue does the lower third of the esophageal wall contain?

- + The smooth muscle tissue.
- The striated muscle tissue.
- The striated and smooth muscle tissue.

– The smooth muscle tissue and loose connective tissue.

105. What muscle tissue does the middle third of the esophageal wall contain?

- + The striated and smooth muscle tissue.
- The smooth muscle tissue.
- The striated muscle tissue.
- The striated muscle tissue and loose connective tissue.

106. The wall of the esophagus consists of the following layers:

- + Mucosa, submucosa, muscular layer, adventitia.
- Mucosa, muscular layer, fibrous layer, peritoneum.
- Mucosa, submucosa, muscular layer, submuscular layer.
- Mucosa, fibrous layer, muscular layer, adventitia.

THE STOMACH, SMALL AND LARGE INTESTINE

1. The surface of abdomen is divided by two horizontal lines into three parts:

- + Epigastrium, mesogastrium, hypogastrium.
- Epigastrium, hypochondrium, hypogastrium.
- Mesogastrium, hypochondrium, hypogastrium.
- Epigastrium, mesogastrium, hypochondrium.

2. What lines divide the surface of abdomen into areas?

- + Linea bicostalis and linea bispinalis.
- Linea bicostalis and the bitransversal line.
- Infrasternal line and linea bispinalis.
- Bicrestal line and the infrasternal line.

3. Epigastrium is subdivided by two vertical lines into secondary regions:

- + The epigastric region, the right/left hypochondrium.
- The right/left hypochondrium, the umbilical region.
- The right/left lateral region, the epigastric region.

– The right/left inguinal region, the umbilical region.

4. Mesogastrium is subdivided by two vertical lines into secondary regions:

- + The right/left lateral region, the umbilical region.
- The right/left lateral region, the pubic region.
- The right/left hypochondrium, the umbilical region.
- The right/left inguinal region, the pubic region.

5. Hypogastrium is subdivided by two vertical lines into secondary regions:

- + The right/left inguinal region, the pubic region.
- The right/left inguinal region, the umbilical region.
- The right/left lateral region, the pubic region.
- The right/left hypochondrium, the umbilical region.

6. The stomach is located between:

- + The esophagus and the duodenum.
- The esophagus and the caecum.
- The pharynx and the caecum.
- The small and large intestine.

7. The stomach is projected onto the regions of abdomen:

- + The left hypochondrium and the epigastric region.
- The right hypochondrium and the epigastric region.
- The left lateral region and the epigastric region.
- The right hypochondrium and umbilical region.

8. What walls of the stomach are distinguished?

- + The anterior and posterior walls.
- The superior and inferior walls.
- The lateral and medial walls.

- The proximal and distal walls.
9. Where is the lesser curvature of the stomach directed to?
- + Upward and to the right.
 - Downward and to the left.
 - Upward and to the left.
 - Downward and to the right.
10. Where is the greater curvature of the stomach directed to?
- + Downward and to the left.
 - Downward and to the right.
 - Upward and to the right.
 - Upward and to the left.
11. The opening of the esophagus into the stomach is called:
- + The cardiac orifice.
 - The pyloric canal.
 - The fornix.
 - The pyloric antrum.
12. The inlet (the cardiac orifice) is located at the level of:
- + Th10–Th11.
 - Th9–Th10.
 - Th6–Th7.
 - Th12–L1.
13. The following parts are distinguished in the stomach:
- + The cardiac portion, the fundus (fornix), the body, the pyloric portion.
 - The cardiac portion, the body, the neck.
 - The pyloric portion, the body, the cardiac portion, the tail.
 - The cardiac portion, the fornix, the pyloric portion, the body.
14. The outlet (pyloric orifice) is located at the level of:
- + Th12–L1.
 - L1–L2.
 - Th9–Th10.
 - Th6–Th7.
15. The peritoneal ligaments which originate from the lesser curvature of the stomach are:
- + The hepatogastric ligament, the gastrophrenic ligament.
 - The hepatogastric ligament, the gastrocolic ligament.
 - The gastrocolic ligament, the gastrosplenic ligament.
 - The gastrophrenic ligament, the gastrosplenic ligament.
16. The peritoneal ligaments which originate from the greater curvature of the stomach are:
- + The gastrocolic ligament, the gastrosplenic ligament.
 - The gastrocolic ligament, the hepatogastric ligament.
 - The gastrosplenic ligament, the gastrophrenic ligament.
 - The hepatogastric ligament, the gastrophrenic ligament.
17. The external layer of the gastric wall is formed by:
- + Peritoneum (the serous coat).
 - Pleura (the serous coat).
 - Adventitia.
 - Fibrous coat.
18. What is the peritoneal relation of the stomach?
- + The intraperitoneal position.
 - The mesoperitoneal position.
 - The extraperitoneal position.
 - The retroperitoneal position.
19. The stomach wall consists of the following layers:
- + Mucosa, submucosa, muscular layer, serosa.
 - Adventitia, muscular layer, submucosa, mucosa.
 - Mucosa, fibrosa, muscular layer, adventitia.
 - Mucosa, muscular layer, fibrosa, serosa.

20. How many layers does the muscular coat of the stomach have?
- + 3.
 - 2.
 - 1.
 - 4.
21. The muscular coat of the stomach wall consists of smooth muscle tissue, which forms three layers:
- + The external longitudinal layer, the middle circular layer, the internal oblique fibers.
 - The external oblique fibers, the middle longitudinal layer, the internal circular layer.
 - The external circular layer, the middle oblique fibers, the internal longitudinal layer.
 - The external and internal circular layers, the middle longitudinal layer.
22. What layer of muscular coat of stomach wall forms the pyloric sphincter?
- + The circular layer.
 - The longitudinal layer.
 - The the oblique fibers.
 - All layers.
23. The pyloric cusp is formed by:
- + Mucosa.
 - Muscular layer.
 - Serosa.
 - Adventitia.
24. The longitudinal folds of the gastric mucosa are located:
- + On the lesser curvature.
 - On the fundus (fornix).
 - On the body.
 - On the cardiac part.
25. The transverse, oblique and longitudinal folds of the stomach mucosa are located:
- + On the body and fundus (fornix).
 - On the lesser curvature.
 - On the greater curvature.
 - On the pyloric part.
26. What shape of stomach is in patients with a dolichomorphic type of constitution?
- + The elongated shape and the vertical position.
 - The horn-shaped stomach and the transverse position.
 - The hook-shaped stomach and the oblique position.
 - The cone-shaped stomach and the vertical position.
27. What shape of stomach is in patients with a brachymorphic type of constitution?
- + The horn-shaped stomach and the transverse position.
 - The hook-shaped stomach and the oblique position.
 - The elongated shape and the vertical position.
 - The pyramid-shaped stomach and oblique position.
28. What shape of stomach is in patients with a mesomorphic type of constitution?
- + The hook-shaped stomach and the oblique position.
 - The horn-shaped stomach and the transverse position.
 - The cone-shaped stomach and the vertical position.
 - The elongated shape and the vertical position.
29. The small intestine begins at:
- + The pylorus.
 - The cardiac orifice.
 - The ileocaecal junction.
 - The duodenojejunal flexure.
30. The small intestine ends at:
- + The ileal orifice of the caecum.
 - The pyloric orifice.
 - The cardiac orifice.
 - The sacral flexure of rectum.

31. What parts are distinguished in the small intestine?
- + The duodenum, the jejunum, the ileum.
 - The caecum, the jejunum, the ileum.
 - The duodenum, the ileum, the rectum.
 - The duodenum, the caecum, the rectum.
32. The duodenum has a shape of the horseshoe bending around:
- + The head of pancreas.
 - The body of pancreas.
 - The left kidney.
 - The spleen.
33. What parts are distinguished in the duodenum?
- + The superior, descending, horizontal (inferior) and ascending parts.
 - The superior, descending, vertical and ascending parts.
 - The transverse, descending, horizontal (inferior) and ascending parts.
 - The superior, descending, horizontal (inferior) and vertical parts.
34. The superior part of the duodenum lies at the level of:
- + Th12–L1 vertebrae.
 - L1–L2 vertebrae.
 - L2–L3 vertebrae.
 - Th10–Th11 vertebrae.
35. The superior duodenal flexure is located between:
- + The superior part and the descending part of duodenum.
 - The pyloric part of stomach and the superior part of duodenum.
 - The descending part and the horizontal part of duodenum.
 - The ascending part of duodenum and the jejunum.
36. The descending part of the duodenum lies at the level of:
- + L1–L3 vertebrae.
 - Th12–L1 vertebrae.
 - Th10–Th11 vertebrae.
 - L3–L5 vertebrae.
37. The longitudinal fold of the duodenal mucosa is located in the descending part:
- + On the medial wall.
 - On the lateral wall.
 - On the anterior wall.
 - On the posterior wall.
38. What lies at the lower end of the longitudinal fold of the duodenal mucosa?
- + The major duodenal papilla.
 - The superior duodenal papilla.
 - The inferior duodenal papilla.
 - The superior duodenal fold.
39. The inferior duodenal flexure is located between:
- + The descending part and horizontal (inferior) part.
 - The superior part and descending part.
 - The horizontal (inferior) part and ascending part.
 - The ascending part of the duodenum and jejunum.
40. There is the opening on the top of the major duodenal papilla of:
- + The bile duct and pancreatic duct.
 - The common hepatic duct and the pancreatic duct.
 - The bile duct and the accessory pancreatic duct.
 - The common hepatic duct and the accessory pancreatic duct.
41. The minor duodenal papilla contains the opening of:
- + The accessory pancreatic duct.
 - The common pancreatic duct.
 - The bile duct.
 - The common hepatic duct.

42. The horizontal (inferior) part of the duodenum is located at the level of:
- + L3 vertebra.
 - Th12 vertebra.
 - L1 vertebra.
 - Th10 vertebra.
43. The ascending part of the duodenum is located at the level of:
- + L3–L2 vertebrae.
 - Th12–L1 vertebrae.
 - Th10–Th11 vertebrae.
 - L1–L2 vertebrae.
44. The major duodenal papilla (Vater's papilla) is located on:
- + The medial wall of descending part.
 - The lateral wall of descending part.
 - The medial wall of the ascending part.
 - The anterior wall of the horizontal (inferior) part.
45. How is the initial part of the duodenum called?
- + The duodenal bulb.
 - The descending part.
 - The major duodenal papilla.
 - The duodenojejunal flexure.
46. What is the peritoneal relation of the duodenum ?
- + The extraperitoneal position.
 - The intraperitoneal position.
 - The mesoperitoneal position.
 - The subperitoneal position.
47. The large intestine is divided into:
- + The caecum, colon, rectum and anal canal.
 - The ileum, colon, rectum, anal canal.
 - The caecum, jejunum, rectum, anal canal.
 - The jejunum, ileum, colon, rectum.
48. The colon is divided into:
- + The ascending colon, transverse colon, descending colon, sigmoid colon.
 - The ascending colon, superior colon, descending colon, sigmoid colon.
 - The ascending colon, horizontal colon, descending colon, rectum.
 - The ascending colon, descending colon, sigmoid colon, rectum.
49. The large intestine appearance is characterized by the presence of:
- + The taeniae coli, haustra of colon, omental appendices.
 - The taeniae coli, mesentery, the anal canal.
 - The flexures of colon, the anal canal, the intestinal villi.
 - The omental appendices, vermiform appendix, the intestinal villi.
50. What are the taeniae coli formed by?
- + The muscular fibers of longitudinal layer.
 - The muscular fibers of circular layer.
 - The muscular fibers of oblique layer.
 - All fibers of muscular layer.
51. Which taeniae coli does the colon have?
- + The mesocolic taenia, the omental taenia, the free taenia.
 - The mesocolic taenia, the omental taenia, the caecal taenia.
 - The free taenia, the omental taenia, the sigmoid taenia.
 - The caecal taenia, the rectal taenia, the free taenia.
52. What is the peritoneal relation of the caecum?
- + The intraperitoneal position.
 - The mesoperitoneal position.
 - The extraperitoneal position.
 - The retroperitoneal position.
53. The vermiform appendix is covered with the peritoneum from:
- + All sides and has mesentery.
 - Three sides and has no mesentery.
 - One side and has no mesentery.
 - Not covered at all.

54. Where is the caecum located?
- + In the right iliac fossa.
 - In the left iliac fossa.
 - In the pelvic cavity.
 - In the left hypochondrium.
55. The ascending colon is related to:
- + The right lateral region.
 - The left lateral region.
 - The pelvic cavity.
 - The right iliac fossa.
56. The ascending colon is covered with peritoneum from:
- + Three sides.
 - One side.
 - All sides.
 - Not covered at all.
57. The right colic flexure is between:
- + The ascending colon and transverse colon.
 - The ascending colon and descending colon.
 - The caecum and ascending colon.
 - The transverse colon and descending colon.
58. The transverse colon passes between:
- + The right and left colic flexure.
 - The iliocaecal junction and left colic flexure.
 - The iliocaecal junction and right colic flexure.
 - The left colic flexure and sacral flexure of rectum.
59. The transverse colon is covered with peritoneum from:
- + All sides and has mesentery.
 - All sides but has no mesentery.
 - One side.
 - Three sides.
60. The left colic flexure is between:
- + The transverse colon and descending colon.
 - The ascending colon and transverse colon.
 - The ascending colon and descending colon.
- The descending colon and sigmoid colon.
61. The descending colon is related to:
- + The left lateral region.
 - The right lateral region.
 - The pelvic cavity.
 - The left iliac fossa.
62. The descending colon is covered with peritoneum from:
- + Three sides.
 - One side.
 - All sides.
 - Not covered at all.
63. The descending colon passes between:
- + The transverse colon and sigmoid colon.
 - The ascending colon and transverse colon.
 - The caecum and ascending colon.
 - The caecum and sigmoid colon.
64. What type of folds does the mucosa of large intestine form?
- + The semilunar folds.
 - The circular folds.
 - The oblique folds.
 - The longitudinal folds.
65. Where does the rectum lie?
- + In the lesser pelvis.
 - In the greater pelvis.
 - In the abdominal cavity.
 - In the anorectal fossa.
66. The rectum has the flexures in sagittal and frontal planes as follows:
- + The sacral flexure, the perineal flexure, the S-shaped frontal flexure.
 - The coccygeal flexure, the perineal flexure, the S-shaped sagittal flexure.
 - The sacral flexure, the sigmoid flexure, the S-shaped frontal flexure.
 - The sacral flexure, the coccygeal flexure, the perineal flexure.

67. Which mucosal folds are present in the rectal ampulla?

- + The transverse folds.
- The longitudinal folds.
- The oblique folds.
- The semilunar folds.

68. The mucosa of the anal canal contains the following structures:

- + The anal columns, sinuses, valves, transitional zone, anocutaneous line.
- The anal columns, sinuses, orifices, external sphincter.
- The anal sinuses, valves, anal haustrae, taeniae, transitional zone.
- The anal transitional zone, anocutaneous line, anal appendices.

69. The internal anal sphincter is formed by:

- + The circular layer of the muscular coat of the anal canal.
- The longitudinal layer of the muscular coat of the anal canal.
- The circular striated muscular fibers of the perineum.
- The longitudinal striated muscular fibers of the perineum.

70. The external anal sphincter is formed by:

- + The circular striated muscular fibers of the perineum.
- The longitudinal smooth muscular fibers of the perineum.
- The circular layer of the muscular coat of the anal canal.
- The longitudinal layer of the muscular coat of the anal canal.

71. What structures are between the anal columns?

- + The anal sinuses.
- The anal ampullae.
- The anal orifices.
- The anal fissurae.

72. The dilatable pelvic segment of the rectum is called:

- + The rectal ampulla.
- The body.
- The fundus.
- The rectal bulb.

THE LIVER, THE PANCREAS. THE PERITONEUM

1. Which surfaces does the liver have?

- + The diaphragmatic and visceral surfaces.
- The diaphragmatic and cardiac surfaces.
- The pulmonary and intestinal surfaces.
- The medial and lateral surfaces.

2. What impression is on the diaphragmatic surface of the liver?

- + The cardiac impression.
- The esophageal impression.
- The gastric impression.
- The renal impression.

3. The visceral surface of the liver bears some impressions produced by the abdominal viscera. They are:

- + The esophageal, gastric, duodenal, colic, renal, suprarenal impressions.
- The esophageal, gastric, cardiac, pulmonary, suprarenal impressions.
- The diaphragmatic, duodenal, rectal, colic, renal impressions.
- The gastric, duodenal, colic, caecal, splenic, cardiac impressions.

4. The liver is projected on the anterior abdominal wall:

- + In the right hypochondrium, the epigastric region, the left hypochondrium.
- In the left hypochondrium, the epigastric region, the left lateral region.
- In the right hypochondrium, the umbilical region, the right lateral region.
- In the right lateral region, the umbilical region, the left lateral region.

5. What ligament is located on the diaphragmatic surface of the liver?
- + The falciform ligament.
 - The ligamentum venosum.
 - The ligamentum teres of the liver.
 - The hepatorenal ligament.
6. A deep transverse fissure located in the centre of the visceral surface of the liver is called:
- + The porta hepatis.
 - The groove for vena cava.
 - The fissure for ligamentum teres.
 - The fissure for ligamentum venosum.
7. Through the porta hepatis some structures enter the liver and leave it (from the right to the left):
- + The common hepatic duct, the portal vein, the proper hepatic artery.
 - The bile duct, the portal vein, the common hepatic artery.
 - The common hepatic duct, the inferior vena cava, the proper hepatic artery.
 - The common hepatic duct, the common hepatic vein, the common hepatic artery.
8. The left sagittal groove of the visceral surface of the liver is formed by:
- + The fissure for ligamentum teres, the fissure for ligamentum venosum.
 - The fossa for gallbladder, the fissure for ligamentum venosum.
 - The fossa for gallbladder, the groove for vena cava.
 - The fissure for ligamentum teres, the groove for vena cava.
9. The right sagittal groove of the visceral surface of the liver is formed by:
- + The fossa for gallbladder, the groove for vena cava.
 - The fissure for ligamentum teres, the fissure for ligamentum venosum.
 - The fossa for gallbladder, the fissure for ligamentum venosum.
- The fissure for ligamentum teres, the groove for vena cava.
10. The quadrate lobe on the visceral surface of the liver is bounded by:
- + The fissure for ligamentum teres, the fossa for gallbladder, the porta hepatis.
 - The fossa for gallbladder, the porta hepatis, the groove for vena cava.
 - The fissure for ligamentum teres, the fissure for ligamentum venosum, the porta hepatis.
 - The groove for vena cava, the fossa for gallbladder, the porta hepatis.
11. The caudate lobe on the visceral surface of the liver is bounded by:
- + The fissure of ligamentum venosum, the groove for vena cava, the porta hepatis.
 - The groove for vena cava, the fissure of ligamentum venosum, the fossa for gallbladder.
 - The groove for vena cava, the fissure of ligamentum teres, the porta hepatis.
 - The fossa for gallbladder, the fissure of ligamentum teres, the porta hepatis.
12. What lobe of the liver lies anterior to the porta hepatis?
- + The quadrate lobe.
 - The caudate lobe.
 - The right lobe.
 - The left lobe.
13. What lobe of the liver lies posterior to the porta hepatis?
- + The caudate lobe.
 - The quadrate lobe.
 - The right lobe.
 - The left lobe.
14. The caudate lobe has two processes:
- + The papillary process, the caudate process.
 - The papillary process, the uncinat process.
 - The caudate process, the omental process.
 - The uncinat process, the omental process.

15. What is the morpho functional unit of the liver?

- + The lobule of liver.
- The lobe of liver.
- The acinus.
- The nephron.

16. What is located in the centre of hepatic lobule (the morpho functional unit)?

- + The central vein.
- The hepatic vein.
- The bile duct.
- The proper hepatic artery.

17. The initial links of the ducts which carry bile from the liver are:

- + The bile ductules.
- The right hepatic duct.
- The left hepatic duct.
- The bile duct (choledoch).

18. The common hepatic duct is formed by the junction of:

- + The right and the left hepatic ducts.
- The bile ductules and the bile duct (choledoch).
- The hepatic duct and the pancreatic duct.
- The bile duct (choledoch) and the pancreatic duct.

19. The bile duct (choledoch) forms in the porta hepatis as the result of junction of:

- + The common hepatic duct and the cystic duct.
- The right and left hepatic duct.
- The common hepatic duct and the pancreatic duct.
- The bile ductule and the common hepatic duct.

20. The highest point of the upper boundary of the liver on the right midclavicular line reaches:

- + The 4th intercostal space.
- The 5th intercostal space.
- The 6th intercostal space.

– The 10th intercostal space.

21. The upper and lower boundaries of the liver join on the right midaxillary line at the level of:

- + The 10th intercostal space.
- The 9th intercostal space.
- The 11th intercostal space.
- The 7th intercostal space.

22. The upper and lower boundaries of the liver join the left parasternal line at the level of:

- + The 5th intercostal space.
- The 10th intercostal space.
- The 7th intercostal space.
- The 4th intercostal space.

23. What parts does the gallbladder have?

- + The fundus, body, neck.
- The fornix, body, isthmus.
- The fundus, body, ampulla.
- The body, ampulla, neck.

24. The neck of the gallbladder is continuous with:

- +The cystic duct.
- The ampullar duct.
- The common hepatic duct.
- The bile duct (choledoch).

25. The hepatopancreatic ampulla is formed by joint of:

- + The bile duct (choledoch) and pancreatic duct.
- The common hepatic duct and pancreatic duct.
- The cystic duct and common hepatic duct.
- The common hepatic duct and common pancreatic duct.

26. Where does the hepatopancreatic ampulla open?

- + On the tip of the major duodenal papilla .
- On the tip of the minor duodenal papilla.
- On the mucosa of the gallbladder.

– On the mucosa of the pyloric canal of stomach.

27. The gallbladder is covered with peritoneum on:

- + Three sides.
- One side.
- Two sides.
- Not covered at all.

28. What is Oddi's sphincter?

- + The sphincter of hepatopancreatic ampulla.
- The sphincter of common hepatic duct.
- The cystic sphincter.
- The pyloric sphincter.

29. The pancreas is divided into:

- + The head, body, tail.
- The head, neck, body.
- The body, neck, tail.
- The fundus, body, tail.

30. The pancreas belongs to:

- + The retroperitoneal organs.
- The mesoperitoneal organs.
- The intraperitoneal organs.
- The subperitoneal organs.

31. The pancreas lies at the level of:

- + The L1–L2 vertebrae.
- The Th12–L1 vertebrae.
- The L2–L4 vertebrae.
- The L3–L5 vertebrae.

32. The tail of pancreas passes in direction of:

- + The splenic hilum.
- The porta hepatis.
- The hilum of the right kidney.
- The hilum of the left kidney.

33. The accessory pancreatic duct is formed in:

- + The head.
- The body.

- The neck.
- The tail.

34. The accessory pancreatic duct opens on:

- + The minor duodenal papilla.
- The major duodenal papilla.
- The omental eminence.
- The head of pancreas.

35. The pancreas belongs to:

- + The glands of mixed secretion.
- The exocrine glands.
- The endocrine glands.
- The salivary glands.

36. The pancreatic islets (Islets of Langerhans) belong to:

- + The endocrine portion.
- The exocrine portion.
- The stroma of pancreas.
- The mixed portion.

37. The exocrine portion of the pancreas consists of functional units:

- + The pancreatic lobules.
- The pancreatic islets (Islets of Langerhans).
- The pancreatic ducts.
- The pancreatic segments.

38. The endocrine portion of the pancreas is represented with:

- + The pancreatic islets (Islets of Langerhans islets).
- The pancreatic lobules.
- The pancreatic acini.
- The stroma of pancreas.

39. Where do the pancreatic islets mainly lie?

- + In the tail.
- In the body.
- In the head.
- In the neck.

40. The superior wall of the abdominal cavity which separates it from the thoracic one is:

- + The diaphragm.
 - The transverse colon.
 - The lesser omentum.
 - The liver.
41. The anterior wall of the abdominal cavity is formed by:
- + The tendinous expansions of three broad abdominal muscles and the rectus abdominis muscles.
 - The ascending and descending colon
 - The transverse colon.
 - The lumbar sgment of the spine, the psoas major and quadratus lumborum muscles.
42. The components of the lateral walls of the abdominal cavity are:
- + The muscular portions of three broad muscles of the abdomen.
 - The tendinous expansions of three broad abdominal muscles and the rectus abdominis muscles.
 - The ascending and the descending colon.
 - The greater omentum.
43. The components of the inferior wall of the abdominal cavity are:
- + The iliac bones and the pelvic diaphragm.
 - The transverse colon.
 - The lumbar sgment of the spine, the psoas major and the quadratus lumborum muscles.
 - The transverse mesocolon.
44. The posterior wall of the abdominal cavity is formed by:
- + The lumbar sgment of the spine, the psoas major and the quadratus lumborum muscles.
 - The iliac bone and the pelvic diaphragm.
 - The root of the mesentery.
 - The muscular portions of three broad muscles of the abdomen.
45. Which of the following are intraperitoneal organs?

- + The stomach, transverse colon, the caecum.
- The stomach, gallbladder, spleen.
- The liver, the spleen, the sigmoid colon.
- The pancreas, caecum, urinary bladder.

46. Which of the following are extraperitoneal organs?

- + The pancreas, kidneys, ureters.
- The pancreas, spleen, urinary bladder.
- The liver, kidneys, rectum.
- The stomach, transverse colon, duodenum.

47. Intraperitoneal organs are organs covered with peritoneum from:

- + All sides.
- Three sides.
- One side.
- Not covered at all.

48. Mesoperitoneal organs are organs covered with peritoneum from:

- + Three sides.
- One side.
- All sides.
- Not covered at all.

49. Extraperitoneal organs are organs covered with peritoneum from:

- + One side.
- Three sides.
- Two sides.
- Four sides.

50. Which peritoneal fold connects the small intestine to the posterior abdominal wall?

- + The mesentery.
- The median umbilical fold.
- The greater omentum.
- The rectovesical folds.

51. Which of the following organs have mesenteries?

- + The transverse colon, sigmoid colon, jejunum, ileum.
- The caecum, sigmoid colon, duodenum, ileum.

- The ascending colon, descending colon, jejunum, ileum.
- The duodenum, transverse colon, sigmoid colon, rectum.

52. Between the median umbilical fold and the medial umbilical folds are:

- + The supramesical fossae.
- The medial inguinal fossae.
- The lateral inguinal fossae.
- The intramesical fossae.

53. The supramesical fossae are located between:

- + The median umbilical and medial umbilical folds.
- The median umbilical and lateral umbilical folds.
- The hepatogastric and hepatoduodenal ligaments.
- The ileocaecal and caecal folds.

54. Between the medial umbilical and lateral umbilical folds is:

- + The medial inguinal fossa.
- The lateral inguinal fossa.
- The femoral fossa.
- The rectovesical pouch.

55. The medial inguinal fossa is located between:

- + The medial umbilical and lateral umbilical folds.
- The median umbilical and medial umbilical folds.
- The gastrosplenic and gastrocolic ligaments.
- The sigmoid mesocolon and the root of mesentery.

56. The superficial inguinal ring is located exactly opposite to:

- + The medial inguinal fossa.
- The lateral inguinal fossa.
- The supramesical fossa.
- The rectovesical pouch.

57. The deep inguinal ring corresponds to:

- + The lateral inguinal fossa.
- The medial inguinal fossa.
- The intramesical fossa.
- The femoral fossa.

58. The lesser omentum consists of:

- + The hepatogastric ligament, hepatoduodenal ligament.
- The hepatogastric ligament, gastrocolic ligament.
- The gastrocolic ligament, gastrosplenic ligament.
- The gastrosplenic ligament, hepatoesophageal ligament.

59. What structures are located between the layers of the hepatoduodenal ligament (from the right to the left)?

- + The bile duct, the hepatic portal vein, the proper hepatic artery.
- The bile duct, the inferior vena cava, the common hepatic artery.
- The common hepatic duct, the hepatic portal vein, the common hepatic artery.
- The common hepatic duct, the hepatic veins, the proper hepatic artery.

60. Inferior to the transverse colon is located greater omentum which consists of:

- + Four plates of peritoneum.
- Three plates of peritoneum.
- Two plates of peritoneum.
- Six plates of peritoneum.

61. The superior level of the peritoneal cavity is separated from the inferior level by:

- + The transverse colon and its mesocolon.
- The duodenum.
- The root of mesentery.
- The coronary ligament, the right/left triangular ligaments.

62. The superior level of the peritoneal cavity is divided into:

- + The hepatic bursa, pregastric bursa, omental bursa.
 - the right mesenteric sinus, left mesenteric sinus.
 - The the right paracolic gutter, left paracolic gutter.
 - The prehepatic bursa, intragastric bursa, omental bursa.
63. Which of the following are the organs of the superior level of the peritoneal cavity?
- + The liver, gallbladder, stomach, spleen.
 - The liver, urinary bladder, pancreas, caecum.
 - The stomach, caecum, kidneys.
 - The liver, stomach, ascending colon, descending colon.
64. The hepatic bursa is separated from the pregastric bursa by:
- + The falciform ligament of the liver.
 - The venous ligament of the liver.
 - The lesser omentum.
 - The root of the mesentery.
65. Which structures of the general peritoneal cavity communicates through the epiploic (omental) foramen?
- + The hepatic bursa and omental bursa.
 - The hepatic bursa and pregastric bursa.
 - The pregastric bursa and omental bursa.
 - The omental bursa and inferior level of the peritoneal cavity.
66. The omental bursa is bounded above by:
- + The caudate lobe of the liver.
 - The quadrate lobe of the liver.
 - The diaphragm.
 - The transverse colon and its mesocolon.
67. What is the omental bursa bounded in front by?
- +The posterior wall of stomach, lesser omentum, gastrocolic ligament.
 - The anterior wall of stomach, lesser omentum, coronary ligament.
- The parietal peritoneum covering the posterior abdominal wall.
 - The coronary ligament, the right/left triangular ligaments.
68. What is the omental bursa bounded behind by?
- + The parietal peritoneum covering the posterior abdominal wall.
 - The posterior wall of stomach, the lesser omentum, the gastrocolic ligament.
 - The transverse colon and its mesocolon.
 - The diaphragmatic peritoneum.
69. What is the omental bursa bounded below by?
- + The transverse colon and its mesocolon
 - The coronary ligament, the right/left triangular ligaments.
 - The superior part of duodenum.
 - Free margin of the hepatoduodenal ligament.
70. The pregastric bursa is bounded posteriorly by:
- + The anterior wall of stomach, lesser omentum, left triangular ligament.
 - The posterior wall of stomach, lesser omentum, gastrocolic ligament.
 - The parietal peritoneum covering the posterior abdominal wall.
 - The falciform ligament.
71. The epiploic (omental) foramen is bounded anteriorly by:
- + The free margin of the hepatoduodenal ligament.
 - The falciform ligament.
 - The caudate lobe of liver.
 - The parietal peritoneum covering the posterior abdominal wall.
72. What is the epiploic (omental) foramen bounded behind by?
- + The parietal peritoneum, the hepatorenal ligament.
 - The superior part of duodenum.

- The transverse mesocolon.
- The coronary ligament, the right triangular ligament.

73. What is the epiploic (omental) foramen bounded above by?

- + The caudate lobe of liver.
- The quadrate lobe of liver.
- The superior part of duodenum.
- The parietal peritoneum, the hepatorenal ligament.

74. The epiploic (omental) foramen is bounded inferiorly by:

- + The superior part of duodenum.
- The quadrate lobe of liver.
- The free margin of the hepatoduodenal ligament.
- The transverse mesocolon.

75. The right paracolic gutter is limited by:

- + The caecum, ascending colon, parietal peritoneum.
- The descending colon, sigmoid colon, parietal peritoneum.
- The root of mesentery, parietal peritoneum.
- The root of mesentery, root of transverse mesocolon, ascending colon.

76. The left paracolic gutter is limited by:

- + The descending colon, sigmoid colon, parietal peritoneum.
- The caecum, ascending colon, parietal peritoneum.
- The descending colon, sigmoid colon, root of mesentery.
- The ascending colon, transverse colon, root of mesentery.

77. The right mesenteric sinus is bounded by:

- + The ascending colon, root of mesentery, root of transverse mesocolon.
- The descending colon, root of mesentery, root of transverse mesocolon.
- The descending colon, root of mesentery, rectum.

- The caecum, ascending colon, parietal peritoneum.

78. The right mesenteric sinus and left mesenteric sinus are separated by:

- + The root of mesentery.
- The root of transverse mesocolon.
- The root of sigmoid mesocolon.
- The falciform ligament of liver.

79. The right mesenteric sinus has a triangular shape. The superior margin of the triangle consists of:

- + The root of transverse mesocolon.
- The root of mesentery.
- The descending colon, the sigmoid mesocolon.
- The caecum, the ascending colon.

80. The left mesenteric sinus is bounded by:

- + The descending colon, sigmoid mesocolon, root of mesentery, pelvic inlet.
- The descending colon, root of mesocolon, root of transverse mesocolon.
- The ascending colon, root of mesentery, root of transverse mesocolon.
- The caecum, the ascending colon, root of mesentery, pelvic inlet.

81. The left wall of the left mesenteric sinus is formed by:

- + The descending colon, sigmoid mesocolon.
- The caecum, ascending colon.
- The root of transverse mesocolon.
- The root of mesentery.

82. The right wall of the right mesenteric sinus is formed by:

- + The ascending colon.
- The descending colon.
- The root of transverse mesocolon.
- The root of mesentery.

83. Which of the following excavations are located in female lesser pelvis?

- +The recto-uterine pouch, the vesico-uterine pouch.
- The recto-uterine pouch, the pubo-uterine pouch.
- The vesico-uterine pouch, the recto-vesical pouch.
- The pubo-vesical pouch, the recto-sacral pouch.

84. Which of the following excavations are located in male lesser pelvis?

- + The recto-vesical pouch.
- The recto-sacral pouch, the pubo-vesical pouch.
- The pubo-rectal pouch, the recto-prostatic pouch.
- The vesico-prostatic pouch.

85. In what level of the peritoneal cavity is the mesenteric portion of the small intestine located?

- + In the middle level.
- In the superior level.
- In the pelvic cavity.
- In the retroperitoneal space.

86. Which of the following are the organs of pelvic cavity?

- + The uterus, the prostate, the rectum, the urinary bladder.
- The uterus, the rectum, the gallbladder, the sigmoid colon.
- The uterus, the prostate, the ovaries, the testes.
- The caecum, the sigmoid colon, the rectum, the urinary bladder.

87. The peritoneal relation of full urinary bladder is:

- + Mesoperitoneal organ.
- Intraperitoneal organ.
- Extraperitoneal organ.
- Retroperitoneal organ.

88. Empty urinary bladder is covered with the peritoneum from:

- + One side.

- Three sides.
- All sides.
- Not covered at all.

THE RESPIRATORY SYSTEM: THE NOSE, THE NASAL CAVITY, TRACHEA, BRONCHI

1. The parts of the nose are the following:

- + The root, the dorsum, the apex, the alae of the nose.
- The root, the dorsum, the body, the external naris.
- The dorsum, the apex, the choanae.
- The root, the body, the external naris, the choanae.

2. The bony skeleton of the nose is formed by:

- + The nasal bones, the frontal processes of maxillae.
- The nasal bones, the nasal part of frontal bone.
- The frontal processes of maxillae, the nasal part of frontal bone.
- The nasal surfaces of maxillae, the nasal part of frontal bone.

3. The cartilaginous skeleton of the nose consists of the following nasal cartilages:

- + The major and minor alar cartilages, the septal nasal cartilage, the vomeronasal cartilage, the accessory nasal cartilages.
- The medial nasal cartilage, the major and minor alar cartilages, the septal nasal cartilage.
- The septal nasal cartilage, the vomeronasal cartilage, the arytenoid cartilages, the accessory nasal cartilages.
- The major and minor alar cartilages, the arytenoid cartilages, the cuneiform cartilages.

4. Posteriorly the nasal cavity communicates via choanae with:

- + The nasopharynx.
- The laryngopharynx.
- The external environment.

- The superior nasal meatuses.
5. The bony part of the nasal septum is formed by:
 - + The perpendicular plate of ethmoid bone, the vomer.
 - The vomer, the horizontal plate of ethmoid bone.
 - The horizontal plate of ethmoid and palatine bones.
 - The perpendicular plate of ethmoid and palatine bones.
 6. The superior nasal meatus is located between:
 - + The superior and middle nasal conchae.
 - The middle and inferior nasal conchae.
 - The superior nasal concha and the superior wall of nasal cavity.
 - The nasal septum and the medial surfaces of nasal conchae.
 7. The superior nasal meatus receives the openings of:
 - + The sphenoid sinus, the posterior ethmoidal cells, the sphenopalatine foramen.
 - The anterior and middle openings of ethmoidal cells, the frontal sinus.
 - The semilunar hiatus, the ethmoid infundibulum, the sphenoid sinus.
 - The posterior ethmoidal cells, the maxillary sinus, the incisive canal.
 8. The middle nasal meatus is located between:
 - + The middle and the inferior nasal conchae.
 - The superior and the inferior nasal conchae.
 - The superior and the middle nasal conchae.
 - The inferior nasal concha and the inferior wall of nasal cavity.
 9. The middle nasal meatus receives the openings of:
 - + The anterior and middle ethmoidal cells, the semilunar hiatus (maxillary sinus), the ethmoidal infundibulum (frontal sinus).
 - The posterior ethmoidal cells, the sphenoid sinus, the ethmoidal infundibulum (frontal sinus).
 - The opening of nasolacrimal duct, the incisive canal.
 - The sphenopalatine foramen, the sphenoid sinus, the semilunar hiatus (maxillary sinus).
 10. The inferior nasal meatus is located between:
 - + The inferior nasal concha and the hard palate.
 - The superior and inferior nasal conchae.
 - The superior and middle nasal conchae.
 - The middle and inferior nasal conchae.
 11. The inferior nasal meatus receives openings of:
 - + The nasolacrimal duct, the incisive canal.
 - The posterior ethmoidal cells, the sphenoid sinus.
 - The anterior and middle ethmoid cells, the semilunar hiatus, the incisive canal.
 - The anterior ethmoidal cells, the ethmoidal infundibulum (frontal sinus).
 12. The olfactory region is the portion of nasal mucosa covering:
 - + The superior nasal concha, the upper part of middle concha and respective area of nasal septum.
 - The middle nasal concha, the upper part of inferior concha and respective area of nasal septum.
 - The inferior nasal concha and respective area of nasal septum.
 - The nasal septum.
 13. The respiratory region is the portion of nasal mucosa covering:
 - + The inferior nasal concha, the part of middle concha and respective area of nasal septum.

- The superior nasal concha, the part of middle concha and respective area of nasal septum.
- The superior nasal concha and respective area of nasal septum.
- The nasal septum.

14. The larynx is located at the level of:

- + C4 – C6 vertebrae.
- C2 – C4 vertebrae.
- C5 – C7 vertebrae.
- C3 – the vertebrae.

15. The laryngeal inlet is bounded by:

- +The epiglottis, aryepiglottic folds, apices of arytenoid cartilages, the interarytenoid fold.
- The epiglottis, thyroepiglottic folds, the lateral glossoepiglottic folds.
- The vocal folds.
- The vocal folds and the vestibular folds.

16. The laryngeal cavity is divided into the following compartments:

- + The vestibule, the middle part, the infraglottic cavity.
- The vestibule, the rima vestibuli, the rima glottidis.
- The rima glottidis, the laryngeal ventricle, the infraglottic cavity.
- The rima glottidis, the vestibule, the laryngeal ventricle.

17. The laryngeal ventricle is located between:

- + The vestibular fold and the vocal folds.
- The laryngeal inlet and the vocal folds.
- The laryngeal inlet and the vestibular folds.
- The aryepiglottic folds and the epiglottis.

18. The laryngeal vestibule is located between:

- + The laryngeal inlet and the vestibular folds.
- The laryngeal inlet and the vocal folds.
- The vestibular folds and the vocal folds.
- The vestibular folds and the infraglottic cavity.

19. What is the rima glottidis bounded by?

- + The vocal folds.
- The vestibular folds.
- The vocal ligaments.
- The aryepiglottic folds.

20. Which parts does the rima glottidis have?

- + The intermembranous part and the intercartilaginous part.
- The intercartilaginous part and the intermuscular part.
- The intermembranous part and the bony part.
- The anterior and the posterior part.

21. The fibro-elastic membrane of larynx consists of:

- + The conus elasticus and the quadrangular membrane.
- The quadrangular membrane and the pharyngobasilar fascia.
- The conus elasticus and the pharyngobasilar fascia.
- The vestibular folds and the vocal folds.

22. The vestibular ligament of the larynx is formed by:

- + The free inferior border of quadrangular membrane.
- The superior border of quadrangular membrane.
- The free superior border of conus elasticus.
- The inferior border of conus elasticus.

23. The quadrangular membrane is elastic membrane located under mucosa of lateral wall of:

- + The laryngeal vestibule.
- The intermediate laryngeal cavity.
- The infraglottic cavity.
- The laryngeal ventricles.

24. The vocal ligament of the larynx is formed by:

- + The free superior border of conus elasticus.

- The inferior border of conus elasticus.
- The free inferior border of quadrangular membrane.
- The superior border of quadrangular membrane.

25. The conus elasticus is elastic membrane located under mucosa of walls of:

- + The infraglottic cavity.
- The laryngeal vestibule.
- The laryngeal ventricle.
- The ary-epiglottic folds.

26. Which of laryngeal cartilages are unpaired cartilages?

- + The thyroid, cricoid and epiglottic.
- The thyroid, epiglottic and cuneiform.
- The arytenoid, corniculate and cuneiform.
- The cricoid, arytenoid and corniculate.

27. Which of laryngeal cartilages are paired cartilages?

- + The arytenoid, corniculate and cuneiform.
- The arytenoid, corniculate and thyroid.
- The corniculate, cuneiform and cricoid.
- The epiglottic, thyroid and arytenoid.

28. Which joints do the laryngeal cartilages form?

- + The cricothyroid joint and the cricoarytenoid joint.
- The cricocorniculate joint and the thyrocorniculate joint.
- The thyroepiglottic joint and the cricocuneiform joint.
- The thyroarytenoid joint and the thyrohyoid joint.

29. Which processes does the arytenoid cartilage have?

- + The vocal and the muscular processes.
- The vocal and the vestibular processes.
- The muscular and the corniculate processes.
- The vocal, the corniculate and the cuneiform processes.

30. The laryngeal muscles that widen the rima glottidis are as follows:

- + The posterior cricoarytenoid muscle.
- The lateral cricoarytenoid muscle.
- The thyroarytenoid muscle.
- The aryepiglottic and the transverse arytenoid muscles.

31. What is the function of the posterior cricoarytenoid muscle?

- + It opens the rima glottidis.
- It narrows the rima glottidis.
- It tenses the vocal ligaments.
- It relaxes the vocal ligaments.

32. Which of the following muscles does the rima glottidis narrow?

- + The lateral cricoarytenoid muscle.
- The posterior cricoarytenoid muscle.
- The cricothyroid muscle.
- The vocalis muscle.

33. What is the function of the lateral cricoarytenoid muscle?

- + It narrows the rima glottidis.
- It opens the rima glottidis.
- It tenses the vocal ligaments.
- It relaxes the vocal ligaments.

34. The laryngeal muscles that tense the vocal ligaments are as follows:

- + The cricothyroid muscle.
- The transverse and the oblique arytenoid muscles.
- The thyroarytenoid muscle.
- The lateral and the posterior cricoarytenoid muscles.

35. What is the function of the cricothyroid muscle?

- + It tenses the vocal ligaments.
- It relaxes the vocal ligaments.
- It tenses the vestibular ligaments.
- It opens the rima glottidis.

36. What is the function of the transverse and oblique arytenoid muscles?
- + They narrow the rima glottidis.
 - They open the rima glottidis.
 - They tense the vocal ligaments.
 - They relax the vestibular ligaments.
37. What is located behind the larynx?
- + The laryngopharynx.
 - The esophagus.
 - The nasopharynx.
 - The trachea.
38. Which laryngeal cartilage does the Adam's apple (laryngeal prominence) form?
- + The thyroid cartilage.
 - The cricoid cartilage.
 - The epiglottis.
 - The arytenoid cartilage.
39. The upper air passage includes:
- +The nasal cavity, pharynx.
 - The nasal cavity, pharynx, larynx.
 - The pharynx, larynx, trachea.
 - The laryngopharynx, larynx.
40. The lower air passage includes:
- + The larynx, trachea, bronchi.
 - The laryngopharynx, larynx, trachea.
 - The nasal cavity, nasopharynx, oropharynx.
 - The trachea, bronchi, lungs.
41. The thyroid cartilage is the largest of the laryngeal cartilages. It consists of:
- + Two laminae, superior and inferior horns.
 - The lamina and the arch.
 - Two laminae, vocal and muscular processes.
 - The lamina, superior and inferior horns.
42. Where is the arch of the cricoid cartilage located?
- + In front and on the sides.
 - At the back and on the sides.
- Laterally.
 - Medially.
43. Where is the lamina (plate) of the cricoid cartilage located?
- + At the back and on the sides.
 - In front and on the sides.
 - Laterally.
 - Medially.
44. The trachea is located at the level of:
- + C6 – Th5.
 - C4 – Th5.
 - Th1 – Th5.
 - C4 – C6.
45. Where is the trachea split into two principal bronchi?
- + At the level of Th5 vertebra.
 - At the level of Th7 vertebra.
 - At the level of C5 vertebra.
 - At the level of C7 vertebra.
46. The tracheal bifurcation is located at the level of:
- + Th5.
 - C5.
 - Th7.
 - C7.
47. What parts does the trachea have?
- +The cervical and thoracic parts.
 - The cranial and cervical parts.
 - The cervical, thoracic and abdominal parts.
 - The cranial, cervical and thoracic parts.
48. Posteriorly the trachea is related to:
- + The oesophagus.
 - The bronchi.
 - The larynx.
 - The pharynx.
49. How many incomplete rings of cartilage does the trachea have?
- + 16–20.

- 10–15.
- 20–25.
- 25–30.

50. The posterior wall of the trachea is called:

- + The membranous wall.
- The cartilaginous wall.
- The bony wall.
- The muscular wall.

51. The trachea splits into:

- + The principal (main) bronchi.
- The lobar bronchi.
- The lobular bronchi.
- The segmental bronchi.

THE LUNGS, PLEURA, MEDIASTINUM

1. Which surfaces are distinguished in the lungs?

- + The costal, diaphragmatic, medial, interlobar surfaces.
- The diaphragmatic, costal, lateral, cardiac surfaces.
- The costal, medial, lateral, basilar surfaces.
- The costal, medial, interlobar surfaces.

2. The medial surface of the lung is divided into:

- + The mediastinal and vertebral parts.
- The vertebral and costal parts.
- The mediastinal and lateral parts.
- The costal and cardiac parts.

3. What border of the left lung is interrupted with the cardiac notch?

- + The anterior border.
- The posterior border.
- The inferior border.
- The superior border.

4. The cardiac notch of the left lung is bounded below by:

- + The lingula of the lung.
- The process of the lung.
- The hilum of the lung.
- The apex of the lung.

5. How many lobes does the left lung have?

- + 2.
- 3.
- 4.
- 1.

6. How many lobes does the right lung have?

- + 3.
- 2.
- 1.
- 4.

7. The right lung has the following fissures:

- + The oblique and the horizontal fissures.
- The oblique and the vertical fissures.
- The horizontal and the vertical fissures.
- The oblique and the straight fissures.

8. Where is the hilum of the lung located?

- + On the mediastinal surface.
- On the diaphragmatic surface.
- On the costal surface.
- On the apex of the lung.

9. Some structures enter the right lung and leave it via the hilum (from up to down):

- + The main bronchus, the pulmonary artery, the pulmonary veins.
- The pulmonary artery, the main bronchus, the pulmonary veins.
- The pulmonary veins, the main bronchus, the pulmonary artery.
- The pulmonary artery, the pulmonary veins, the main bronchus.

10. Some structures enter the left lung and leave it via the hilum (from up to down):

- + The pulmonary artery, the main bronchus, the pulmonary veins.
- The pulmonary artery, the pulmonary veins, the main bronchus.

- The main bronchus, the pulmonary artery, the pulmonary veins.
- The pulmonary veins, the pulmonary artery, the main bronchus.

11. Each of the main bronchi on reaching the pulmonary hilum separates into:

- + The lobar bronchi.
- The segmental bronchi.
- The lobular bronchi.
- The terminal bronchioles.

12. How many lobar bronchi are in the right lung?

- + 3.
- 2.
- 5.
- 10.

13. How many lobar bronchi are in the left lung?

- + 2.
- 3.
- 5.
- 10.

14. On entering the substance of the lung, the lobar bronchi give off several smaller, tertiary bronchi called:

- + The segmental bronchi.
- The main bronchi.
- The lobular bronchi.
- The terminal bronchioles.

15. All the bronchi compose a single bronchial tree, they are:

- + The main, lobar, segmental, lobular bronchi and terminal bronchioles.
- The segmental, lobular bronchi; terminal and respiratory bronchioles.
- The respiratory bronchioles, alveolar ducts, alveolar saccules.
- The terminal and respiratory bronchioles, alveolar ducts.

16. The alveolar tree (acinus) is formed by:

- + The respiratory bronchioles, alveolar ducts, alveolar saccules, pulmonary alveoles.
- The main, lobar, segmental, lobular bronchi and terminal bronchioles.
- The segmental bronchi, respiratory bronchioles, alveolar ducts.
- The terminal and respiratory bronchioles, alveolar ducts and saccules.

17. What is the structural–functional unit of the parenchyma of the lung?

- + The acinus.
- The bronchial tree.
- The lobules.
- The segment.

18. How many segments does the superior lobe of the left lung have?

- + 5.
- 4.
- 3.
- 6.

19. The inferior lobe of the left lung consists of:

- + 5 segments.
- 4 segments.
- 3 segments.
- 6 segments.

20. How many segments does the upper lobe of the right lung have?

- + 3.
- 4.
- 2.
- 5.

21. How many segments does the middle lobe of the right lung have?

- + 2.
- 3.
- 5.
- 1.

22. How many segments does the inferior lobe of the right lung have?

- + 5.
 - 3.
 - 2.
 - 6.
23. The root of the lung has the following structures:
- + The main bronchus, pulmonary artery, pulmonary veins, lymphatic vessels, nerves, lymph nodes.
 - The segmental bronchus, pulmonary artery, pulmonary veins, lymphatic vessels, lymph nodes.
 - The pulmonary artery, pulmonary veins, nerves, trachea.
 - The lobular bronchi, pulmonary artery, pulmonary veins, nerves, lymph nodes.
24. The apex of the lungs is located anteriorly:
- + 2cm above the clavicle or 3 – 4 cm above the 1st rib.
 - 3cm above the clavicle or 1 – 2 cm above the 1st rib.
 - 2cm below the clavicle or 1 – 2 cm below the 1st rib.
 - 4cm below the clavicle or 4 – 5 cm above the 1st rib.
25. The apex of the lungs is located posteriorly at the level of:
- + The spinous process of C7.
 - The spinous process of C5.
 - The transverse processes of C4.
 - The spinous process of Th1.
26. Where is the anterior boundary of the right lung continuous with its inferior boundary?
- + At the level of the 6th rib.
 - At the level of the 4th rib.
 - At the level of the 7th rib.
 - At the level of the 10th rib.
27. At the midclavicular line the inferior boundary of the right lung crosses:
- + The 6th rib.
 - The 4th rib.
 - The 8th rib.
 - The 10th rib.
28. The inferior boundary of the right lung crosses the 6th rib at:
- + The midclavicular line.
 - The midaxillary line.
 - The scapular line.
 - The paravertebral line.
29. What rib does the inferior boundary of the right lung cross at the anterior axillary line?
- + The 7th rib.
 - The 6th rib.
 - The 9th rib.
 - The 10th rib.
30. The inferior boundary of the right lung crosses the 7th rib at:
- + The anterior axillary line.
 - The midclavicular line.
 - The posterior axillary line.
 - The scapular line.
31. What rib does the inferior boundary of the right lung cross at the midaxillary line?
- + The 8th rib.
 - The 5th rib.
 - The 10th rib.
 - The 6th rib.
32. What rib does the inferior boundary of the right lung cross at the posterior axillary line?
- + The 9th rib.
 - The 6th rib.
 - The 7th rib.
 - The 10th rib.
33. The inferior boundary of the right lung crosses the 10th rib at:
- + The scapular line.
 - The midaxillary line.

- The paravertebral line.
 - The anterior axillary line.
34. The posterior boundaries of the lungs run along the vertebral column:
- + From the neck of the 11th rib to the head of the 2nd rib.
 - From the neck of the 10th rib to the head of the 1st rib.
 - From the head of the 12th rib to the neck of the 3rd rib.
 - From the head of the 12th rib to the neck of the 6th rib.
35. The serous covering of the lung is called:
- + The pleura.
 - The peritoneum.
 - The pericardium.
 - The mediastinum.
36. What parts does the parietal pleura have?
- + The costal, mediastinal, diaphragmatic and cervical pleura.
 - The costal, lateral, medial and superior pleura.
 - The mediastinal, diaphragmatic, cervical and sternal pleura.
 - The cervical, anterior and posterior pleura.
37. The pleural cupula (dome of pleura) is the apical part of the parietal pleura formed by merged:
- + Mediastinal and costal parts.
 - Costal and diaphragmatic parts.
 - Mediastinal and diaphragmatic parts.
 - Parietal and visceral layers.
38. The pleural cavity is the potential space between:
- + The parietal and visceral pleurae.
 - The mediastinal and diaphragmatic pleurae.
 - The diaphragmatic and costal pleurae.
 - The mediastinal and costal pleurae.
39. Which of the pleural recesses is the deepest one?
- + The costodiaphragmatic recess.
 - The costomediastinal recess.
 - The phrenicomediastinal recess.
 - The vertebromediastinal recess.
40. The pleural cupula (dome of pleura) is located at the level of:
- + The spinous process of C7.
 - The transverse process of C6.
 - The spinous process of Th1.
 - The neck of the 2nd rib.
41. Anteriorly the pleural cupula (dome of pleura) lies:
- + 3– 4 cm higher from the 1st rib or 1– 2 cm higher from the clavicle.
 - 1– 2 cm higher from the 1st rib or behind the clavicle.
 - 1– 2 cm below the 1st rib or 3– 4 cm below the clavicle.
 - 3– 4 cm below the 1st rib or 1– 2 cm below the clavicle.
42. Where is the anterior boundary of the right pleura continuous with its inferior boundary?
- + At the level of the 6th rib.
 - At the level of the 8th rib.
 - At the level of the 9th rib.
 - At the level of the 4th rib.
43. The inferior boundary of the pleura crosses the 7th rib at:
- + The midclavicular line.
 - The parasternal line.
 - The midaxillary line.
 - The paravertebral line.
44. What rib does the inferior boundary of the pleura cross at the anterior axillary line?
- + The 8th rib.
 - The 6th rib.
 - The 10th rib.
 - The 12th rib.

45. The inferior boundary of the pleura crosses the 9th rib at:

- + The midaxillary line.
- The parasternal line.
- The scapular line.
- The anterior axillary line.

46. What rib does the inferior boundary of the pleura cross at the posterior axillary line?

- + The 10th rib.
- The 8th rib.
- The 11th rib.
- The 12th rib.

47. The inferior boundary of the pleura crosses the 11th rib at:

- + The scapular line.
- The midaxillary line.
- The anterior axillary line.
- The paravertebral line.

48. What rib does the inferior boundary of the pleura cross at the paravertebral line?

- + The 12th rib.
- The 10th rib.
- The 9th rib.
- The 8th rib.

49. The inferior boundary of the left pleura lies:

- + 1 cm lower than the right.
- 1 cm higher than the right.
- The same as the right.
- 2 cm higher than the right.

50. The posterior boundaries of the pleura pass along the vertebral column:

- + From the 12th rib to the 2nd rib.
- From the 11th rib to the 1st rib.
- From the 12th rib to the 3rd rib.
- From the 10th rib to the 1st rib.

51. The mediastinum is bounded anteriorly by:

- + The ribs and sternum.
- The anterior pericardial wall.
- The mediastinal pleura.
- The costal pleura.

52. The mediastinum is bounded posteriorly by:

- + The bodies of thoracic vertebra.
- The posterior pericardial wall.
- The mediastinal pleura.
- The costal pleura.

53. By what is the mediastinum bounded laterally?

- + The mediastinal pleura.
- The ribs and sternum.
- The costal pleura.
- The bodies of thoracic vertebra.

54. The inferior mediastinum consists of the following compartments:

- + The anterior, middle and posterior mediastinum.
- The superior, inferior and middle mediastinum.
- The medial, lateral and intermediate mediastinum.
- The right, intermediate and left mediastinum.

55. Where is the thymus located?

- + In the superior mediastinum.
- In the anterior mediastinum.
- In the posterior mediastinum.
- In the middle mediastinum.

56. The anterior mediastinum is located between:

- + The posterior surface of sternum and the anterior surface of pericardium.
- The posterior surface of sternum and the posterior surface of pericardium.
- The anterior and posterior surfaces of pericardium.
- The posterior surface of pericardium and the vertebral column.

57. The anterior pericardium contains:

- + The internal thoracic arteries and veins, the lymph nodes, fat.
- The main bronchi, the lymph nodes, fat.
- The thymus, the internal thoracic arteries and veins.
- The heart, the lymph nodes, the sympathetic trunks.

58. The middle mediastinum is bounded by:

- + The anterior and posterior walls of pericardium.
- The anterior wall of pericardium and the sternum.
- The posterior wall of pericardium and the vertebral column.
- The hilum of lungs and the vertebral column.

59. Which of the following organs are the organs of the middle mediastinum?

- + The heart and pericardium, main bronchi, phrenic nerves, lymph nodes.
- The heart, trachea, vagus nerves, sympathetic trunk, phrenic nerves.
- The thymus, pericardium, internal thoracic arteries and nerves.
- The oesophagus, trachea, heart, thoracic duct, lymph nodes.

60. Where is the heart located?

- + In the middle mediastinum.
- In the anterior mediastinum.
- In the posterior mediastinum.
- In the superior mediastinum.

61. Where is the trachea located?

- + In the superior mediastinum.
- In the anterior mediastinum.
- In the middle mediastinum.
- In the posterior mediastinum.

62. The main bronchi are located in:

- + The middle mediastinum.
- The anterior mediastinum.
- The posterior mediastinum.

– The superior mediastinum.

63. The posterior mediastinum is bounded by:

- + The posterior wall of pericardium and the vertebral column.
- The anterior and posterior walls of pericardium.
- The anterior wall of pericardium and the sternum.
- The sternum and the vertebral column.

64. Which of the following organs are the organs of the posterior mediastinum?

- + The oesophagus, vagus nerves, sympathetic trunk, aorta, thoracic duct.
- The oesophagus, internal thoracic arteries and veins, phrenic nerves, heart.
- The trachea, sympathetic trunks, thoracic aorta, fat, heart.
- The heart, phrenic nerves, main bronchi, azygos and hemiazygos veins.

65. Where is the thoracic aorta located?

- + In the posterior mediastinum.
- In the superior mediastinum.
- In the middle mediastinum.
- In the anterior mediastinum.

URINARY ORGANS

1. How does the peritoneum cover kidneys?

- + Extraperitoneally.
- Intraperitoneally.
- Mesoperitoneally.
- Subperitoneally.

2. The right kidney is located at the level of

- + Th 12th to L 3rd.
- Th 11th to L 2nd.
- Th 12th to L 2nd.
- Th 11th to L 3rd.

3. The left kidney is located at the level of

- + Th 11th to L 2nd.

- Th 12th to L 3rd.
- Th 12th to L 2nd.
- Th 11th to L 3rd.

4. What adjoins to the superior pole of the kidney?

- + Suprarenal gland.
- Spleen.
- Stomach.
- Pancreas.

5. What adjoins to the medial margin of the right kidney?

- + Descending part of the duodenum.
- Spleen.
- Stomach.
- Pancreas.

6. What adjoins to the anterior surface of the right kidney?

- + Liver, right colic flexure.
- Stomach, pancreas.
- Stomach, left colic flexure.
- Spleen, small intestine.

7. What adjoins to the lateral margin of the left kidney?

- + Spleen.
- Duodenum.
- Stomach.
- Pancreas.

8. What adjoins to the anterior surface of the left kidney?

- + Stomach, small intestine and pancreas.
- Stomach, spleen and duodenum.
- Liver, pancreas, small intestine.
- Stomach, spleen, transverse colon.

9. What is renal bed made of?

- + Diaphragm, psoas major, quadratus lumborum, transversus abdominis .
- Qudratus lumborum, internal oblique..
- Internal oblique, qudratus lumborum, transversus abdominis..
- Diaphragm, psoas major, internal oblique.

10. What poles does the kidney have?

- + Superior and inferior.
- Posterior and anterior.
- Medial and lateral.
- Rihgt and left.

11. What margins does the kidney have?

- + Medial and lateral.
- Superior and inferior.
- Posterior and anterior.
- Rihgt and left.

12. Where is the hilum of the kidney located?

- + On the medial margin.
- On the lateral margin.
- On the anterior surface.
- On the posterior surface.

13. Which of the following is a part of supporting apparatus of kidney?

- + Renal seat.
- Hilum of the kidney.
- Renal sinus.
- Renal cortex.

14. The renal pedicle consists of:

- + Renal artery and vein, ureter.
- Renal fascia, renal artery and vein.
- Renal sinus, lesser and major calyces.
- Hilum of the kidney, renal artery and vein.

15. What capsules of the kidney do you now?

- + Fibrous and adipous capsules, renal fascia.
- Fibrous and adipous capsules, serous coat.
- Fibrous and serous capsules.
- Serous and adipous capsules.

16. The cortex of the kidney descends to the medulla as:

- + Renal column.
- Renal pyramid.
- Renal papilla.
- Renal calyx.

17. The renal sinus contains:

- + Renal calices.
- Ureter.
- Renal columns.
- Renal pyramids.

18. The structural and functional unit of the kidney is:

- + Nephron.
- Renal lobe.
- Renal lobule.
- Renal pyramid.

19. The renal columns consist of:

- + Cortex.
- Medulla.
- Renal sinus.
- Renal calices.

20. The renal pyramids consist of:

- + Medulla.
- Cortex.
- Renal sinus.
- Renal calices.

21. What parts does the renal pyramid have?

- + Base and apex.
- Fundus and apex.
- Body and head.
- Neck and apex.

22. What parts of nephron do you know?

- + Glomerular capsule, proximal and distal convoluted tubules and loop of Henle.
- Glomerular capsule and loop of Henle.
- Glomerular capsule, proximal and distal convoluted tubules.
- Proximal and distal convoluted tubules and loop of Henle.

23. The primary urine is formed in:

- + Renal corpuscle.
- Distal convoluted tubules.
- Proximal convoluted tubules.
- Renal pelvis.

24. The secondary urine is formed in:

- + Renal tubules.
- Renal corpuscle.
- Renal pelvis.
- Renal calices.

25. Arrange the structures of the renal hilum (from front to back).

- + Vein, artery and ureter.
- Artery, vein and ureter.
- Ureter, artery, vein.
- Vein, ureter, artery.

26. What types of the renal pelvis do you know?

- + Embryonal, fetal and mature.
- Primary and secondary.
- Embryonal, primary and secondary.
- Primary and secondary and mature.

27. What parts does the ureter have?

- + Abdominal, pelvic and intramural.
- Renal, abdominal and pelvic.
- Abdominal, pelvic and inguinal.
- Abdominal, pelvic and vesical.

28. Where is the 1st constriction of the ureter located?

- + Where the renal pelvis joins the ureter.
- Where the abdominal part of ureter joins the pelvic one.
- Pelvic part.
- Inside the wall of the bladder.

29. Where does the 2nd constriction of the ureter appear?

- + Where the abdominal part of ureter joins the pelvic one.
- Where the renal pelvis joins the ureter.
- Pelvic part.
- Inside the wall of the bladder.

30. Where is the 3rd constriction of the ureter located?

- + Pelvic part.
- Where the abdominal part of ureter joins the pelvic one.
- Where the renal pelvis joins the ureter.
- Inside the wall of the bladder.

31. Where is the 4th constriction of ureter located?

- + Inside the wall of the bladder.
- Pelvic part.
- Where the abdominal part of ureter joins the pelvic one.
- Where the renal pelvis joins the ureter.

32. How does the peritoneum cover ureter?

- + Extraperitoneally.
- Intraperitoneally.
- Mesoperitoneally.
- Subperitoneally.

33. What layers does the wall of ureter have?

- + Mucous, muscular and adventitial.
- Mucous, muscular and serous.
- Fibrous and serous.
- Mucous and muscular.

34. What is the outer layer of the ureter?

- + Adventitial.
- Serous.
- Muscular.
- Mucous.

35. What is the outer layer of the ureter?

- + Apex, body, fundus and neck.
- Body, neck and head.
- Body and head.
- Body, head and fundus.

36. How are the parts of the urinary bladder located?

- + Extraperitoneally.
- Intraperitoneally.
- Mesoperitoneally.
- Subperitoneally.

37. How does the peritoneum cover the empty urinary bladder?

- + Mesoperitoneally.
- Extraperitoneally.
- Intraperitoneally.
- Subperitoneally.

38. The fundus of the urinary bladder in male adheres to:

- + Prostate.
- Rectum.
- Urogenital diaphragm.
- Seminal vesicles.

39. What is located behind the urinary bladder in males?

- + Rectum.
- Uterus.
- Sacrum.
- Pubic symphysis.

40. The bladder doesn't have the following coat:

- + Fibrous.
- Muscular.
- Adventitial.
- Mucous.

41. The muscular coat of the bladder consists of?

- + Internal and external oblique, medial circular muscles.
- Internal and external circular, medial oblique muscles.
- Internal oblique and external circular muscles.
- Internal circular and external oblique muscles.

42. The mucous membrane doesn't make folds in region of:

- + Trigone of bladder.
- Body.
- Neck.
- Apex.

43. The submucous membrane is absent in region of:

- + Trigone of bladder.
- Body.
- Neck.
- Apex.

GENITAL ORGANS

1. What organ doesn't belong to the external female genital ones?

- + Vagina.
- Clitoris.
- Vestibule of vagina.
- Labia minora pudendi.

2. What organ doesn't belong to the internal female genital ones?

- + Clitoris.
- Uterus.
- Vagina.
- Uterine tube.

3. What borders does the ovary have?

- + Tubal and uterine.
- Mesovarian and free.
- Medial and lateral.
- Posterior and anterior.

4. The uterus doesn't have:

- + Fornix.
- Fundus.
- Body.
- Cervix.

5. What borders does the uterus have?

- + Right and left.
- Anterior and posterior.
- Superior and inferior.
- Lateral and medial.

6. The uterus doesn't have the following coat:

- + Adventitial.

- Serous.
- Muscular.
- Mucous.

7. How is the serous coat of the uterus called?

- + Perimetrium.
- Endometrium.
- Myometrium.
- Parametrium.

8. How is the muscular coat of the uterus called?

- + Myometrium.
- Perimetrium.
- Endometrium.
- Parametrium.

9. How is mucous coat of the uterus called?

- + Endometrium.
- Myometrium.
- Perimetrium.
- Parametrium.

10. What is perimetrium?

- + Serous coat.
- Muscular coat.
- Mucous coat.
- Adventitial coat.

11. What is endometrium?

- + Mucous coat.
- Serous coat.
- Muscular coat.
- Adventitial coat.

12. What is myometrium?

- + Muscular coat.
- Mucous coat.
- Serous coat.
- Adventitial coat.

13. How does the peritoneum cover the uterus?

- + Mesoperitoneally.

- Extraperitoneally.
- Intraperitoneally.
- Subperitoneally.

14. The uterine tube doesn't have the following part:

- + Neck.
- Uterine.
- Ampula.
- Infundibulum.

15. How does peritoneum cover the uterine tube?

- + Intraperitoneally.
- Mesoperitoneally.
- Extraperitoneally.
- Subperitoneally.

16. Where does the vagina open?

- + To the vestibule of vagina.
- To the the glottis pudendi.
- To the uterus.
- To the pelvis.

17. The vagina doesn't have the following coat:

- + Serous.
- Adventitial.
- Muscular.
- Mucous.

18. What walls does the vagina have?

- + Anterior and posterior.
- Superior and inferior.
- Lateral and medial.
- Right and left.

19. What surfaces does the testis have?

- + Lateral and medial.
- Anterior and posterior.
- Superior and inferior.
- Right and left.

20. What borders does the testis have?

- + Anterior and posterior.

- Lateral and medial.
- Superior and inferior.
- Right and left.

21. What extremities does the testis have?

- + Superior and inferior.
- Anterior and posterior.
- Lateral and medial.
- Right and left.

22. What parts does the epididymis have?

- + Head, body and tail.
- Head, neck and tail.
- Neck, body and tail.
- Head, neck and body.

23. How does peritoneum cover ductus deferens?

- + Extraperitoneally.
- Intraperitoneally.
- Mesoperitoneally.
- Subperitoneally.

24. The base of prostate turns bends down:

- + Upwards.
- Downwards.
- Laterally.
- Medially.

25. The prostate doesn't have the following part:

- + Neck.
- Isthmus.
- Right lobe.
- Left lobe.

26. The apex of prostate bends down:

- + Downwards.
- Upwards.
- Laterally.
- Medially.

27. The penis doesn't have the following part:

- + Tail.
- Glans.

- Body.
- Root.

28. How many coats does the scrotum have?

- + 7.
- 6.
- 5.
- 8.

29. The external coat of the scrotum is:

- + Skin.
- Dartos tunic.
- External spermatic fascia.
- Peritoneum.

30. The voluntary urethral sphincter consists of:

- + Perineum muscle.
- Prostate muscle.
- Circular muscular layer of the urethra.
- Longitudinal muscular layer of the urethra.

31. What organ doesn't belong to external female genital ones?

- + Vagina.
- Clitoris.
- Vestibule of vagina.
- Labium minus pudendi.

32. What organ doesn't belong to internal female genital ones?

- + Clitoris.
- Uterus.
- Vagina.
- Uterine tube.

33. What surfaces does the ovary have?

- + Medial and lateral.
- Mesovarian and free.
- Tubal and uterine.
- Posterior and anterior.

34. What borders does the ovary have?

- + Mesovarian and free.
- Medial and lateral.

- Tubal and uterine.
- Superior and inferior.

35. What ends does the ovary have?

- + Tubal and uterine.
- Mesovarian and free.
- Medial and lateral.
- Posterior and anterior.

36. What ligaments does the ovary have?

- + Proper ovarian ligament and suspensory ligament.
- Proper ovarian ligament and ligamentum teres uteri.
- Proper ovarian ligament and cardinal ligament.
- Ligamentum teres uteri and cardinal ligament.

37. Where is the hilum of the ovary located?

- + On the mesovarian border.
- On the free border.
- On the lateral surface.
- On the medial surface.

38. What covers the ovary from outside?

- + Simple germinal epithelium.
- Serous coat.
- Adventitial coat.
- Fibrous membrane.

39. The uterus doesn't have the following part:

- + Fornix .
- Fundus.
- Body.
- Cervix.

40. What surfaces does the body of the uterus have?

- + Anterior (vesical) and posterior (intestinal).
- Anterior (vesical) and posterior (sacral).
- Anterior (intestinal) and posterior (symphyseal).
- Anterior (symphyseal) and posterior (intestinal).

41. What borders does the uterus have?

- + Right and left.
- Anterior and posterior.
- Superior and inferior.
- Lateral and medial.

42. The uterus doesn't have the following coat:

- + Adventitial.
- Serous.
- Muscular.
- Mucous.

43. How is serous coat of the uterus called?

- + Perimetrium.
- Endometrium.
- Myometrium.
- Parametrium.

44. How is muscular coat of the uterus called?

- + Myometrium.
- Perimetrium.
- Endometrium.
- Parametrium.

45. How is mucous coat of the uterus called?

- + Endometrium.
- Myometrium.
- Perimetrium.
- Parametrium.

46. What is perimetrium?

- + Serous coat.
- Muscular coat.
- Mucous coat.
- Adventitial coat.

47. What is endometrium?

- + Mucous coat.
- Serous coat.
- Muscular coat.
- Adventitial coat.

48. What is myometrium?

- + Muscular coat.
- Mucous coat.
- Serous coat.
- Adventitial coat.

49. How does peritoneum cover the uterus?

- + Mesoperitoneally.
- Extraperitoneally.
- Intraperitoneally.
- Subperitoneally.

50. Serous coat doesn't cover:

- + Vaginal portion of cervix.
- Supravaginal portion of cervix.
- Body.
- Fundus.

51. The uterine tube doesn't have the following part:

- + Neck.
- Uterine.
- Ampulla.
- Infundibulum.

52. The isthmus of the uterine tube is located between:

- + The uterine part and ampulla.
- The uterus and uterine part.
- The ampulla and infundibulum.
- The uterine part and infundibulum.

53. The uterine tube doesn't have the following coat:

- + Adventitial.
- Serous.
- Muscular.
- Mucous.

54. The longest fimbria of the uterine tube is called as:

- + Ovarian.
- Uterine.
- Tubal.
- Vaginal.

55. What ostium does the uterine tube have?

- + Uterine and peritoneal (abdominal).
- Uterine and pelvic.
- Vaginal and abdominal.
- Vaginal and pelvic.

56. How does peritoneum cover the uterine tube?

- + Intraperitoneally.
- Mesoperitoneally.
- Extraperitoneally.
- Subperitoneally.

57. Where does the vaginal orifice open?

- + In to the vestibule of vagina.
- In to the glottis **pudenda**.
- In to the uterus.
- In to the pelvis.

58. The vagina doesn't have the following coat:

- + Serous.
- Adventitial.
- Muscular.
- Mucous.

59. What walls does the vagina have?

- + Anterior and posterior.
- Superior and inferior.
- Lateral and medial.
- Right and left.

60. The glottis **pudendi** is limited by:

- + Labia majora pudenda.
- Labia minora pudenda.
- Frenulum of labia minora.
- Frenulum of clitoris.

61. The vestibule of vagina is limited by:

- + Labia minora pudenda.
- Labia majora pudenda.
- Frenulum of labia minora.
- Frenulum of clitoris.

62. What is located behind the bladder in female?

- + Uterus.
- Rectum.
- Sacrum.
- Pubic symphysis.

PERINEUM. ENDOCRINE GLANDS

1. What shape does the perineum have?

- + Rhomboid.
- Round.
- Oval.
- Trapezoid.

2. The perineum is limited in front by the:

- + Pubic symphysis.
- Coccyx.
- Central tendon of perineum.
- Tuber of the ischium.

3. The perineum is limited behind by the:

- + Coccyx.
- Pubic symphys.
- Central tendon of perineum.
- Tuber of ischium.

4. The perineum is divided in two regions:

- + Urogenital and pelvic.
- Sacral and urethral.
- Urethral and anal.
- Lateral and medial.

5. Where is the thyroid gland located?

- + Anterior cervical region.
- Superior mediastinum.
- Posterior mediastinum.
- Abdominal.

6. What lobes does the thyroid gland have?

- + Right and left.
- Anterior and posterior.
- Superior and inferior.
- Lateral and medial.

7. The parathyroid glands are located:

- +On the posterior surface of the thyroid.
- On the anterior surface of the thyroid.
- On the superior surface of the thyroid.
- On the inferior surface of the thyroid.

8. How does peritoneum cover adrenal glands?

- +Extraperitoneally.
- Intraperitoneally.
- Mesoperitoneally.
- Subperitoneally.

9. The medulla of the adrenal glands synthesizes:

- +Adrenalin.
- Androgen.
- Hydrocortisone.
- Aldosterone.

HEART

1. What direction does the apex of the heart have?

- +On the left, downwards and forward.
- On the left, downwards and backward.
- On the left, upwards and forward.
- On the left, upwards and backward.

2. What direction does the base of the heart have?

- +Upwards and backward.
- Downwards and forward.
- Upwards and forward.
- Downwards and backward.

3. The anterior surface of the heart adjoins:

- + The sternum and ribs.
- The right lung.
- The left lung.
- The vertebral column.

4. The inferior surface of the heart adjoins:

- +The diaphragm.
- The right lung.
- The left lung.
- The vertebral column.

5. The lateral surfaces of the heart adjoin the:

- + The lungs.
- The diaphragm.
- The vertebral column.
- The sternum and ribs.

6. Where is the coronary groove located?

- +Between the ventricles and atriums.
- Between the right and left ventricles.
- Between the right and left atriums.
- Between the right ventricles and pulmonary trunk.

7. Where is the anterior interventricular groove located?

- +Between the ventricles on the anterior surface.
- Between the ventricles on the posterior surface.
- Between the atriums on the anterior surface.
- Between the atriums on the posterior surface.

8. Where is the posterior interventricular groove located?

- +Between the ventricles on the posterior surface.
- Between the ventricles on the anterior surface.
- Between the atriums on the anterior surface.
- Between the atriums on the posterior surface.

9. What chamber of the heart does the diaphragmatic surface consist of?

- +Left ventricle (mainly).
- Right ventricle.
- Left atrium.
- Right atrium.

10. How many chambers does the heart have?

- +4.
- 3.
- 2.
- 5.

11. The blood directs from the right atrium to:

- +The right ventricle.
- The left ventricle.
- The inferior vena cava.
- The superior vena cava.

12. The blood directs from the right ventricle to:

- + The pulmonary trunk.
- The right atrium.
- The left ventricle.
- The aorta.

13. The blood directs from the left atrium to:

- + The left ventricle.
- The right ventricle.
- The pulmonary veins.
- The aorta.

14. The blood directs from the left ventricle to:

- + The aorta.
- The left atrium.
- The right ventricle.
- The pulmonary veins.

15. What vessels are the part of the lesser (pulmonary) circulation?

- +Pulmonary trunk and pulmonary veins.
- Aorta and pulmonary veins.
- Pulmonary trunk and superior vena cava.
- Aorta, superior and inferior vena cava.

16. What vessels are the part of the greater (systemic) circulation?

- +Aorta, superior and inferior vena cava.
- Pulmonary trunk and pulmonary veins.

- Aorta and pulmonary veins.
- Pulmonary trunk and superior vena cava.

17. The lesser (pulmonary) circulation begins in:

- +The pulmonary trunk.
- The aorta.
- The pulmonary veins.
- The superior vena cava.

18. The greater (systemic) circulation begins in:

- + The aorta.
- The pulmonary trunk.
- The pulmonary veins.
- The superior vena cava.

19. The lesser (pulmonary) circulation ends in:

- + The pulmonary veins.
- The pulmonary trunk.
- The aorta.
- The superior vena cava.

20. The greater (systemic) circulation ends in:

- + The superior and inferior vena cava.
- The aorta.
- The pulmonary trunk.
- The pulmonary veins.

21. The oxygenated blood fills:

- + The aorta.
- The pulmonary arteries.
- The superior vena cava.
- The inferior vena cava.

22. The deoxygenated blood fills:

- + The superior vena cava.
- The aorta.
- The coronary artery.
- The pulmonary veins.

23. The pulmonary trunk begins in:

- + The right ventricle.

- The left ventricle.
- The left atrium.
- The right atrium.

24. The aorta begins:

- + In left ventricle.
- In right ventricle.
- In left atrium.
- In right atrium.

25. The upper border of the heart is:

- + Line between the upper borders of the 3rd costal cartilages.
- Line between the upper borders of the 4th costal cartilages.
- Line between the sternoclavicular joints.
- At the level of the sternal angle.

26. The right border of the heart is:

- + 1- 2 cm to the right from the sternum between the 3rd and 5th costal cartilages.
- At the right border of the sternum.
- On the middle of the sternum.
- On the midclavicular line.

27. The apex of the heart projects:

- + 1,5 cm medially from midclavicular line on the 5th left intercostal space.
- 1,5 cm laterally from midclavicular line on the 5th left intercostal space.
- In the left 3rd intercostal space.
- In the right 3rd intercostal space.

28. The additional chamber of the right atrium is:

- + Right auricle.
- Coronary sinus.
- Fossa ovalis.
- Sinus venosus.

29. What separates the right and left atria?

- + Interatrial septum.
- Interventricular septum.
- Septum pellucidum.
- Interatrial membrane.

30. What separates the right and left ventricles?

- + Interventricular septum.
- Interatrial septum.
- Septum pellucidum.
- Interventricular membrane.

31. Where is the heart located?

- + In the middle mediastinum.
- In the superior mediastinum.
- In the anterior mediastinum.
- In the posterior mediastinum.

32. The right atrium doesn't have the following structure:

- + Opening of the pulmonary trunk.
- Opening of the superior vena cava.
- Opening of the inferior vena cava.
- Opening of the coronary sinus

33. What structure is located on the interatrial septum?

- + Fossa ovalis.
- Opening of the superior vena cava.
- Opening of the inferior vena cava.
- Opening of the coronary sinus.

34. Where is the intervenous tubercle located?

- + Between the openings of superior and inferior vena cava.
- On the interatrial septum.
- Inside the right auricle.
- Near the coronary sinus.

35. What structure is located between the right atrium and right ventricle?

- + Right atrioventricular opening.
- Terminal crest.
- Opening of the inferior vena cava.
- Opening of the coronary sinus.

36. What wall of the right ventricle consists of the interventricular septum?

- + Medial (left).

- Inferior.
- Anterior.
- Lateral.

37. What parts does the interventricular septum have?

- + Membranous and muscular.
- Membranous and spongy.
- Septal and muscular.
- Mucous and muscular.

38. The right ventricle doesn't have the following structure:

- + Aortic opening.
- Opening of the pulmonary trunk.
- Septal cusp of the tricuspid valve.
- Anterior cusp of the tricuspid valve.

39. The tricuspid valve doesn't have the following structure:

- + Semilunar valvulae.
- Septal cusp.
- Posterior cusp.
- Anterior cusp.

40. The chordae tendineae are located:

- + Between papillary muscles and free borders of the atrioventricular valves.
- Between papillary muscles and free borders of the semilunar valves.
- Between papillary muscles and aortic valve.
- Between pectinate muscles and free borders of the atrioventricular valves.

41. The valve of the pulmonary trunk doesn't have the following structure:

- + Posterior semilunar valve.
- Anterior semilunar valve.
- Right semilunar valve.
- Left semilunar valve.

42. How many openings does the left atrium have?

- + 5.
- 3.
- 2.

- 6.

43. How many openings does the left ventricle have?

- + 2.
- 3.
- 4.
- 5.

44. What valve closes the left atrioventricular opening?

- + Mitral valve.
- Tricuspid valve.
- Aortic valve.
- Valve of the pulmonary trunk.

45. The aortic valve doesn't have the following structure:

- + Anterior semilunar valve.
- Posterior semilunar valve.
- Right semilunar valve.
- Left semilunar valve.

46. What valve closes the right atrioventricular opening?

- + Tricuspid valve.
- Mitral valve.
- Aortic valve.
- Valve of the pulmonary trunk.

47. The outer layer of the cardiac wall is:

- + Epicardium.
- Myocardium.
- Endocardium.
- Pericardium.

48. The middle layer of the cardiac wall is:

- + Myocardium.
- Epicardium.
- Endocardium.
- Pericardium.

49. The inner layer of the cardiac wall is:

- + Endocardium.
- Myocardium.

- Epicardium.
- Pericardium.

50. Where do the muscular fibers of the myocardium originate?

- + From the fibrous rings.
- From the apex.
- From the atriums.
- From the aortic opening.

51. What parts of the soft skeleton of the heart do you know?

- + Fibrous rings and trigones.
- Papillary muscles.
- Pectinate muscles.
- Endocardium.

52. What is the function of the conducting system of the heart?

- + Control and coordination of heart contraction.
- Control of arterial blood circulation.
- Control of venous blood circulation.
- Conducting system of the heart – is a soft skeleton of the heart.

53. Which of the following is not the structure of conducting system of the heart?

- + Right and left fibrous trigones.
- Sinoatrial node.
- Atrioventricular node.
- Atrioventricular bundle.

54. Which of the following is not the structure of conducting system of the heart?

- + Right and left fibrous rings.
- Sinoatrial node.
- Atrioventricular node.
- Atrioventricular bundle.

55. The atrioventricular node is:

- + The node of Aschoff – Tawara.
- The node of Keith – Flack.
- The bundle of His.
- The fibers of Purkinje.

56. The sinoatrial node is:

- + Node of Keith – Flack.
- Node of Aschoff – Tawara.
- Bundle of His.
- Fibers of Purkinje.

57. The atrioventricular bundle is:

- + The bundle of His.
- The node of Keith – Flack.
- The node of Aschoff – Tawara.
- The fibers of Purkinje.

58. Where is sino-atrial node located?

- + Within the right atrial wall between the superior vena cava and right auricle.
- Within the right atrial wall between the inferior vena cava and right auricle.
- Within the left atrial wall between right and left pulmonary veins.
- Within the lower part of interatrial septum.

59. Where is atrioventricular node located?

- + Within the lower part of interatrial septum.
- Within the right atrial wall between the superior vena cava and right auricle.
- Within the upper part of interatrial septum.
- Within the membranous part of interventricular septum.

60. What structure of conducting system of the heart is pacemaker?

- + Sinoatrial node.
- Atrioventricular node.
- Atrioventricular bundle.
- The fibers of Purkinje.

61. Where is atrioventricular bundle located?

- + Within interventricular septum.
- Within lower part of interatrial septum.
- Within the septal cusp of tricuspid valve.
- Within the right atrial wall between superior vena cava and right auricle.

62. Where are the fibers of Purkinje located?

- + Within the myocardium of right and left ventricles.
- Within the myocardium of right and left atria.
- Within the septal cusp of tricuspid valve.
- Within lower part of interatrial septum.

63. The coronary arteries arise from:

- + The right and left aortic sinuses.
- The aortic arch.
- The thoracic aorta.
- The pulmonary trunk.

64. The right coronary artery does not supply:

- + The anterior wall of the right ventricle.
- The posterior part of interventricular septum.
- The right atrium with nodes of conducting system.
- The posterior wall of the right ventricle.

65. The right coronary artery supplies:

- + The nodes of conducting system.
- The anterior part of interventricular septum.
- The left atrium.
- The anterior wall of the right ventricle.

66. The left coronary artery does not supply:

- + The posterior part of interventricular septum.
- The anterior wall of the left ventricle.
- The anterior part of interventricular septum.
- The anterior wall of right ventricle.

67. The left coronary artery supplies:

- + The anterior wall of the right ventricle.
- The posterior wall of the right ventricle.
- The posterior part of interventricular septum.
- The nodes of conducting system.

68. The left coronary artery gives the following branches:

- + The anterior interventricular and circumflex branches.

- The posterior interventricular and circumflex branches.
- The ascending and descending branches.
- The anterior and posterior interventricular branches.

69. Where is horizontal (transverse) anastomosis between the branches of the right and left coronary arteries located?

- + In the coronary sulcus.
- In the anterior and posterior interventricular sulci.
- On the apex of the heart.
- Within interventricular septum.

70. Where is vertical (longitudinal) anastomosis between the branches of the right and left coronary arteries located?

- + On the apex of the heart.
- In the coronary sulcus.
- In the anterior and posterior interventricular sulci.
- Within interventricular septum.

71. What branches of coronary arteries take part in formation of horizontal (transverse) anastomosis?

- + The circumflex branch of the left coronary artery and right coronary artery.
- The anterior interventricular branch of the left coronary artery and posterior interventricular branch of the right coronary artery.
- The circumflex branch of the right coronary artery and left coronary artery.
- The anterior interventricular branch the right coronary artery and posterior interventricular branch of the left coronary artery.

72. What branches of coronary arteries take part in formation of vertical (longitudinal) anastomosis?

- + The anterior interventricular branch of the left coronary artery and posterior interventricular branch of the right coronary artery.

- The circumflex branch of the left coronary artery and right coronary artery.
- The circumflex branch of the right coronary artery and left coronary artery.
- The anterior interventricular branch of the right coronary artery and posterior interventricular branch of the left coronary artery.

73. The coronary sinus does not drain:

- + The anterior cardiac veins.
- The great cardiac vein.
- The middle cardiac vein.
- The small cardiac vein.

74. The coronary sinus does not drain:

- + The smallest cardiac veins.
- The posterior vein of the left ventricle.
- The oblique vein of the left atrium.
- The small cardiac vein.

75. The coronary sinus is located:

- + On the posterior surface of the heart within the coronary sulcus.
- On the anterior surface of the heart within the coronary sulcus.
- On the posterior interventricular sulcus.
- On the anterior interventricular sulcus.

76. The coronary sinus opens into:

- + The right atrium.
- The left atrium.
- The right ventricle.
- The left ventricle.

77. Where is the great cardiac vein located?

- + In the anterior interventricular sulcus.
- On the anterior surface within the coronary sulcus.
- In posterior interventricular sulcus.
- On the posterior surface within coronary sulcus.

78. Where is the middle cardiac vein located?

- + In posterior interventricular sulcus.
- In the anterior interventricular sulcus.

- On anterior surface within the coronary sulcus.
- On posterior surface within coronary sulcus

79. Where is the small cardiac vein located?

- + Within the right part of coronary sinus.
- Within the left part of coronary sinus.
- In the posterior interventricular sulcus.
- In the anterior interventricular sulcus.

80. The anterior cardiac veins open into:

- + The right atrium.
- The left atrium.
- The right ventricle.
- The left ventricle.

81. The smallest cardiac veins open into:

- + The right atrium and right ventricle.
- The left atrium and left ventricle.
- The left and right ventricle.
- The left and right atrium.

82. Which of the following do not take part in formation of innervation of the heart?

- + Somatic motor neuron.
- Sensory nerve.
- Vegetative sympathetic nerve.
- Vegetative parasympathetic nerve.

83. The sympathetic nervous fibers:

- + Accelerate rhythm of the heart contraction and provide dilation of coronary arteries.
- Decelerate the heart rhythm and coronary arteries stenosis.
- The heart rhythm and lumen of coronary arteries are unchanged.
- Decelerate the heart rhythm and provide dilation of coronary arteries.

84. The parasympathetic nervous fibers:

- + Decelerate the heart rhythm and coronary arteries stenosis.
- Accelerate rhythm of heart contraction and provide dilation of coronary arteries.
- The heart rhythm and lumen of coronary arteries are unchanged.

– Accelerate the heart rhythm and provide dilation of coronary arteries.

85. How many layers does the pericardium have?

- + 2 layers (fibrous and serous).
- 3 layers (fibrous, muscular and serous).
- 4 layers (fibrous, muscular, endothelial and serous) .
- 1 layer (only fibrous).

86. What pericardial sinuses do you know?

- + Oblique and transverse pericardial sinuses.
- Transverse and vertical pericardial sinuses.
- Right and left pericardial sinuses.
- Anterior and posterior pericardial sinuses.

87. The pericardial cavity contains:

- + Serous fluid.
- Lymph.
- Venous blood.
- Arterial blood.

AORTA. EXTERNAL AND INTERNAL CAROTID ARTERIES

1. What is not correct for definition of aorta?

- + It is venous vessel.
- It is vessel of systemic circulation.
- It is unpaired vessel.
- It is the biggest arterial vessel.

2. Which doesn't belong to?

- + Pelvic.
- Ascending.
- Arch.
- Descending.

3. The aorta arises from:

- + The left ventricle.
- The left atrium.
- The right atrium.
- The right ventricle.

4. How is the dilation of the initial part of aorta called?

- + Aortic bulb.
- Aortic isthmus.
- Aortic bifurcation.
- Coronary sinus.

5. What vessels arise from aortic sinuses?

- + The right and left coronary arteries.
- The great cardiac vein.
- The right and left common carotid arteries.
- The coronary sinus.

6. How is descending aorta divided?

- + Into thoracic and abdominal ones.
- Into abdominal and pelvic ones.
- Into ascending part and arch ones.
- Into cervical, thoracic and abdominal ones.

7. The aorta passes through the following part of diaphragm:

- + Lumbar.
- Costal.
- Sternal.
- Centrum tendineum.

8. Where is the abdominal aorta located?

- + In the retroperitoneal space.
- In middle mediastinum.
- In lesser pelvis.
- In the posterior mediastinum.

9. Where is the thoracic aorta located?

- + In the posterior mediastinum.
- In the middle mediastinum.
- In the anterior mediastinum.
- In the superior mediastinum.

10. Where does the ascending aorta become continuous with the arch of aorta?

- + At the level of the 2nd right sternocostal joint.
- At the level of the 3rd left sternocostal joint.

- At the level of the body of Th4 on the left.
- At the level of the body of Th2 on the right.

11. The aortic orifice of the left ventricle of the heart is supplied with:

- + The aortic valve.
- The bicuspid valve.
- The tricuspid valve.
- The aortic isthmus.

12. How is the beginning of the ascending aorta called?

- + The aortic bulb.
- The aortic isthmus.
- The aortic bifurcation.
- The arch of aorta.

13. Where does the arch of aorta become continuous with the descending part of thoracic aorta?

- + At the level of the body of Th4 on the left.
- At the level of the body of Th2 on the right.
- At the level of the 2nd left sternocostal joint.
- At the level of the body of L4 on the left.

14. The narrowness between the aortic arch and the descending part of aorta is called:

- + The aortic isthmus.
- The aortic bulb.
- The aortic bifurcation.
- The aortic valve.

15. Which of the following doesn't belong to the aortic arch?

- + The right subclavian artery.
- The left subclavian artery.
- The brachiocephalic trunk.
- The left common carotid artery.

16. What joins the concave side of the arch of aorta and pulmonary trunk?

- + The ligamentum arteriosum.
- The ligamentum venosum.
- The pulmonary ligament.
- The brachiocephalic trunk.

17. At what level is the descending aorta located?

- + At the level of vertebrae Th4 – L4.
- At the level of vertebrae Th2 – L4.
- At the level of vertebrae Th4 – L2.
- At the level of vertebrae Th2 – S4.

18. Where does the abdominal aorta end by splitting into its terminal branches?

- + At the level of L4.
- At the level of Th4.
- At the level of aortic hiatus.
- At the level of aortic isthmus.

19. The terminal branches of abdominal aorta are:

- + The right and left common iliac arteries.
- The external and internal iliac arteries.
- The right and left common carotid arteries.
- The right and left subclavian arteries.

20. The place where aorta splits into its terminal branches is called:

- + The aortic bifurcation.
- The aortic bulb.
- The aortic isthmus.
- The aortic sinus.

21. The aortic arch bends posteriorly and to the left curving over:

- + The left principal bronchus.
- The right principal bronchus.
- The pulmonary trunk.
- The right brachiocephalic vein.

22. The terminal branches of the brachiocephalic trunk are:

- + The right common carotid and right subclavian arteries.
- The left common carotid and left subclavian arteries.
- The right external and right internal carotid arteries.
- The right and left subclavian arteries.

23. Where is the brachiocephalic trunk divided into its terminal branches?

- + Behind the right sternoclavicular joint.
- Behind the right 2nd sternocostal joint.
- Behind the left 2nd sternocostal joint.
- At the level of body of Th4 on the left.

24. Where does the right common carotid artery arise?

- + From the brachiocephalic trunk.
- From the arch of aorta.
- From the right aortic sinus.
- From the thyrocervical trunk.

25. Where does the left common carotid artery arise?

- + From the arch of aorta.
- From the brachiocephalic trunk.
- From the left aortic sinus.
- From the aortic bulb.

26. The main branches of the aortic arch are (from right to the left):

- + The brachiocephalic trunk, the left common carotid artery, the left subclavian artery.
- The brachiocephalic trunk, the right common carotid artery, the right subclavian artery.
- The left common carotid artery, the left subclavian artery, the brachiocephalic trunk.
- The left subclavian artery, the brachiocephalic trunk, the right common carotid artery.

27. In the region of the neck the common carotid artery passes:

- + In the carotid trigone.
- In the lateral trigone.
- In the retrovisceral space.
- In the retromandibular fossa.

28. Within the carotid sheath the common carotid artery passes:

- + Medially from the internal jugular vein and the vagus nerve.
- Laterally from the vagus nerve.
- Anteriorly from the internal jugular vein.
- Posteriorly from the internal jugular vein and the vagus nerve.

29. The common carotid artery splits into:

- + The external and internal carotid arteries.
- The external carotid and subclavian arteries.
- The internal carotid and facial arteries.
- The brachiocephalic trunk and subclavian artery.

30. Where is the common carotid artery divided into its terminal branches?

- + At the level of the superior border of the thyroid cartilage.
- At the level of the mandibular angle.
- At the level of the inferior border of the thyroid cartilage.
- At the level of sternoclavicular joint.

31. What can one see at the carotid bifurcation?

- + The carotid sinus and the carotid body.
- The coronary sinus and the bundle of His.
- The cavernous sinus and the carotid body.
- The carotid sinus and the superior bulb.

32. What does the internal carotid artery supply with blood?

- + The brain and the visual organ.
- The parotid gland and the muscles of the facial expression.
- The brain and the organ of hearing.
- The thyroid gland, the tongue and the meninges of the brain.

33. Which of the following doesn't belong to the internal carotid artery?

- + The thoracic part.
- The cavernous part.
- The petrous part.
- The cervical part.

34. The internal carotid artery enters the cranial cavity via:

- + The carotid canal.
- The foramen magnum.
- The facial canal.
- The mastoid foramen.

35. The parts of the internal carotid artery are:

- + The cervical, the petrous, the cavernous and the cerebral parts.
- The anterior, posterior and the medial parts.
- The mandibular, the pterygoid and the pterygopalatine parts.
- The thoracic, the cervical, the pterygoid and the cerebral parts.

36. The branches of the cerebral part of the internal carotid artery are:

- + The ophthalmic artery, the anterior and middle cerebral arteries, the posterior communicating artery and the anterior choroidal artery.
- The ophthalmic artery, the anterior and posterior cerebral arteries, the anterior and posterior choroidal arteries.
- The anterior, posterior and middle cerebral arteries, the anterior and posterior communicating arteries.
- The central retinal artery, the anterior and posterior ethmoidal arteries, the anterior and posterior ciliary arteries.

37. Which of the following is not the branch of the cerebral part of the internal carotid artery?

- + The posterior cerebral artery.
- The anterior cerebral artery.
- The anterior choroidal artery.
- The posterior ciliary arteries.

38. The ophthalmic artery enters the orbit via:

- + The optic canal.
- The superior orbital fissure.
- The inferior orbital fissure.
- The posterior ethmoidal foramen.

39. Which of the following are the branches of the ophthalmic artery?

- + The central retinal artery and the dorsal nasal artery.
- The anterior choroidal artery and the posterior communicating artery.
- The anterior and posterior communicating arteries.
- The anterior and middle cerebral arteries.

40. Which of the following don't belong to the branches of the ophthalmic artery?

- + The anterior and posterior communicating arteries.
- The anterior and posterior ethmoidal arteries.
- The anterior and posterior ciliary arteries.
- The supraorbital and supratrochlear arteries.

41. How is the anastomosis between the right and left anterior cerebral arteries called?

- + The anterior communicating artery.
- The posterior communicating artery.
- The anterior ciliary artery.
- The anterior ethmoidal artery.

42. What artery forms the choroid plexus of both lateral and third ventricles?

- + The anterior choroidal artery.
- The anterior cerebral artery.
- The anterior communicating artery.
- The anterior ciliary artery.

43. The central retinal artery is the branch of:

- + The ophthalmic artery.
- The petrous part of the internal carotid artery.
- The cavernous part of the internal carotid artery.
- The middle cerebral artery.

44. The anterior and posterior ciliary arteries are the branches of:

- + The ophthalmic artery.

- The anterior choroidal artery.
- The anterior cerebral artery.
- The anterior communicating artery.

45. The lacrimal artery branches off from:

- + The ophthalmic artery.
- The cavernous part of the internal carotid artery.
- The caroticotympanic artery.
- The cervical part of the internal carotid artery.

46. The anterior and posterior ethmoidal arteries are the branches of:

- + The ophthalmic artery.
- The anterior communicating artery.
- The posterior communicating arteries.
- The posterior cerebral arteries

47. The dorsal nasal artery is the terminal branch of:

- + The ophthalmic artery.
- The middle cerebral artery.
- The cerebral part of the internal carotid artery.
- The cervical part of the internal carotid artery.

48. The anterior cerebral artery branches off from:

- + The cerebral part of the internal carotid artery.
- The cavernous part of the internal carotid artery.
- The petrous part of the internal carotid artery.
- The ophthalmic artery.

49. The middle cerebral artery branches off from:

- + The cerebral part of the internal carotid artery.
- The ophthalmic artery.
- The supraorbital artery.
- The supratrochlear artery.

50. The posterior communicating arteries are branches of:

- + The cerebral part of the internal carotid artery.
- The cervical part of the internal carotid artery.
- The ophthalmic artery.
- The caroticotympanic arteries.

51. The anterior choroidal artery originates from:

- + The cerebral part of the internal carotid artery.
- The ophthalmic artery.
- The brachiocephalic trunk.
- The petrous part of the internal carotid artery.

52. What branches does the petrous part of the internal carotid artery give?

- + The caroticotympanic arteries.
- The anterior meningeal branches.
- The anterior ciliary arteries.
- The anterior choroidal arteries.

53. The external carotid artery has the following groups of branches:

- + Anterior, posterior, medial and terminal.
- Lateral, medial, terminal.
- Anterior, posterior, medial and lateral.
- External, internal, medial and terminal.

54. What branches are the anterior group of external carotid artery?

- + Superior thyroid, lingual and facial.
- Occipital, posterior auricular and sternocleidomastoid.
- Ascending pharyngeal.
- Maxillary and superficial temporal.

55. What branches are the posterior group of external carotid artery?

- + Occipital, posterior auricular and sternocleidomastoid.
- Superior thyroid, lingual and facial.
- Ascending pharyngeal.

- Maxillary and superficial temporal.
56. What branches are the medial group of external carotid artery?
- + Ascending pharyngeal.
 - Occipital, posterior auricular and sternocleidomastoid.
 - Superior thyroid, lingual and facial.
 - Maxillary and superficial temporal.
57. What branches are the terminal group of external carotid artery?
- + Maxillary and superficial temporal.
 - Ascending pharyngeal.
 - Occipital, posterior auricular and sternocleidomastoid.
 - Superior thyroid, lingual and facial.
58. What branches does superior thyroid artery give?
- + Glandular and superior laryngeal.
 - Inferior laryngeal.
 - Sublingual and inferior laryngeal.
 - Ascending palatine.
59. What salivary gland does the facial artery supply?
- + Submandibular.
 - Sublingual.
 - Parotid.
 - It doesn't supply.
60. What artery doesn't begin from the facial artery on the face?
- + Ascending palatine.
 - Superior labial.
 - Inferior labial.
 - Angular.
61. The angular artery makes anastomosis with ...
- + Dorsal nasal artery.
 - Supratrochlear artery.
 - Supraorbital artery.
 - Central retinal artery.
62. What does the ascending palatine artery supply?
- + Soft palate.
 - Upper teeth.
 - Root of the tongue.
 - Apex of the tongue.
63. The posterior auricular artery doesn't give:
- + Tonsillar branch.
 - Posterior tympanic branch.
 - Auricular branch.
 - Stylomastoid branch.
64. What artery doesn't begin from the superficial temporal artery?
- + Occipital.
 - Parotid.
 - Transverse facial.
 - Anterior auricular.
65. What artery doesn't begin from superficial temporal artery?
- + Mastoid.
 - Frontal and parietal branches.
 - Middle temporal.
 - Anterior auricular.
66. How many sections does the maxillary artery have?
- + 3.
 - 4.
 - 2.
 - 5.
67. The maxillary artery has all sections, except:
- + Petrosal.
 - Mandibular.
 - Pterygoid.
 - Pterygopalatine.
68. What artery doesn't begin from the maxillary artery in the mandibular section?

- + Masseteric.
- Deep auricular.
- Anterior tympanic.
- Inferior alveolar.

69. What artery begins from the maxillary artery in the mandibular section?

- + Middle meningeal.
- Masseteric.
- Superior posterior alveolar.
- Buccal.

70. The middle meningeal artery enters the skull through:

- + Foramen spinosum.
- Foramen ovale.
- Foramen lacerum.
- Foramen rotundum.

71. What artery doesn't begin from the maxillary artery in pterygopalatine section?

- + Masseteric.
- Infraorbitalis.
- Descending palatine.
- Sphenopalatine.

THORACIC AORTA. ARTERIES OF UPPER LIMB

1. Where does right subclavian artery begin?

- + From brachiocephalic trunk.
- From aortic arch.
- From ascending aorta.
- From pulmonary trunk.

2. Where does left subclavian artery begin?

- + From aortic arch.
- From brachiocephalic trunk.
- From ascending aorta.
- From pulmonary trunk.

3. What artery doesn't begin from subclavian one in the 1st section?

- + Transverse cervical.

- Internal thoracic.
- Vertebral.
- Thyrocervical trunk.

4. What artery begins from the subclavian in the 2nd section?

- + Costocervical trunk.
- Internal thoracic.
- Vertebral.
- Thyrocervical trunk.

5. What artery begins from the subclavian in the 3rd section?

- + Transverse cervical.
- Internal thoracic.
- Vertebral.
- Thyrocervical trunk.

6. How many sections does the vertebral artery have?

- + 4.
- 3.
- 2.
- 5.

7. The vertebral artery has all sections except:

- + Pterygoid.
- Prevertebral.
- Transversal.
- Atlantic.

8. The vertebral artery enters the skull:

- + Through the foramen magnum.
- Through the foramen jugulare.
- Through the carotid canal.
- Through the foramen lacerum.

9. What branches begin from the cervical part of the vertebral artery?

- + Spinal.
- Posterior meningeal.
- Anterior meningeal.
- Posterior spinal.

10. What artery consists of the right and left vertebral artery?
- + Basillar.
 - Spinalis anterior.
 - Cerebri posterior.
 - Communicans posterior.
11. What are terminal branches does the internal thoracic artery have?
- + Musculophrenic and superior epigastric arteries.
 - Pericardiophrenic artery.
 - Intercostal branches.
 - Perforating branches.
12. The inferior laryngeal artery is the branch of:
- + Inferior thyroid artery.
 - Internal thoracic artery.
 - Superior laryngeal artery.
 - Deep cervical artery.
13. What artery from the thyrocervical trunk takes part in formation of scapular arterial circle?
- + Suprascapular.
 - Inferior thyroid.
 - Superficial cervical.
 - Ascending cervical.
14. What artery from the thyrocervical trunk supplies the endocrine gland?
- + Inferior thyroid.
 - Suprascapular.
 - Superficial cervical.
 - Ascending cervical.
15. Where does the costocervical trunk arise?
- + Inside the interscalene space.
 - Outside the interscalene space.
 - Before the interscalene space.
 - At the level of lateral border of the 1st rib.
16. What branches does the thoracic aorta have?
- + Parietal and visceral.
 - Anterior and posterior.
 - Superficial and deep.
 - Lateral and medial.
17. The thoracic aorta continues with abdominal aorta at the level of:
- + Th 12.
 - Th 10.
 - Th 11.
 - L 1.
18. How does aorta enter the abdominal cavity?
- + Trough the aortic hiatus.
 - Trough the esophageal hiatus.
 - Trough the foramen venae cavae.
 - Trough the left lumbocostal trigon.
19. What artery is not parietal branch of thoracic aorta?
- + Mediastinal artery.
 - Superior phrenic artery.
 - Posterior intercostal artery.
 - Subcostal artery.
20. What branch of thoracic aorta supplies the diaphragm?
- + Superior phrenic artery.
 - Mediastinal artery.
 - Posterior intercostal artery.
 - Subcostal artery.
21. What branches of thoracic aorta pass in intercostal spaces?
- + Posterior intercostal arteries.
 - Superior phrenic arteries.
 - Mediastinal arteries.
 - Subcostal artery.
22. The 12th intercostal arteries is called:
- + Subcostal.
 - Superior phrenic.
 - Inferior phrenic.
 - Subclavian.

23. What artery is not a visceral branch of thoracic aorta?

- + Subcostal.
- Bronchial.
- Esophageal.
- Pericardial.

24. What artery is a visceral branch of thoracic aorta?

- + Mediastinal.
- Lateral cutaneous.
- Spinal.
- Dorsal.

25. What visceral branches of thoracic aorta supply the lungs?

- + Bronchial.
- Mediastinal.
- Pericardial.
- Esophageal.

26. What visceral branches of thoracic aorta supply the pericardium?

- + Pericardial.
- Bronchial.
- Mediastinal.
- Esophageal.

27. The axillary artery is continuation of:

- + Subclavian artery.
- Brachiocephalic trunk.
- Common carotid artery.
- Intercostal artery.

28. Where is the border between the subclavian and axillary arteries?

- + The level of the external border of the 1st rib.
- The level of the internal border of the 1st rib.
- The level of acromial end of clavicle.
- The level of the 2nd rib.

29. Axillary artery continues in:

- + The brachial artery.

- The deep brachial artery.
- The ulnar artery.
- The radial artery.

30. Where is the distal border of the axillary artery located?

- + At the lower edge of the tendon of latissimus dorsi muscle.
- At the upper edge of the tendon of latissimus dorsi muscle.
- At the lower border of the pectoralis minor muscle.
- At the upper border of the pectoralis minor muscle.

31. How many sections does the axillary artery have?

- + 3.
- 4.
- 2.
- 5.

32. The 1st section of axillary artery corresponds to:

- + Clavipectoral trigone.
- Pectoral trigone.
- Subpectoral trigone.
- Omoclavicular trigone.

33. The 2nd section of axillary artery corresponds to:

- + Pectoral trigone.
- Clavipectoral trigone.
- Subpectoral trigone.
- Omoclavicular trigone.

34. The 3rd section of axillary artery corresponds to:

- + Subpectoral trigone.
- Pectoral trigone.
- Clavipectoral trigone.
- Omoclavicular trigone.

35. What artery is a branch of the 1st section of axillary artery?

- + Superior thoracic artery.

- Subscapular artery.
 - Anterior circumflex humeral artery.
 - Posterior circumflex humeral artery.
36. What artery supplies the 1st and 2nd intercostal spaces?
- + Superior thoracic artery.
 - Anterior circumflex humeral artery.
 - Posterior circumflex humeral artery.
 - Subscapular artery.
37. What branch of axillary artery supplies m. subscapularis?
- + Subscapular artery.
 - Superior thoracic artery.
 - Anterior circumflex humeral artery.
 - Thoracoacromial artery.
38. What artery arises from axillary one at the level of superior edge of pectoralis minor muscle?
- + Thoracoacromial artery.
 - Superior thoracic artery.
 - Anterior circumflex humeral artery.
 - Lateral thoracic artery.
39. What artery is not a branch of thoracoacromial artery?
- + Lateral thoracic artery.
 - Acromial artery.
 - Clavicular artery.
 - Deltoid artery.
40. What artery arises directly from thoracoacromial artery?
- + Pectoral artery.
 - Subscapular artery.
 - Lateral thoracic artery.
 - Anterior circumflex humeral artery.
41. What artery supplies the acromioclavicular and shoulder joints?
- + Acromial branch of thoracoacromial artery.
 - Deltoid branch of thoracoacromial artery.
 - Pectoral branch of thoracoacromial artery.
 - Anterior circumflex humeral artery.
42. What artery arises from axillary one at the level of pectoral trigone?
- + Lateral thoracic artery.
 - Subscapular artery.
 - Posterior circumflex humeral artery.
 - Anterior circumflex humeral artery.
43. What muscle does the lateral thoracic artery supply?
- + Serratus anterior.
 - Subscapular.
 - Infraspinatus.
 - Pectoralis major.
44. What artery is not a branch of the 3rd section of axillary artery?
- + Thoracoacromial artery.
 - Subscapular artery.
 - Posterior circumflex humeral artery.
 - Anterior circumflex humeral artery.
45. What artery passes through the triangular space?
- + Circumflex scapular artery.
 - Posterior circumflex humeral artery.
 - Anterior circumflex humeral artery.
 - Thoracodorsal artery.
46. What artery passes on anterior surface of the surgical neck of humerus?
- + Anterior circumflex humeral artery.
 - Thoracodorsal artery
 - Circumflex scapular artery.
 - Posterior circumflex humeral artery.
47. What artery passes through the quadrangular space?
- + Posterior circumflex humeral artery.
 - Circumflex scapular artery.
 - Anterior circumflex humeral artery.
 - Thoracodorsal artery.
48. What artery doesn't supply the shoulder joint?
- + Thoracodorsal artery.

- Posterior circumflex humeral artery.
- Anterior circumflex humeral artery.
- Thoracoacromial artery.

49. Where does the brachial artery begin?

- + At the level of lower edge of the pectoralis major.
- At the level of upper edge of the pectoralis major.
- At the level of lower edge of the pectoralis minor.
- At the level of upper edge of the pectoralis minor.

50. Where does the brachial artery pass?

- + In the medial bicipital groove.
- In the lateral bicipital groove.
- In the radial canal.
- In the groove for ulnar nerve.

51. Where is brachial artery divided into the terminal branches?

- + In the cubital fossa at the level of radial neck.
- At the level of capitulum humeri.
- At level of the cubital joint.
- Between the middle and inferior third of the arm.

52. The terminal branch of brachial artery is:

- + Ulnar artery.
- Deep brachial artery.
- Superior ulnar collateral artery.
- Inferior ulnar collateral artery.

53. The terminal branch of brachial artery is:

- + Radial artery.
- Deep brachial artery.
- Superior ulnar collateral artery.
- Inferior ulnar collateral artery.

54. What artery passes together with the radial nerve?

- + Deep brachial artery.
- Radial artery.
- Superior ulnar collateral artery.
- Inferior ulnar collateral artery.

55. What artery doesn't arise from the deep brachial artery?

- + Superior ulnar collateral artery.
- Middle collateral artery.
- Radial collateral artery.
- Humeral nutrient artery.

56. What artery doesn't take part in formation of cubital arterial network?

- + Deltoid artery.
- Superior ulnar collateral artery.
- Middle collateral artery.
- Inferior ulnar collateral artery.

57. What artery passes through the canal for radial nerve?

- + Deep brachial.
- Superior ulnar collateral.
- Middle collateral.
- Inferior ulnar collateral.

58. What arteries are terminal branches of the brachial artery?

- + Radial and ulnar arteries.
- Superior ulnar collateral.
- Deep brachial.
- Inferior ulnar collateral.

59. What branch of brachial artery passes in the medial groove of forearm?

- + Ulnar.
- Radial.
- Superior ulnar collateral.
- Inferior ulnar collateral.

60. What artery passes in the lateral groove of the forearm?

- + Radial.
- Ulnar.
- Superior ulnar collateral.
- Inferior ulnar collateral.

61. What artery lies under the skin and fascia in the lower third of the forearm?

+ Radial.

– Ulnar.

– Superior ulnar collateral.

– Inferior ulnar collateral.

62. What artery is used for pulse measure?

+ Radial.

– Ulnar.

– Superior ulnar collateral.

– Inferior ulnar collateral.

63. The terminal part of the radial artery forms:

+ Deep palmar arch.

– Superficial palmar arch.

– Dorsal carpal network.

– Palmar carpal network.

64. What arteries arise from deep palmar arch?

+ Palmar metacarpal arteries.

– Dorsal metacarpal arteries.

– Common digital arteries.

– Proper digital arteries.

65. The perforating arteries arise from:

+ The palmar metacarpal arteries.

– The dorsal carpal arteries.

– The common digital arteries.

– The proper digital arteries.

66. The perforating arteries connect:

+ Palmar and dorsal metacarpal arteries.

– Radial and ulnar.

– Princeps pollicis and radialis indicis.

– Common and proper digital arteries.

67. What artery arises from the initial part of the radial artery?

+ Radial recurrent.

– Radial collateral.

– Princeps pollicis.

– Common interosseal.

68. What arteries form anastomoses in the anterior lateral cubital groove?

+ Radial collateral and radial recurrent.

– Middle collateral and interosseous recurrent.

– Superior ulnar collateral and posterior branch from ulnar recurrent.

– Inferior ulnar collateral and anterior branch from ulnar recurrent.

69. What arteries form anastomoses in the posterior lateral cubital groove?

+ Middle collateral and interosseous recurrent.

– Radial collateral and radial recurrent.

– Superior ulnar collateral and posterior branch from ulnar recurrent.

– Inferior ulnar collateral and anterior branch from ulnar recurrent.

70. What arteries form anastomoses in the anterior medial cubital groove?

+ Inferior ulnar collateral and anterior branch from ulnar recurrent.

– Middle collateral and interosseous recurrent.

– Radial collateral and radial recurrent.

– Superior ulnar collateral and posterior branch from ulnar recurrent.

71. What arteries form anastomoses in the posterior medial cubital groove?

+ Superior ulnar collateral and posterior branch from ulnar recurrent.

– Inferior ulnar collateral and anterior branch from ulnar recurrent.

– Middle collateral and interosseous recurrent.

– Radial collateral and radial recurrent.

72. What branch of radial artery takes part in formation of superficial palmar arch?

+ Superficial palmar.

– Palmar carpal.

– Dorsal carpal.

– Princeps pollicis.

73. What branch of radial artery takes part in formation of palmar carpal network?

- + Palmar carpal.
- Superficial palmar.
- Palmar dorsal.
- Princeps pollicis.

74. What branch of radial artery takes part in formation of dorsal carpal network?

- + Dorsal carpal.
- Superficial palmar.
- Palmar carpal.
- Princeps pollicis.

75. Where do the dorsal metacarpal arteries begin?

- + From dorsal carpal network.
- From deep palmar arch.
- From superficial palmar arch.
- From palmar carpal network.

76. What branches give dorsal metacarpal artery?

- + Two dorsal digital.
- Radialis indicis.
- Common palmar digital.
- Palmar metacarpal.

77. What artery arises from the initial part of the ulnar artery?

- + Recurrent ulnar.
- Radial.
- Superior ulnar collateral.
- Inferior ulnar collateral.

78. What artery passed on the anterior surface of the antebrachial interosseous membrane?

- + Anterior interosseous.
- Common interosseous.
- Posterior interosseous.
- Ulnar

79. What artery supplies the posterior muscles of the forearm?

- + Posterior interosseous.
- Common interosseous.

- Anterior interosseous.
- Brachial.

80. What artery passes through the antebrachial interosseous membrane?

- + Posterior interosseous.
- Common interosseous.
- Anterior interosseous.
- Radial.

81. The terminal part of the ulnar artery forms:

- + Superficial palmar arch.
- Deep palmar arch.
- Palmar carpal network.
- Dorsal carpal network.

82. What arteries arise from the superficial palmar arch?

- + Common palmar digital arteries.
- Proper palmar digital arteries.
- Dorsal metacarpal.
- Palmar metacarpal.

ABDOMINAL AORTA. ARTERIES OF THE PELVIC CAVITY

1. What artery is the parietal branch of the abdominal aorta?

- + Inferior phrenic artery.
- Superior phrenic artery.
- Subcostal artery.
- Inferior mesenteric artery.

2. What arteries are parietal branches of the abdominal aorta?

- + Lumbar arteries.
- Posterior intercostal arteries.
- Anterior intercostal arteries.
- Lateral sacral arteries.

3. What arteries are branches of the inferior phrenic artery?

- + Superior suprarenal arteries.
- Inferior suprarenal arteries.

- Middle suprarenal arteries.
 - Lumbar arteries.
4. What branches of the abdominal aorta supply the spinal cord?
- + Lumbar arteries.
 - Inferior suprarenal arteries.
 - Coeliac trunk.
 - Renal arteries.
5. What branches of the abdominal aorta supply the muscles and skin of posterior abdominal wall?
- + Lumbar arteries.
 - Middle suprarenal artery.
 - Renal arteries.
 - Superior mesenteric artery.
6. What branches of the abdominal aorta supply the muscles of abdomen?
- + Lumbar arteries.
 - Inferior phrenic artery.
 - Superior mesenteric artery.
 - Middle suprarenal artery.
7. The visceral branches of the abdominal aorta are divided into:
- + Paired visceral and unpaired visceral.
 - Superior visceral and inferior visceral.
 - Right visceral and left visceral.
 - Superficial visceral and deep visceral.
8. What artery is the paired visceral branch of the abdominal aorta?
- + Renal artery.
 - Superior mesenteric artery.
 - Coeliac trunk.
 - Inferior phrenic artery.
9. What artery is the paired visceral branch of the abdominal aorta?
- + Middle suprarenal artery.
 - Inferior suprarenal artery.
 - Superior suprarenal artery.
 - Inferior mesenteric artery.
10. What artery is the paired visceral branch of the abdominal aorta?
- + Testicular artery.
 - Superior mesenteric artery.
 - Median sacral artery.
 - Iliocolic artery.
11. What artery is the unpaired visceral branch of the abdominal aorta?
- + Coeliac trunk.
 - Inferior phrenic artery.
 - Common iliac artery.
 - Renal artery.
12. What artery is the unpaired visceral branch of the abdominal aorta?
- + Superior mesenteric artery.
 - Testicular artery.
 - Middle suprarenal artery.
 - Lateral sacral artery.
13. What artery is the unpaired visceral branch of the abdominal aorta?
- + Inferior mesenteric artery.
 - Renal artery.
 - Lumbar artery.
 - Splenic artery.
14. What artery is not the branch of the celiac trunk?
- + Cystic artery.
 - Left gastric artery.
 - Common hepatic artery.
 - Splenic artery.
15. What artery is the branch of the left gastric artery?
- + Oesophageal branch.
 - Epiploic branch.
 - Pancreatic branch.
 - Short gastric branch.
16. What branches does the common hepatic artery give?

- + Proper hepatic artery and gastroduodenal artery.
- Right and left branches.
- Left gastric and right gastric arteries.
- Cystic artery and hepatic artery.

17. The proper hepatic artery is located inside:

- + The hepatoduodenal ligament.
- The round ligament of the liver.
- The hepatogastric ligament.
- The falciform ligament.

18. What branches does the proper hepatic artery give near the porta hepatis?

- + The right and left branches.
- The anterior and posterior branches.
- The deep and superficial branches.
- The visceral and parietal branches.

19. What artery arises from the right branch of the proper hepatic artery?

- + Cystic branch.
- Left gastric artery.
- Left gastroepiploic artery.
- Right gastroepiploic artery.

20. What artery passes along the lesser curvature of the stomach?

- + Right gastric artery.
- Right gastroepiploic artery.
- Cystic branch.
- Right branch of proper hepatic artery.

21. Where is anastomosis between the left gastric artery and the right gastric artery located?

- + On the lesser curvature of the stomach.
- On the greater curvature of the stomach.
- On the posterior wall of the stomach.
- On the anterior wall of the stomach.

22. What branches does the gastroduodenal artery give?

- + Right gastroepiploic artery and superior pancreaticoduodenal artery.

- Right gastroduodenal artery and right gastric artery.
- Right gastric artery and left gastric artery.
- Right gastroepiploic artery and left gastroepiploic artery.

23. The right gastroepiploic artery supplies the following organs:

- + Stomach and greater omentum.
- Duodenum and lesser omentum.
- Duodenum and pancreas.
- Duodenum and jejunum.

24. The superior pancreaticoduodenal artery supplies the following organs:

- + Duodenum and head of the pancreas.
- Pylorus of the stomach and gallbladder.
- Liver and gall bladder.
- Tail of the pancreas and spleen.

25. Where is splenic artery located?

- + Along superior border of the pancreas.
- On the lesser curvature.
- On the greater curvature.
- Inside the lesser omentum.

26. What artery is not the branch of the splenic artery?

- + Duodenal branch.
- Pancreatic branch.
- Short gastric branch.
- Left gastroepiploic artery.

27. What arteries supply the fundus of the stomach?

- + Short gastric branches.
- Left gastric artery.
- Right gastric artery.
- Right and left gastroepiploic arteries.

28. The left gastroepiploic artery supplies the following organs:

- + Stomach and greater omentum.
- Tail of the pancreas and spleen.
- Body of the pancreas and lesser omentum.

– Fundus of the stomach and abdominal part of the oesophagus.

29. Where is anastomosis between the right and left gastrointestinal arteries located?

- + On the greater curvature of the stomach.
- On the lesser curvature of the stomach.
- On the superior border of the pancreas.
- Near the fundus of the stomach.

30. What arteries are not branches of the superior mesenteric artery?

- + Superior pancreaticoduodenal artery.
- Inferior pancreaticoduodenal artery.
- Jejunal arteries.
- Ileal arteries.

31. What artery is not the branch of the superior mesenteric artery?

- + Left colic artery.
- Iliocolic artery.
- Right colic artery.
- Middle colic artery.

32. Inferior pancreaticoduodenal artery supplies:

- + The head of the pancreas and horizontal part of the duodenum.
- The pylorus of the stomach and bulb of the duodenum.
- The fundus of the stomach and spleen.
- The greater curvature of the stomach.

33. What arteries supply the mesenteric part of the small intestine?

- + Jejunal and ileal arteries.
- Superior pancreaticoduodenal artery.
- Inferior pancreaticoduodenal artery.
- Middle colic artery.

34. Iliocolic artery supplies:

- + Caecum.
- Transverse colon.
- Sigmoid colon.
- Descending colon.

35. What artery supplies the vermiform process?

- + Iliocolic artery.
- Right colic artery.
- Ileal artery.
- Middle colic artery.

36. Iliocolic artery supply doesn't the following organ:

- + Transverse colon.
- Ascending colon.
- Caecum.
- Vermiform process.

37. What artery supplies ascending colon?

- + Right colic.
- Left colic.
- Sigmoid arteries.
- Ileal artery.

38. What artery supplies transverse colon?

- + Middle colic artery.
- Right colic artery.
- Ileocolic artery.
- Sigmoid artery.

39. The inferior mesenteric artery doesn't supply the following organ:

- + Scending colon.
- Rectum.
- Descending colon.
- Sigmoid colon.

40. What artery is not the branch of the inferior mesenteric artery?

- + Middle colic artery.
- Left colic artery.
- Sigmoid artery.
- Superior rectal artery.

41. What artery takes part in formation of anastomosis with branches of the internal iliac artery?

- + Superior rectal artery.
- Middle colic artery.

- Left colic artery.
 - Sigmoid artery.
42. What artery originates directly from the abdominal aorta?
- + Middle suprarenal artery.
 - Superior suprarenal artery.
 - Inferior suprarenal artery.
 - Ureteric branches.
43. The inferior suprarenal artery is the branch of:
- + The renal artery.
 - Abdominal aorta.
 - Ovarian (testicular) artery.
 - Inferior phrenic artery.
44. The abdominal aorta bifurcates at the level of:
- + L IV.
 - S I.
 - L II.
 - T XII.
45. The abdominal aorta bifurcates into the following arteries:
- + Right and left common iliac arteries.
 - Anterior and posterior iliac arteries.
 - Internal and external iliac arteries.
 - Right and left external iliac arteries.
46. What branches does the common iliac artery give?
- + External and internal iliac arteries.
 - Anterior and posterior iliac arteries.
 - Superior and inferior gluteal arteries.
 - Lateral sacral arteries.
47. The internal iliac artery supplies:
- + Walls and organs of the pelvis.
 - Walls and organs of the abdominal cavity.
 - Inferior limb.
 - Anterior wall of the abdomen.
48. Where is the internal iliac artery divided?
- + At the level of superior margin of the greater sciatic foramen.
 - At the level of sacroiliac joint.
 - At the level of lesser sciatic foramen.
 - At the level of the obturator foramen.
49. Which of the following is present only in female?
- + Uterine artery.
 - Inferior gluteal artery.
 - Obturator artery.
 - Internal pudendal artery.
50. Which of the following is present only in male?
- + Artery to ductus deferens.
 - Obturator artery.
 - Iliolumbar artery.
 - Lateral sacral artery.
51. What branches does iliolumbar artery give?
- + Lumbar and iliac branches.
 - Dorsal and ventral branches.
 - Muscular and cutaneous branches.
 - Medial and lateral branches.
52. The iliac branch of the iliolumbar artery supplies:
- + Iliac muscle and iliac bone.
 - Psoas major muscle and quadratus lumborum muscle.
 - Piriformis muscle.
 - Gluteus medius and gluteus minimus muscles.
53. What branches of the internal iliac artery supply the meninges of the spinal cord?
- + Spinal branches.
 - Iliac branch.
 - Superficial branch.
 - Deep branch.
54. The superior gluteal artery leaves the pelvic cavity through:
- + Suprapiriform foramen.

- Infrapiriform foramen.
- Obturator foramen.
- Lesser sciatic foramen.

55. What branch of the internal iliac artery supplies middle part of the rectum?

- + Middle rectal artery.
- Iliolumbar artery.
- Superior gluteal artery.
- Inferior gluteal artery.

56. What branch of the internal iliac artery supplies the seminal vesicle and prostate gland (in male)?

- + Middle rectal artery.
- Internal pudendal artery.
- Superior gluteal artery.
- Inferior gluteal artery.

57. The internal pudendal artery leaves the pelvic cavity through:

- + Infrapiriform foramen.
- Suprapiriform foramen.
- Lesser sciatic foramen.
- Obturator canal.

58. What branch of the internal pudendal artery supplies the rectum?

- + Inferior rectal artery.
- Perineal artery.
- Urethral artery.
- Deep artery of the penis (clitoris).

59. What branch of the internal pudendal artery is absent in male?

- + Artery of the bulb of the vestibule.
- Urethral artery.
- Artery of the bulb of the penis.
- Dorsal artery of the penis.

60. What branch of the internal pudendal artery is present only in female?

- + Deep artery of the clitoris.
- Deep artery of the penis.
- Urethral artery.
- Inferior rectal artery.

61. What branch of the internal pudendal artery is present both in female and male?

- + Urethral artery.
- Deep artery of the penis.
- Dorsal artery of the clitoris.
- Artery of the bulb of penis.

62. What branch of the internal pudendal artery is present both in female and male?

- + Perineal artery.
- Artery of the bulb of the vestibule.
- Artery of the bulb of penis.
- Deep artery of the clitoris.

63. What branch of the internal pudendal artery is present both in female and male?

- + Inferior rectal artery.
- Deep artery of the penis.
- Deep artery of the clitoris.
- Artery of the bulb of the vestibule.

64. What branch of the internal pudendal artery is present only in male?

- + Deep artery of the penis.
- Inferior rectal artery.
- Perineal artery.
- Urethral artery.

65. What branch of the internal pudendal artery is present only in female?

- + Dorsal artery of the clitoris.
- Inferior rectal artery.
- Perineal artery.
- Urethral artery.

66. The obturator artery leaves the pelvic cavity through:

- + Obturator canal.
- Vascular space.
- Infrapiriform foramen.
- Lesser sciatic foramen.

67. What branch of the obturator artery supplies the medial group of thigh muscles?

- + Anterior branch.
- Posterior branch.
- Acetabular branch.
- Pubic branch.

68. The inferior gluteal artery leaves the pelvic cavity through:

- + Infrapiriform foramen.
- Suprapiriform foramen.
- Vascular space.
- Lesser sciatic foramen.

69. The external iliac artery leaves the pelvic cavity through:

- + Vascular space.
- Obturator canal.
- Muscular space.
- Greater sciatic foramen.

70. What branch of the external iliac artery anastomoses with branch of the subclavian artery?

- + Inferior epigastric artery.
- Artery of round ligament of uterus.
- Deep circumflex iliac artery.
- Celiac artery.

THE ARTERIES OF THE LOWER LIMB

1. The femoral artery is continuation of:

- + The external iliac artery.
- The internal iliac artery.
- The obturator artery.
- The umbilical artery.

2. The femoral artery goes to thigh through:

- + Vascular space (lacuna vasorum).
- Muscular space (lacuna musculorum).
- Obturator canal.
- Infrapiriform foramen.

3. What structure is located medially to the femoral artery in vascular space?

- + Femoral vein.
- Iliopsoas muscle.
- Inguinal ligament.
- Pectinate ligament.

4. On leaving the vascular space the femoral artery appears:

- + Within femoral triangle.
- In adductor canal.
- In popliteal fossa.
- In iliac fossa.

5. Pulsation of the femoral artery is palpable:

- + Below the inguinal ligament in the femoral triangle.
- In the adductor canal.
- In the inguinal canal.
- In the femoral canal.

6. From the femoral groove the femoral artery proceeds to:

- + The adductor canal.
- The inguinal canal.
- The muscular space.
- The popliteal fossa.

7. What artery is not the branch of the femoral artery?

- + The inferior epigastric artery.
- The superficial epigastric artery.
- The superficial circumflex iliac artery.
- The external pudendal artery.

8. What artery is not the branch of the femoral artery?

- + The deep circumflex iliac artery.
- The deep femoral artery.
- The superficial circumflex iliac artery.
- The external pudendal artery.

9. What artery is not the branch of the femoral artery?

- + The internal pudendal artery.
- The deep femoral artery.
- The superficial circumflex iliac artery.

– The external pudendal artery.

10. The superficial epigastric artery goes to:

- + In the anterior abdominal wall.
- In the lateral abdominal wall.
- In the external genital organs.
- In the medial surface of the thigh.

11. Which artery supplies the muscles of the thigh?

- + Deep femoral artery.
- Superficial circumflex iliac artery.
- Popliteal artery.
- Descending genicular artery.

12. Which artery supplies the knee joint?

- + Popliteal artery.
- Deep femoral artery.
- Obturator artery.
- Superficial circumflex iliac artery.

13. What artery is not the branch of the deep femoral artery?

- + Obturator artery.
- Medial circumflex femoral artery.
- Lateral circumflex femoral artery.
- Perforating arteries.

14. What artery supplies the medial muscles of the thigh?

- + Medial circumflex femoral artery.
- Lateral circumflex femoral artery.
- The third perforating artery.
- Superficial circumflex iliac artery.

15. Which arteries go to the posterior femoral area?

- + Perforating arteries.
- Medial circumflex femoral artery.
- Lateral circumflex femoral artery.
- Descending genicular artery.

16. What artery supplies the anterior muscles of the thigh?

- + Lateral circumflex femoral artery.

- Popliteal artery.
- The third perforating artery.
- External pudendal arteries.

17. What branch of the femoral artery arises within the adductor canal?

- + Descending genicular artery.
- Deep femoral artery.
- Superficial circumflex iliac artery.
- Superficial epigastric artery.

18. What artery is a direct continuation of the femoral artery?

- + Popliteal artery.
- Descending genicular artery.
- The third perforating artery.
- Deep femoral artery.

19. How many branches does the popliteal artery give for blood supply of the knee joint?

- + 5 arterial branches.
- 3 arterial branches.
- 4 arterial branches.
- 2 arterial branches.

20. What artery supplies cruciform ligaments and menisci of knee joint?

- + Middle genicular artery.
- Superior medial genicular artery.
- Superior lateral genicular artery.
- Inferior lateral genicular artery.

21. What artery does not take part in formation of the genicular anastomosis?

- + The second perforating artery.
- The superior medial genicular artery.
- The superior lateral genicular artery.
- The descending genicular artery.

22. The popliteal artery splits into following terminal branches:

- + Anterior tibial and posterior tibial arteries.
- Medial plantar and lateral plantar arteries
- Tibial and fibular arteries .
- Lateral tibial and medial tibial arteries.

23. What artery is a direct continuation of the popliteal artery?

- + Posterior tibial artery.
- Anterior tibial artery.
- Peroneal (fibular) artery.
- Dorsal artery of the foot.

24. Where is the posterior tibial artery located?

- + In the cruropopliteal canal.
- In the vsuperior musculoperoneal canal.
- In the inferior musculoperoneal canal.
- In the adductor canal.

25. Before the plantar surface of the foot the posterior tibial artery passes:

- + Behind the medial malleolus under the flexor retinaculum.
- In front of the medial malleolus under the flexor retinaculum.
- Behind the lateral malleolus under the extensor retinaculum.
- In front of the lateral malleolus under the flexor retinaculum.

26. Where can you palpate the pulsation of the posterior tibial artery?

- + Behind the medial malleolus.
- Under the lateral border of the soleus muscle.
- In the cruropopliteal canal.
- Behind the lateral malleolus.

27. What artery is not the branch of the posterior tibial artery?

- + Posterior tibial recurrent artery.
- Peroneal artery.
- Circumflex fibular artery.
- Nutrient tibial artery.

28. What branch of the posterior tibial artery passes through the inferior muscular peroneal canal?

- + Peroneal (fibular) artery.
- Circumflex fibular artery.
- Muscular branches.

– Nutrient tibial artery.

29. Where does the peroneal (fibular) artery pass?

- + In the inferior musculoperoneal canal.
- In the superior musculoperoneal canal.
- In the cruropopliteal canal.
- In the adductor canal.

30. What artery blood supplies the short and long peroneal (fibular) muscles?

- + Peroneal (fibular) artery.
- Posterior tibial artery.
- Anterior tibial artery.
- Lateral plantar artery.

31. What branches are terminal branches of the posterior tibial artery?

- + Lateral and medial plantar arteries.
- Plantar metatarsal arteries.
- Dorsal artery of the foot and arcuate artery.
- Dorsal metatarsal arteries.

32. Where is the medial plantar artery located?

- + In the medial plantar groove.
- In the lateral plantar groove.
- In the inferior plantar canal.
- In the inferior musculoperoneal canal.

33. Where is the lateral plantar artery located?

- + In the lateral plantar groove.
- In the medial plantar groove.
- In the inferior plantar canal.
- In the inferior musculoperoneal canal.

34. The lateral plantar artery at the level of the base of the metatarsal bones forms:

- + Deep plantar arch.
- Superficial plantar arch.
- Rete plantaris.
- Dorsal arch of the foot.

35. The lateral plantar artery anastomoses with:

- + Deep plantar artery.
- Lateral tarsal artery.
- Dorsal artery of the foot.
- Medial tarsal artery.

36. What branches does the deep plantar arch give?

- + Plantar metatarsal arteries I– IV.
- Plantar digital arteries proper.
- Dorsal metatarsal arteries.
- Dorsal digital arteries.

37. The terminal branches of the common plantar digital arteries are:

- + Plantar digital arteries proper.
- Perforating branches.
- Dorsal metatarsal arteries.
- Dorsal digital arteries.

38. The anterior tibial artery goes to the anterior surface of the leg:

- + Via the interosseus membrane.
- Via the superior musculo-peroneal canal.
- Via the anterior intermuscular septum.
- Between the long and short peroneal muscles.

39. What branch of the anterior tibial artery takes part in formation of the genicular anastomosis?

- + Anterior tibial recurrent artery.
- Anterior lateral malleolar artery.
- Anterior medial malleolar artery.
- Dorsal artery of the foot.

40. What artery is the direct continuation of the anterior tibial artery on the foot?

- + Dorsal artery of the foot.
- Lateral tarsal artery.
- Arcuate artery.
- Deep plantar artery.

41. What artery is not the branch of the dorsal artery of the foot?

- + Lateral malleolar artery.

- Lateral tarsal artery.
- Medial tarsal artery.
- Deep plantar artery.

42. What arteries are the branches of the arcuate artery?

- + Dorsal metatarsal II– V.
- Dorsal digital arteries.
- Plantar metatarsal arteries.
- Common plantar digital arteries.

43. How is each dorsal metatarsal artery divided?

- + Into dorsal digital arteries.
- Into plantar metatarsal arteries.
- Into common plantar digital arteries.
- Into proper plantar digital arteries.

44. Where is calcaneal network formed?

- + On the posterior surface of calcaneal tuber.
- On the anterior surface of the ankle joint.
- On the lateral malleolus.
- On the plantar surface.

THE SYSTEMS OF THE SUPERIOR AND INFERIOR VENA CAVA

1. The superior vena cava is formed by:

- + The right and left brachiocephalic veins.
- The right and left subclavian vein.
- The external and internal jugular veins.
- The azygos and hemiazygos veins.

2. The superior vena cava drains into:

- + The right atrium.
- The left atrium.
- The left ventricle.
- The right ventricle.

3. The brachiocephalic vein is formed by:

- + The subclavian and internal jugular veins.
- The internal and external jugular veins.
- The subclavian and external jugular vein.
- The subclavian and vertebral veins.

4. What veins do not open into the brachiocephalic vein?

- + Azygos and hemiazygos veins.
- Thymic veins.
- Bronchial veins.
- Oesophageal veins.

5. The azygos vein is a continuation of:

- + The right ascending lumbar vein.
- The left ascending lumbar vein.
- The right lumbar veins I and II.
- The paraumbilical veins.

6. The hemiazygos vein is a continuation of:

- + The left ascending lumbar vein.
- The right ascending lumbar vein.
- The left lumbar veins I and II.
- The paraumbilical veins.

7. The right ascending lumbar vein enters the thoracic cavity via:

- + The opening between the muscular fibers of the right crus of the diaphragm.
- The aortic hiatus of the diaphragm.
- The caval opening of the diaphragm.
- The oesophageal opening of the diaphragm.

8. Where is azygos vein located?

- + In the posterior mediastinum on the right.
- In the anterior mediastinum.
- In the middle mediastinum.
- In the posterior mediastinum on the left.

9. The azygos vein drains into:

- + The superior vena cava.
- The inferior vena cava.
- The right atrium.
- The right brachiocephalic vein.

10. Which of the following is not the tributary of the azygos vein?

- + Internal thoracic vein.
- Posterior intercostal veins IV– IX.
- Right superior intercostal veins.
- Hemiazygos vein.

11. The left ascending lumbar vein enters the thoracic cavity via:

- + The opening between the muscular fibers of the left crus of the diaphragm.
- The aortic hiatus of the diaphragm.
- The caval opening of the diaphragm.
- The oesophageal opening of the diaphragm.

12. Where is the azygos vein located?

- + In the posterior mediastinum on the left.
- In anterior mediastinum.
- In middle mediastinum.
- In the posterior mediastinum on the right.

13. The hemiazygos vein drains into:

- + The azygos vein.
- The superior vena cava.
- The accessory hemiazygos.
- The internal thoracic vein.

14. What vein drains into hemiazygos vein?

- + The accessory hemiazygos vein.
- The right internal thoracic vein.
- The left internal thoracic vein.
- The left superior intercostal vein.

15. The posterior intercostal veins anastomose with:

- + The anterior intercostal veins.
- The mediastinal veins.
- The oesophageal veins.
- The pericardiac veins.

16. Where are the posterior intercostal veins located?

- + In the intercostal space along inferior margin of the upper rib.
- On the internal surface of the corresponding rib.
- On the external surface of the corresponding rib.
- In the intercostal space along the superior margin of the lower rib.

17. What veins drain directly into the posterior intercostal vein?

- + The intervertebral and dorsal vein.
- The oesophageal veins.
- The mediastinal veins.
- The pericardial veins.

18. How are the veins of the upper limbs divided?

- + Into deep and superficial veins.
- Into medial and lateral veins.
- Into visceral and parietal veins.
- Into anterior and posterior veins.

19. The superficial veins of upper limbs gather blood from:

- + Skin and venous network of the subcutaneous fat.
- Muscles of the upper limb.
- Joints of the upper limb.
- Bones of the upper limb.

20. The deep veins of the upper limb do not gather blood from:

- + Venous network of the subcutaneous fat.
- Muscles of the upper limb.
- Joints of the upper limb.
- Bones of the upper limb.

21. Which of the following are the superficial veins of upper limbs?

- + Cephalic and basilic veins.
- Radial veins.
- Ulnar veins.
- Brachial veins.

22. Where are the dorsal metacarpal veins located?

- + On the dorsal surface of the hand in the subcutaneous tissue.
- On the palmar surface of the hand under skin.
- On the palmar surface of the hand under palmar aponeurosis.
- In the muscles of the hand.

23. The dorsal metacarpal veins form:

- + The dorsal venous network of the hand.
- The superficial palmar venous arch.
- The deep palmar venous arch.
- The palmar metacarpal veins.

24. The deep veins of the forearm originate from:

- + The superficial and deep palmar arches.
- The dorsal metacarpal veins.
- The dorsal venous network of the hand.
- The median cubital vein.

25. What vein continues as cephalic vein?

- + The dorsal metacarpal vein I.
- The superficial palmar venous arch.
- The deep palmar venous arch.
- The palmar digital I.

26. Where is the cephalic vein located?

- + On the anterior surface along the radial aspect of the forearm.
- On the dorsal surface of the forearm.
- On the ulnar part of the forearm.
- On the hand.

27. What vein continues as basilic vein?

- + Dorsal metacarpal vein IV.
- Superficial palmar venous arch.
- Palmar digital IV.
- Dorsal metacarpal vein I.

28. Where is the basilic vein located?

- + On the anterior surface along the ulnar part of the forearm.
- On the anterior surface along the radial part of the forearm.
- On the dorsal surface of the forearm.
- On the hand.

29. What vein anastomoses the cephalic and basilic veins?

- + Median cubital vein.
- Median vein of the forearm.
- Dorsal metacarpal vein I.

– Dorsal metacarpal vein IV.

30. Which vein is used for intravenous injections?

- + Median cubital vein.
- Median vein of the forearm.
- Basilic vein.
- Dorsal metacarpal vein IV.

31. The cephalic vein drains into:

- + The axillary vein.
- The subclavian vein.
- The brachial vein.
- The basilic vein.

32. Where is the median cubital vein located?

- + Under skin in the cubital fossa.
- Under skin in the region of medial epicondyle of the humerus.
- Under skin in the region of lateral epicondyle of the humerus.
- Under skin in the region of olecranon.

33. The median cubital vein joins the following veins:

- + Basilic and cephalic veins.
- Basilic and radial veins.
- Cephalic and radial veins.
- Radial and ulnar veins.

34. How many veins accompany the radial artery?

- + 2.
- 1.
- 3.
- 4.

35. How many veins accompany the ulnar artery?

- + 2.
- 1.
- 3.
- 4.

36. How many veins does the neurovascular bundle include in the lower third of the arm?

- + 2.
- 1.
- 3.
- 4.

37. The brachial veins are formed by:

- + The junction of the ulnar and radial veins.
- The junction of the cephalic and ulnar veins.
- The junction of the basilic and radial veins.
- The junction of the cephalic and basilic veins.

38. Two brachial veins meet forming the following vein:

- + The axillary vein.
- The subclavian vein.
- The cephalic vein.
- The basilic vein.

39. The axillary vein arises at the level:

- + On the lower border of the latissimus dorsi muscle.
- On the lower border of the pectoralis minor muscle.
- On the upper border of the pectoralis minor muscle.
- At the level of the first rib.

40. The axillary vein continues as a following vein:

- + The subclavian vein.
- The basilic vein.
- The cephalic vein.
- The brachiocephalic vein.

41. What is the border between the axillary and subclavian veins?

- + The external margin of the first rib.
- The second rib.
- The inferior margin of the pectoralis minor muscle.
- The inferior margin of the latissimus dorsi muscle.

42. What tributary of the axillary vein takes part in formation of the cavacaval anastomoses?

- + Thoracoepigastric vein.
- Ulnar vein.
- Radial vein.
- Brachial vein.

43. Which artery does not joint the axillary vein?

- + The basilic vein.
- The cephalic vein.
- The anterior circumflex humeral vein.
- The lateral thoracic vein.

44. Which vein does joint the axillary vein?

- + The anterior circumflex humeral vein.
- The ulnar vein.
- The basilic vein.
- The lateral thoracic vein.

45. The thoracoepigastric vein is tributary of _____ vein?

- + The lateral thoracic vein.
- The mediastinal veins.
- The internal thoracic veins.
- The anterior intercostal veins.

46. The lateral thoracic vein is tributary of _____ vein?

- + The axillary vein.
- The subclavian vein.
- The internal thoracic veins.
- The anterior intercostal veins.

47. Which of the following veins anastomose with the superficial epigastric vein?

- + The thoracoepigastric vein.
- The anterior intercostal veins.
- The posterior intercostal veins.
- The brachial veins.

48. Where is the subclavian vein located?

- + In the anterscalene space.

- In the interscalene space.
- In the intercostale space.
- In the suprasternale space.

49. Which venous sinus continues as the internal jugular vein?

- + The sigmoid sinus.
- The transverse sinus.
- The cavernous sinus.
- The straight sinus.

50. The internal jugular vein originates at the level of:

- + The jugular foramen.
- The foramen magnum.
- The foramen lacerum.
- The external carotid foramen.

51. The dilated segment of the internal jugular vein located within the jugular foramen is:

- + The superior bulb of the jugular vein.
- The inferior bulb of the jugular vein.
- The sinus of the jugular vein.
- The cistern of the jugular vein.

52. The internal jugular vein joints with the following vein:

- + The subclavian vein.
- The anterior jugular vein.
- The external jugular vein.
- The retromandibular vein.

53. Where is vertebral vein located?

- + In foramen transversarium of cervical vertebrae.
- On the posterior surface of transverse processes of the cervical vertebrae.
- On the anterior surface of transverse processes of the cervical vertebrae.
- In the vertebral canal.

54. The vertebral vein drains into:

- + The brachiocephalic vein.
- The external jugular vein.
- The internal jugular vein.

– The retromandibular vein.

55. Which of the following veins is not the intracranial tributary of the internal jugular vein?

- + Pharyngeal vein.
- Diploic vein.
- Superficial cerebral vein.
- Superior ophthalmic vein.

56. Which of the following is not the intracranial tributary of the internal jugular vein?

- + The lingual vein.
- The dural venous sinuses.
- The deep cerebral vein.
- The inferior ophthalmic vein.

57. Which of the following veins is the intracranial tributary of the internal jugular vein?

- + Veins of labyrinth .
- Pharyngeal veins.
- Superior palpebral veins.
- Inferior palpebral veins.

58. Where is the superior sagittal sinus located?

- + Along the upper border of falx cerebri.
- Along the lower border of falx cerebri.
- Along the origination of falx cerebelli.
- Along free margin of falx cerebelli.

59. Which of the following does not take part in formation of the confluence of sinuses?

- + Sphenoparietal sinus.
- Occipital sinus.
- Straight sinus.
- Superior sagittal sinus.

60. Where is the inferior sagittal sinus located?

- + Along the lower free border of falx cerebri.
- Along the upper border of falx cerebri.
- Along the origination of falx cerebelli.
- Along the free margin of falx cerebelli.

61. The inferior sagittal sinus drains into:

- + The straight sinus.
- The transverse sinus.
- The sigmoid sinus.
- The cavernous sinus.

62. Which of the following drains into straight sinus?

- + The great cerebral vein.
- The superficial cerebral vein.
- The ophthalmic vein.
- The inferior choroid vein.

63. Where is the transverse sinus located?

- + Along the base of tentorium cerebelli.
- Along the lower free border of falx cerebri.
- Along the upper border of falx cerebri.
- On the base of the skull on sides of the Turkish saddle.

64. Where is the occipital sinus located?

- + Along the origination (base) of falx cerebelli.
- Along the lower free border of falx cerebri.
- Along the upper border of falx cerebri.
- Along free margin of the falx cerebelli.

65. The transverse sinus continues to:

- + The sigmoid sinus.
- The internal jugular vein.
- The straight sinus.
- The occipital sinus.

66. The sigmoid sinus continues to:

- + The internal jugular vein.
- The external jugular vein.
- The anterior jugular vein.
- The basal vein.

67. Where is cavernous sinus located?

- + On both lateral sides of the Turkish saddle.
- At the base of falx cerebelli.
- Along the lower free border of falx cerebri.
- Along the upper border of falx cerebri.

68. Through the cavity of the cavernous sinus passes:

- + The internal carotid artery.
- The external carotid artery.
- The anterior cerebral artery.
- The middle cerebral artery.

69. The right and left cavernous sinuses communicate via:

- + The anterior and posterior intercavernous sinuses.
- The inferior and superior communicating veins.
- The diploic veins.
- The emissary veins.

70. What vein opens into the cavernous sinus?

- + The superior ophthalmic vein.
- The inferior ophthalmic vein.
- The frontal diploic vein.
- The parietal emissary vein.

71. Where is sphenoparietal sinus located?

- + Along the posterior border of the lesser wing of sphenoid bone.
- Along squamous border of greater wing of sphenoid bone.
- Along sphenofrontal suture.
- Along coronal suture.

72. The emissary veins communicate:

- + Through the dural venous sinuses with extrinsic veins of the head.
- Through the dural venous sinuses with cerebral veins.
- Through the dural venous sinuses with spinal veins.
- Through the cerebral and spinal veins.

73. Which of the following is not the extracranial tributaries of the internal jugular vein?

- + The condylar emissary vein.
- The lingual vein.

- The facial vein.
- The retromandibular vein.

74. Which of the following is the extracranial tributaries of the internal jugular vein?

- + The superior thyroid vein.
- The parietal emissary vein.
- The mastoid emissary vein.
- The inferior ophthalmic vein.

75. The lingual vein is formed by:

- + The dorsal and deep lingual veins, sublingual vein.
- The superior labial veins.
- The inferior labial veins.
- The parotid veins.

76. Which of the following is not the tributaries of the facial vein?

- + The retromandibular vein.
- The angular vein.
- The superior and inferior labial veins.
- The palatine vein.

77. Where is the external jugular vein located?

- + Near the anterior margin of the sternocleidomastoid muscle.
- In the mental region.
- In the omotrapezoid triangle.
- In the submandibular triangle.

78. Which of the following is not the tributary of the external jugular vein?

- + The auricular (temporomandibular) vein.
- The transverse cervical vein.
- The anterior jugular vein.
- The supraclavicular vein.

79. The right and left anterior jugular veins are joined by:

- + The jugular venous arch.
- The emissary veins.
- The transverse cervical vein.
- The superior anastomotic vein.

80. Where is the subclavian vein located?
- + In the antescalene space.
 - In the interscalene space above trunks of the brachial plexus.
 - In the interscalene space below trunks of the brachial plexus .
 - In the suprasternal interaponeurotic space.
81. Where is the inferior vena cava formed?
- + At the level of the intervertebral disk between the IV and V lumbar vertebrae.
 - At the level of the middle part of the body of the IV lumbar vertebra.
 - At the level of the intervertebral disk between the V lumbar and I sacral vertebrae.
 - At the level of the intervertebral disk between the I and II sacral vertebrae.
82. The inferior vena cava is formed by:
- + The right and left common iliac veins.
 - The right and left external iliac veins.
 - The right and left internal iliac veins.
 - The right and left renal veins.
83. What structure is located to the left from the inferior vena cava?
- + The abdominal aorta.
 - The root of mesentery.
 - The right psoas major muscle.
 - The right sympathetic trunk.
84. How are the tributaries of the inferior vena cava classified?
- + The parietal and visceral.
 - The deep and superficial.
 - The anterior and posterior.
 - The right and left.
85. Where is the inferior vena cava on the visceral surface of the liver located?
- + In the groove for vena cava.
 - In the fissura for venous ligament.
 - In the porta hepatis.
 - In the fissura for round ligament.
86. What veins drain into the inferior vena cava when it passes the liver?
- + The hepatic veins.
 - The hepatic portal vein.
 - The inferior phrenic veins.
 - The renal veins.
87. The inferior vena cava enters the thoracic cavity through:
- + The foramen vena cava.
 - The oesophageal hiatus.
 - The aortic hiatus.
 - The right lumbocostal triangle.
88. Inside the thoracic cavity the inferior vena cava is:
- + In the posterior mediastinum.
 - In the superior mediastinum.
 - In the middle mediastinum.
 - In the anterior mediastinum.
89. The inferior vena cava drains into:
- + The right atrium.
 - The left atrium.
 - The right ventricle.
 - The left ventricle.
90. Which of the following are parietal branches of the inferior vena cava?
- + The lumbar veins.
 - The right and left ascending lumbar veins.
 - The hepatic veins.
 - The inferior epigastric veins.
91. Which of the following are parietal branches of the inferior vena cava?
- + The inferior phrenic veins.
 - The right and left ovarian veins.
 - The superior epigastric veins.
 - The inferior epigastric veins.
92. Which of the following is the visceral branch of the inferior vena cava in male?
- + The right testicular vein.
 - The right ovarian vein.

- The dorsal vein of penis.
- The deep vein of penis.

93. Which of the following is the visceral branch of the inferior vena cava in female?

- + The right ovarian vein.
- The right testicular vein.
- The left testicular vein.
- The dorsal vein of clitoris.

94. The left testicular vein drains into:

- + The left renal vein.
- The inferior vena cava.
- The inferior mesenteric vein.
- The left ascending lumbar vein.

95. The left ovarian vein drains into:

- + The left renal vein.
- The inferior vena cava.
- The inferior mesenteric vein.
- The left uterine artery.

96. The right suprarenal vein drains into:

- + The inferior vena cava.
- The right renal vein.
- The superior mesenteric vein.
- The hepatic portal vein.

97. The left suprarenal vein drains into:

- + The left renal vein.
- The inferior vena cava.
- The inferior mesenteric vein.
- The right renal vein.

98. The hepatic veins drain into:

- + The inferior vena cava.
- The hepatic portal vein.
- The superior mesenteric vein.
- The inferior phrenic veins.

99. Which groups of tributaries does the internal iliac vein have?

- + The parietal and visceral.
- The right and left.
- The deep and superficial.

- The anterior and posterior.

100. The common iliac vein is formed by:

- + The external and internal iliac veins.
- The inferior and superior mesenteric veins.
- The right and left ascending lumbar veins.
- The inferior and superior gluteal veins.

101. Which vein is formed by junction of the right and left common iliac veins?

- + The inferior vena cava.
- The inferior mesenteric vein.
- The superior mesenteric vein.
- The hepatic portal vein.

102. Which of the following are not the parietal tributaries of the internal iliac vein?

- + The vesical veins.
- The superior gluteal veins.
- The inferior gluteal veins.
- The obturator veins.

103. Which of the following are parietal tributaries of the internal iliac vein?

- + The lateral sacral veins.
- The vesical veins.
- The middle rectal veins.
- The uterine veins.

104. Which venous plexus of the lesser pelvis is in male only?

- + The prostatic venous plexus.
- The rectal venous plexus.
- The vesical venous plexus.
- The uterine venous plexus.

105. Which venous plexus of the lesser pelvis is in the male and in female?

- + The sacral venous plexus.
- The prostatic venous plexus.
- The uterine venous plexus.
- The vaginal venous plexus.

106. Which venous plexus of the lesser pelvis is in male and in female?

- + The rectal venous plexus.
- The prostatic venous plexus.
- The uterine venous plexus.
- The vaginal venous plexus.

107. Which venous plexus of the lesser pelvis is in female only?

- + The uterine venous plexus.
- The prostatic venous plexus.
- The rectal venous plexus.
- The sacral venous plexus.

108. Which venous plexus of the lesser pelvis is in female only?

- + The vaginal venous plexus.
- The prostatic venous plexus.
- The rectal venous plexus.
- The vesical venous plexus.

109. Which venous plexus of the lesser pelvis is in male and in female?

- + The vesical venous plexus.
- The prostatic venous plexus.
- The uterine venous plexus.
- The vaginal venous plexus.

110. Which veins of the lesser pelvis are in female only?

- + The uterine veins.
- The vesical veins.
- The middle rectal veins.
- The lateral sacral veins.

111. The superior rectal vein drains into:

- + The inferior mesenteric vein.
- The middle rectal vein.
- The internal iliac vein.
- The external iliac vein.

112. The inferior rectal veins drain into:

- + The internal pudendal vein.
- The middle rectal vein.
- The internal iliac vein.
- The inferior mesenteric vein.

113. The internal pudendal vein drains into:

- + The internal iliac vein.
- The common iliac vein.
- The inferior mesenteric vein.
- The external iliac vein.

114. Which of the following drains into external iliac vein?

- + The inferior epigastric vein.
- The superior epigastric vein.
- The middle sacral vein.
- The iliolumbar vein.

115. The superior gluteal vein leaves the pelvic cavity through:

- + The suprapiriform foramen.
- The infrapiriform foramen.
- The minor sciatic foramen.
- The obturator canal.

116. The inferior gluteal vein leaves the pelvic cavity through:

- + The infrapiriform foramen.
- The suprapiriform foramen.
- The minor sciatic foramen.
- The obturator canal.

117. The obturator vein leaves the pelvic cavity through:

- + The obturator canal.
- The vascular space.
- The muscular space.
- The minor sciatic foramen.

118. How are the veins of the lower limbs classified?

- + Deep and superficial.
- Parietal and visceral.
- Medial and lateral.
- Anterior and posterior.

119. Where are the superficial veins of the lower limb located?

- + Below skin and outside the proper fascia.

- Below the proper fascia and outside the muscles.
- Within muscles.
- On the bones of the lower limb.

120. The dorsal digital veins open into:

- + The dorsal venous arch of foot.
- The plantar venous network.
- The plantar venous arch of foot.
- The plantar metatarsal veins.

121. Where is the plantar venous network located?

- + On the plantar surface of foot.
- On the dorsal surface of foot.
- Along the medial margin of foot.
- Along the lateral margin of foot.

122. Where is the dorsal venous arch of foot located?

- + On the dorsal surface of foot at the level of distal ends of metatarsal bones.
- On the anterior surface of the ankle joint.
- In the region of medial malleolus.
- In the region of lateral malleolus.

123. Which veins gather blood from the dorsal and plantar subcutaneous veins of foot?

- + The great and small saphenous veins.
- The anterior tibial veins.
- The posterior tibial veins.
- The fibular (perineal) veins.

124. The plantar metatarsal veins open into:

- + The plantar venous arch.
- The dorsal venous arch.
- The lateral marginal vein.
- The medial marginal vein.

125. The blood flow from plantar venous arch into:

- + The posterior tibial veins.
- The anterior tibial veins.
- The fibular (perineal) veins.
- The dorsal venous network of the foot.

126. Which veins of the lower limb are superficial veins?

- + The great and small saphenous veins.
- The anterior tibial veins.
- The posterior tibial veins.
- The femoral and popliteal veins.

127. Which veins of the lower limb are deep veins?

- + Deep femoral vein.
- Lateral marginal vein.
- Medial marginal vein.
- Accessory saphenous vein.

128. Where does the great saphenous vein begin?

- + On the dorsal surface of the foot in front of the medial malleolus.
- On the dorsal surface of the foot in front of the lateral malleolus.
- On the plantar surface of the foot along the medial margin.
- On the plantar surface of the foot along the lateral margin.

129. Where is the great saphenous vein located on the leg?

- + On the medial side near saphenous nerve.
- On the posterior side near sural nerve.
- On the anterior surface.
- On the lateral side.

130. Where is the great saphenous vein located on the thigh?

- + On the anteromedial surface.
- On the anterior surface near rectus femoris muscle.
- On the lateral surface of thigh.
- In the adductor canal.

131. The great saphenous vein drains into:

- + The femoral vein.
- The deep femoral vein.
- The popliteal vein.
- The small saphenous vein.

132. Which veins drain into the great saphenous vein in the femoral triangle?

- + The external pudendal veins.
- The medial circumflex femoral veins.
- The lateral circumflex femoral veins.
- The perforating veins.

133. The small saphenous vein goes to the leg:

- + Behind the lateral malleolus.
- In front of the lateral malleolus.
- Behind of the medial malleolus.
- In front the medial malleolus.

134. Where is the small saphenous vein located on the leg?

- + On the posterior surface between lateral and medial head of the gastrocnemius muscle.
- On the anterior surface.
- On the posterior surface between superficial and deep muscles.
- On the medial surface near saphenous nerve.

135. The small saphenous vein drains into:

- + The popliteal vein.
- The femoral vein.
- The great saphenous vein.
- The deep femoral vein.

136. Which of the following are located on the anterior surface of the interosseus membrane of the leg?

- + The anterior tibial veins.
- The posterior tibial veins.
- The fibular (peroneal) veins.
- The sural veins.

137. What veins pass through the cruropliteal canal?

- + The posterior tibial veins.
- The anterior tibial veins.
- The perforating veins.
- The fibular (peroneal) veins.

138. What veins pass through the inferior musculo–peroneal canal?

- + The fibular (peroneal) veins.
- The posterior tibial veins.
- The anterior tibial veins.
- The genicular veins.

139. What vein is located in the popliteal fossa?

- + The popliteal vein.
- The femoral vein.
- The deep femoral vein.
- The great saphenous vein.

140. Which of the following is in the adductor canal?

- + The femoral vein.
- The popliteal vein.
- The great saphenous vein.
- Small saphenous vein.

141. Which of the following does not drain into the deep femoral vein?

- + The external pudendal vein.
- The medial circumflex femoral vein.
- The lateral circumflex femoral vein.
- The perforating veins.

142. The femoral vein is a continuation of the following vein:

- + The popliteal vein.
- The deep femoral vein.
- The great saphenous vein.
- The small saphenous vein.

143. The femoral vein continues as:

- + The external iliac vein.
- The common iliac vein.
- The internal iliac vein.
- The inferior vena cava.

144. The femoral vein enters the pelvic cavity through:

- + The vascular space.
- The muscular space.

- The obturator canal.
- The minor sciatic foramen.

145. The hepatic portal vein gathers blood from:

- + The unpaired organs of abdominal cavity.
- The paired organs of abdominal cavity.
- The walls of abdominal cavity.
- The walls and organs of the pelvic cavity.

146. Where is hepatic portal vein located?

- + Within the hepatoduodenal ligament.
- Within the hepatogastric ligament.
- Within the round ligament of liver.
- Within the mesentery.

147. Which of the following is not the tributary of the hepatic portal vein?

- + The inferior rectal vein.
- The colic veins.
- The jejunal and ileal veins.
- The gastric veins.

148. Which of the following is the tributary of the hepatic portal vein?

- + Splenic vein.
- Renal vein.
- Suprarenal vein.
- Testicular vein.

149. The hepatic portal vein receives the venous blood from following organ:

- + Pancreas.
- Left kidney.
- Left testis (ovary).
- Right kidney.

150. What vein does not take part in formation of the hepatic portal vein?

- + The inferior rectal vein.
- The superior mesenteric vein.
- The splenic vein.
- The inferior mesenteric vein.

151. Where is hepatic portal vein formed?

- + Behind the head of pancreas.
- Within mesentery.
- Behind the body of pancreas.
- Within psoas major muscle.

152. How is hepatic portal vein divided in porta hepatis:

- + Into right and left branches.
- Into anterior and posterior branches.
- Into superior and inferior branches.
- Into superficial and deep branches.

153. How are terminal branches of the hepatic portal vein called inside the hepatic lobule?

- + Sinusoids.
- Venules.
- Central vein.
- Interlobular vein.

154. Where do sinusoid capillaries open?

- + In the central vein.
- In the interlobular veins.
- In the sublobular veins.
- In the hepatic veins.

155. Where are paraumbilical veins located?

- + Within teres ligament of liver.
- Within coronary ligament of liver.
- Within hepatoduodenal ligament.
- Within falciform ligament.

156. Where is the superior mesenteric vein located?

- + In the root of mesentery.
- Within hepatoduodenal ligament.
- Within transverse mesocolon.
- Within teres ligament of liver.

157. What structure is located to the left side from the superior mesenteric vein?

- + The superior mesenteric artery.
- The common bile duct.
- The common hepatic artery.
- The right gastroepiploic artery.

158. Which of the following is not the tributary of the superior mesenteric vein?
- + The cystic vein.
 - The jejunal veins.
 - The pancreatic vein.
 - The ilioocolic veins.
159. Which of the following is not the tributary of the superior mesenteric vein?
- + The right gastric vein.
 - The pancreaticoduodenal vein.
 - The ileocolic vein.
 - The middle colic vein.
160. Which of the following is not the tributary of the superior mesenteric vein?
- + The sigmoid veins.
 - The pancreaticoduodenal vein.
 - The jejunal and ileal veins.
 - The right gastrointestinal vein.
161. The superior mesenteric vein doesn't gather blood from the following organ:
- + Gall bladder.
 - Vermiform appendix.
 - Ascending colon.
 - Transverse colon.
162. The splenic vein passes:
- + Along the superior border of the pancreas.
 - Along greater curvature of stomach.
 - Along lesser curvature of stomach.
 - Along the inferior border of the pancreas.
163. Where is the union between the superior mesenteric vein and splenic vein located?
- + Behind the head of the pancreas.
 - At the porta hepatis.
 - Behind the bulb of duodenum.
 - Within the hepatoduodenal ligament.
164. Which of the following is not the tributary of the splenic vein?
- + The right and left gastric veins.
 - The pancreatic veins.
 - The short gastric veins.
 - The left gastrointestinal vein.
165. Where is the anastomosis between the right and left gastrointestinal veins located?
- + On the greater curvature of stomach.
 - On the lesser curvature of stomach.
 - On the posterior wall of the stomach.
 - On the superior border of pancreas.
166. The splenic vein doesn't gather blood from:
- + Duodenum.
 - Pancreas.
 - Fundus of stomach.
 - Spleen.
167. Which of the following is not the tributary of the inferior mesenteric vein?
- + Middle rectal vein.
 - Sigmoid veins.
 - Left colic vein.
 - Superior rectal vein.
168. The inferior mesenteric vein doesn't gather blood from:
- + Ascending colon.
 - Descending colon.
 - Upper part of the rectum.
 - Sigmoid colon.
169. Where is the anastomosis between the right and left gastric veins located?
- + On the lesser curvature of stomach.
 - On the greater curvature of stomach.
 - On the posterior wall of stomach.
 - On the abdominal part of oesophagus.
170. Where is the anastomosis between the oesophageal veins and left gastric vein located?
- + At the cardiac part of stomach.
 - On the lesser curvature of stomach.

- On the greater curvature of stomach.
- At the fundus of stomach.

171. The cavacaval anastomoses are:

- + Anastomoses between the tributaries of the superior vena cava and inferior vena cava.
- Anastomoses between the parietal and visceral tributaries of the inferior vena cava.
- Anastomoses between the parietal and visceral tributaries of the superior vena cava.
- Anastomoses between the tributaries of the hepatic portal vein and vena cava.

172. Which veins anastomose within the anterior abdominal wall?

- + Superior and inferior epigastric veins.
- Right and left gastroepiploic veins.
- Right and left gastric veins.
- Superior and inferior gastric veins.

173. Which veins anastomose on the posterior abdominal wall?

- + Azygos vein and right lumbar veins.
- Superior and inferior epigastric veins.
- Thoracoepigastric and superficial epigastric veins.
- Superior and inferior mesenteric veins.

174. Which veins anastomose on the posterior abdominal wall?

- + Hemiazygos vein and left lumbar vein.
- Thoracoepigastric and superficial epigastric veins.
- Right and left gastroepiploic veins.
- Superior and inferior epigastric veins.

175. Which veins anastomose within the anterior abdominal wall?

- + Superior epigastric vein and paraumbilical vein.
- Superior epigastric vein and left gastric vein.
- Superior epigastric vein and right gastric vein.
- Paraumbilical vein and prepyloric vein.

176. Which veins anastomose in the region of the cardiac part of stomach?

- + Left gastric vein and oesophageal veins.
- Left and right gastric veins.
- Left and right gastroepiploic veins.
- Right gastric vein and oesophageal veins.

177. Which veins anastomose within the anterior abdominal wall?

- + Inferior epigastric vein and paraumbilical vein.
- Paraumbilical vein and prepyloric vein.
- Azygos vein and right lumbar veins.
- Left and right gastric veins.

178. Which veins anastomose within the wall of the rectum?

- + Superior and middle rectal veins.
- Superior rectal vein and middle sacral vein.
- Middle rectal vein and middle sacral vein.
- Middle rectal vein and lateral sacral veins.

179. Which vein does not receive blood from the stomach?

- + Inferior mesenteric vein.
- Splenic vein.
- Prepyloric vein.
- Right and left gastric veins.

LYMPHATIC AND IMMUNE SYSTEMS

1. How are the lymph nodes of the lower limb classified?

- + Superficial and deep.
- Anterior and posterior.
- Medial and lateral.
- Parietal and visceral.

2. Where are the superficial lymphatic vessels of the lower limbs located?

- + Within the subcutaneous tissue outside the superficial fascia.
- Accompany deep blood vessels.
- Within the muscles of lower limbs.
- Within skin.

3. Where are the deep lymphatic vessels of lower limbs located?

- + Accompany deep blood vessels.
- Within the subcutaneous tissue outside the superficial fascia.
- Within the muscles of lower limbs.
- Within the skin.

4. The posterior lymph vessels of the lower limbs open into:

- + Popliteal lymph nodes.
- Deep inguinal lymph nodes.
- Superficial inguinal lymph nodes.
- Medial lymph nodes of the lower limbs.

5. Which group of lymph nodes of the lower limb is absent?

- + Anterior popliteal lymph nodes.
- Popliteal lymph nodes.
- Deep inguinal lymph nodes.
- Superficial inguinal lymph nodes.

6. The deep lymph vessels of the lower limb open into:

- + Deep inguinal lymph nodes.
- Superficial inguinal lymph nodes.
- Popliteal lymph nodes.
- Anterior tibial node.

7. Where are the superficial inguinal nodes located?

- + In the femoral triangle outside the fascia lata.
- Within quadriceps femoris muscle.
- In the iliopectineal sulcus under fascia lata.
- Within skin below inguinal ligament.

8. Where are deep inguinal nodes located?

- + In the iliopectineal sulcus under superficial lamina of the fascia lata.
- In the femoral triangle outside the fascia lata.

- Within muscles of the anterior group of the thigh.
- In the capsule of hip joint.

9. How is the upper deep inguinal node called?

- + Pirogov's node.
- Keith – Flack node.
- Aschoff – Tawara node.
- Willis node.

10. The superficial inguinal lymph nodes do not gather lymph from:

- + Muscles, joints and bones of the pelvic region.
- External pudendal organs.
- Skin of the gluteal region.
- Skin of the lower part of the anterior abdominal wall.

11. The efferent vessels of the deep inguinal nodes terminate at:

- + External iliac nodes.
- Internal iliac nodes.
- Common iliac nodes.
- Lumbar iliac nodes.

12. How are the lymph nodes of the pelvic cavity divided?

- + Into parietal and visceral.
- Superficial and deep.
- medial and lateral.
- Anterior and posterior.

13. Which lymph nodes are absent in the pelvic visceral group?

- + External iliac nodes.
- Paravesical nodes.
- Parauterine nodes.
- Paravaginal nodes.

14. Which of the following are the visceral lymph nodes of the pelvic cavity?

- + Pararectal node.
- Internal iliac nodes.
- Gluteal nodes.

– Sacral nodes.

15. Which of the following are the parietal lymph nodes of the pelvic cavity?

- + Obturator nodes.
- Paravesical nodes.
- Parauterine nodes.
- Paravaginal nodes.

16. The efferent lymph vessels pass from the parietal nodes of the pelvic cavity:

- + External and common iliac nodes.
- Visceral vessels of the pelvic cavity.
- Inferior mesenteric nodes.
- Superficial inguinal nodes.

17. The efferent lymph vessels pass from the visceral nodes of the pelvic cavity:

- + Common iliac and subaortic nodes.
- Parietal lymph nodes of the pelvic cavity.
- Inferior mesenteric nodes.
- Deep inguinal nodes.

18. The efferent lymph vessels from common iliac and subaortic nodes pass to:

- + Lumbar lymph nodes.
- Inferior mesenteric nodes.
- Superior mesenteric nodes.
- Superficial inguinal nodes.

19. How are the lymph nodes of the abdominal cavity classified?

- + Parietal and visceral.
- Paired and unpaired.
- Superficial and deep.
- Anterior and posterior.

20. Where are the coeliac lymph nodes located?

- + Near coeliac trunk.
- On the anterior abdominal wall near umbilicus.
- In the lower part of the anterior abdominal wall.
- Within greater omentum.

21. Where are the gastric lymph nodes located?

- + Along the lesser curvature of stomach.
- On the anterior abdominal wall.
- Within posterior abdominal wall.
- Surround pyloric part of stomach.

22. Where are the hepatic lymph nodes located?

- + In the hepatoduodenal ligament, neighbour common hepatic artery.
- On diaphragmatic surface of the right hepatic lobe.
- Within parenchyma of liver.
- On the visceral surface of the liver under peritoneum.

23. Where are the cystic lymph nodes located?

- + Near the neck of gallbladder.
- Near fundus of gallbladder.
- In the cavity of gallbladder.
- Within the wall of gallbladder under mucosa.

24. Where are the superior mesenteric lymph nodes located?

- + Within mesentery along superior mesenteric artery.
- Within sigmoid mesocolon along inferior mesenteric artery.
- In the greater omentum.
- In the lesser omentum.

25. Which lymph nodes of the abdominal cavity constitute the greatest group of the abdominal visceral nodes?

- + Superior mesenteric nodes.
- Inferior mesenteric nodes.
- Coeliac nodes.
- Left and right lumbar nodes.

26. What lymph nodes are not parietal nodes of the abdominal cavity?

- + Inferior mesenteric nodes.
- Inferior epigastric nodes.

- Inferior diaphragmatic nodes.
- Lumbar nodes.

27. What lymph nodes are not parietal nodes of the thoracic cavity?

- + Anterior mediastinal nodes.
- Parasternal nodes.
- Intercostal nodes.
- Superior diaphragmatic nodes.

28. The superficial lymph vessels of the upper limbs are not responsible for drainage of:

- + Skin and subcutaneous fat.
- Muscles, tendons and fascia.
- Joint capsules and ligament.
- Periosteum and nerves.

29. The efferent vessels pass from the cubital nodes to the following ones:

- + Axillary nodes.
- Parasternal nodes.
- Lateral cervical nodes.
- Supraclavicular nodes.

30. The efferent vessels given by axillary nodes give rise to:

- + Subclavian trunk.
- Jugular trunk.
- Bronchomediastinal trunk.
- Right lymphatic and thoracic ducts.

31. The efferent vessels from the mammary gland pass to:

- + Parasternal nodes.
- Paratracheal nodes.
- Prevertebral nodes.
- Tracheobronchial nodes.

32. The efferent vessels from the mammary gland pass to:

- + Supraclavicular nodes.
- Retropharyngeal nodes.
- Prelaryngeal nodes.
- Pretracheal nodes.

33. The lymph from the thoracic part of the oesophagus goes to:

- + Directly to the thoracic duct.
- Right bronchomediastinal trunk.
- Left bronchomediastinal trunk.
- Tracheobronchial nodes.

34. The lymph from the abdominal part of the oesophagus goes to:

- + Left gastric nodes.
- Right gastric nodes.
- Pyloric nodes.
- Splenic nodes.

35. Which of the following nodes are located on the greater curvature of the stomach?

- + Right and left gastroepiploic nodes.
- Suprapyloric nodes.
- Right gastric nodes.
- Left gastric nodes.

36. The efferent vessels pass from the upper part of the rectum to:

- + Superior rectal nodes.
- Internal iliac nodes.
- Sacral nodes.
- Subaortic nodes.

37. The efferent vessels pass from the anal canal to:

- + Anorectal nodes.
- Gluteal nodes.
- External iliac nodes.
- Common iliac nodes.

38. The efferent vessels from the fundus of the uterus pass to:

- + Lumbar nodes.
- Inguinal nodes.
- Gluteal nodes.
- Obturator nodes.

39. Which of the following is not the organ of the immune system?

- + Thyroid gland.

- Thymus.
- Spleen.
- Vermiform appendix.

40. Which of the following is not the organ of the immune system?

- + Parathyroid gland.
- Tonsil.
- Lymph nodes.
- Aggregate lymph nodes .

41. Which of the following is the central organ of the immune system?

- + Bone marrow.
- Spinal cord.
- Medulla oblongata.
- Diencephalon.

42. Which of the following is the central organ of the immune system?

- + Thymus.
- Parotid gland.
- Spleen.
- Pancreas.

43. Which of the following is the peripheral organ of the immune system?

- + Spleen.
- Kidney.
- Thymus.
- Liver.

44. What structures of the intestinal wall are peripheral organs of the immune system?

- + Solitary lymphatic nodules.
- Circular folds.
- Intestinal villi.
- Major duodenal papilla.

45. What structures of the intestinal wall are peripheral organs of immune system?

- + Aggregated lymph nodes.
- Circular folds.
- Minor duodenal papilla.
- Ileocecal valve.

46. How is the pharyngeal lymphoid ring formed by tonsils called?

- + Pirogov – Waldeyer’s ring.
- Eustachian’s ring.
- Haller’s ring.
- Keith– Flacrk’s ring.

47. How many tonsils take part in formation of the pharyngeal lymphoid ring?

- + 6.
- 3.
- 4.
- 8.

48. Where are aggregated lymph nodules located?

- + Within the wall of the ileum.
- Within the wall of the stomach.
- Within the wall of the rectum.
- Within the wall of the urinary system.

49. The bone marrow is subdivided into:

- + Red and yellow bone marrow.
- Red and blue bone marrow.
- Blue and yellow bone marrow.
- Red and orange bone marrow.

50. Where is yellow bone marrow located in adults?

- + In diaphysis of tubular bone.
- In epiphysis of long bone.
- In chambers of the flat bones.
- In chambers of the spongy bones.

51. Where is red bone marrow not located in adults?

- + In diaphysis of tubular bone.
- In epiphysis of long bone.
- In chambers of the flat bones.
- In chambers of the spongy bones.

52. Where is thymus located?

- + In the superior mediastinum.
- In the anterior mediastinum.
- In the posterior mediastinum.

– In the middle mediastinum.

53. What parts of the thymus do you know?

- + Left and right lobes.
- Caudate and quadrate lobes.
- Anterior and posterior lobes.
- Superior and inferior lobes.

54. What is in front of thymus?

- + Manubrium and body of sternum.
- Intercostal muscles and ribs.
- Left lung.
- Right lung.

55. Which of the following does not communicate with the posterior surface of lobes of thymus?

- + Inferior vena cava.
- Aorta.
- Pulmonary trunk.
- Superior vena cava.

56. Which of the following communicate with the lateral surface of lobes of thymus?

- + Mediastinal pleura.
- Pericardium.
- Arch of aorta.
- Left and right brachiocephalic veins.

57. The thymus is covered by:

- + Capsule.
- Pericardium.
- Pleura.
- Fascia.

58. The parenchyma of thymus consists of:

- + Cortex and medulla.
- Acinus and efferent ducts.
- Follicles.
- White and red pulp.

59. How are the thymic bodies called?

- + Hassal's bodies.
- Islets of Langerhans.

– Hering's bodies.

– Leidig's cells.

60. What artery does not supply thymus with blood?

- + Pulmonary trunk.
- Brachiocephalic trunk.
- Internal thoracic artery.
- Aorta.

61. Where is the lingual tonsil located?

- + Under epithelium in the root of the tongue.
- Within muscles of the tongue in the body of tongue.
- On the apex of the tongue.
- On the margin of the tongue.

62. What artery supplies the tongue with blood?

- + Lingual artery.
- Transverse facial artery.
- Superior and inferior facial artery.
- Descending palatine artery.

63. Where is the palatine tonsil located?

- + In tonsillar fossa.
- Within soft palate.
- In retromandibular fossa.
- In supratonsillar fossa.

64. What artery does not take part in blood supply of palatine tonsil?

- + Internal carotid artery.
- Ascending pharyngeal artery.
- Facial artery.
- Lingual artery.

65. Where is the pharyngeal tonsil located?

- + Between the fornix and posterior wall of the pharynx.
- In the tonsillar fossa.
- In the pharyngeal recess.
- In region of the pharyngeal opening of auditory tube.

66. What artery supplies the pharyngeal tonsil with blood?
- + Ascending pharyngeal artery.
 - Ascending palatine artery.
 - Descending palatine artery.
 - Facial artery.
67. Where is tubal tonsil located?
- + In the region of the pharyngeal opening of auditory tube.
 - In the tonsillar fossa.
 - In the pharyngeal recess.
 - In the supratonsillar fossa.
68. What artery supplies the tubal tonsils with blood?
- + Ascending pharyngeal artery.
 - Facial artery.
 - Lingual artery.
 - Maxillary artery.
69. Where is spleen located?
- + In the left hypochondriac region at the level of IX– XI ribs.
 - In epigastric region at the level of xiphoid process.
 - In the right hypochondriac region at the level of the X rib.
 - In the left lateral abdominal region.
70. What surfaces does the spleen have?
- + Diaphragmatic and visceral surfaces.
 - Anterior and posterior surfaces.
 - Superior and inferior surfaces.
 - Parietal and visceral surfaces.
71. Which organ does not communicate with spleen?
- + Liver.
 - Stomach.
 - Left kidney.
 - Left flexure of the colon.
72. What position does the spleen occupy pertaining to the peritoneum?
- + Intraperitoneal position.
 - Mesoperitoneal position.
 - Extraperitoneal position.
 - Retroperitoneal position.
73. How is the parenchyma of spleen divided?
- + Into white and red pulp.
 - Into cortex and medulla.
 - Into grey and white pulp.
 - Into terminal parts and efferent ducts.
74. The splenic artery is a branch of the following artery:
- + The coeliac trunk.
 - The superior mesenteric artery.
 - The inferior mesenteric artery.
 - Directly from abdominal aorta.
75. The splenic vein opens into:
- + Hepatic portal vein.
 - Inferior vena cava.
 - Hemiazygos vein.
 - Azygos vein.
76. What is the vermiform process?
- + Process of the caecum.
 - Process of the ascending colon.
 - Process of the transverse colon.
 - Process of the ileum.
77. Where is the vermiform process located?
- + In the right inguinal region.
 - Umbilical region.
 - Right lateral abdominal region.
 - Epigastric region.
78. The efferent vessels pass from the occipital lymph nodes pass to:
- + The lateral deep cervical nodes.
 - The mastoid nodes.
 - The supraclavicular nodes.
 - The axillary nodes.
79. The occipital lymph nodes receive the afferent vessels from:

- + The occipital and temporal region.
- Posterior region of the neck.
- Skin of the lateral region of the neck.
- Parietal region.

80. The mastoid lymph nodes receive afferent vessels from:

- + The parietal region and external ear.
- The temporal region.
- The mastoid cells.
- The frontal region.

81. The parotid lymph nodes do not receive lymph from:

- + Skin and deep tissue of the occipital region.
- Skin and deep tissue of the parietal region.
- Skin and deep tissue of the frontal region.
- Auricle.

82. The efferent vessels pass from parotid nodes to:

- + The superficial and deep cervical lymph nodes.
- The facial lymph nodes.
- The occipital lymph nodes.
- The mastoid lymph nodes.

83. Where are the submandibular lymph nodes located?

- + Within the submandibular triangle.
- Within the mylohyoid muscle.
- Between mylohyoid and geniohyoid muscles.
- On the internal surface of the mandible angle.

84. The efferent vessels pass from the submandibular lymph nodes to:

- + The deep lateral cervical nodes.
- The superficial anterior cervical nodes.
- The submental nodes.
- The pretracheal nodes.

85. The efferent vessels pass from the superficial cervical lymph nodes to:

- + The deep cervical nodes.
- The anterior mediastinal nodes.
- The parasternal nodes.
- The thoracic lymphatic duct.

86. The efferent vessels from the deep lateral cervical lymph nodes give rise to:

- + The left and right jugular trunk.
- The right lymphatic duct.
- The left and right subclavian trunk.
- The thoracic lymphatic duct.

87. Which of the following is not the structure of lymphatic system?

- + The pulmonary trunk.
- The jugular trunk.
- The subclavian trunk.
- The bronchomediastinal trunk.

88. Which of the following is not the structure of the lymphatic system?

- + The coeliac trunk.
- The lumbar trunk.
- The intestinal trunk.
- The subclavian trunk.

89. Which of the following is the trunk of the lymphatic system?

- + The subclavian trunk.
- The pulmonary trunk.
- The brachiocephalic trunk.
- The coeliac trunk.

90. Which of the following is the trunk of the lymphatic system?

- + The lumbar trunk.
- The coeliac trunk.
- The pulmonary trunk.
- The brachiocephalic trunk.

91. Which of the following is the duct of the lymphatic system?

- + The thoracic lymphatic duct.
- The choledochus duct.
- The cystic duct.
- The deferent duct.

92. Which of the following is the duct of the lymphatic system?

- + The right lymphatic duct.
- The right hepatic duct.
- The left hepatic duct.
- The pancreatic duct.

93. The right subclavian trunk collects the lymph from:

- + The right upper limb.
- The right lower limb.
- The right part of the abdomen and thorax.
- The right part of the head and neck.

94. The right jugular trunk collects the lymph from:

- + The right part of the head and neck.
- The left part of the head and neck.
- The right upper limb.
- The right part of the abdomen and thorax.

95. The right bronchomediastinal trunk collects the lymph from:

- + The organs of the right part of thoracic cavity.
- The organs of the right part of abdominal cavity.
- The right upper limb.
- The right part of the head and neck.

96. Which of the following does not open into the right venous angle?

- + The thoracic duct.
- The right lymphatic duct.
- The right jugular trunk.
- The right bronchomediastinal trunk.

97. The left jugular trunk collects the lymph from:

- + The left part of the head and neck.
- The left part of the abdomen and thorax.
- The left upper limb.
- The left lower limb.

98. The left subclavian trunk collects the lymph from:

- + The left upper limb.
- The left part of the head and neck.
- The organs of the left part of thoracic cavity.
- The organs of the left part of abdominal cavity.

99. The left bronchomediastinal trunk collects the lymph from:

- + The organs of the left part of thoracic cavity.
- The organs of the left part of abdominal cavity.
- The left upper limb.
- The left part of the head and neck.

100. Which of the following does not open into the left venous angle?

- + The right jugular trunk.
- The thoracic duct.
- The left jugular trunk.
- The left subclavian trunk.

101. Which of the following is the greatest lymphatic vessel of the human body?

- + The thoracic duct.
- The right lymphatic duct.
- The right lumbar trunk.
- The left subclavian trunk.

102. Which of the following is not a part of the thoracic duct?

- + The pelvic part.
- The abdominal part.
- The thoracic part.
- The cervical part.

103. How is the dilation of the initial part of the thoracic duct called?

- + The cisterna chyli.
- The cisterna interpeduncularis.
- The cisterna interchiasmatic.
- The bulbus chyli.

104. The thoracic duct enters the thoracic cavity via:

- + The aortic hiatus of the diaphragm.
- The foramen a vena cava of the diaphragm.
- The esophageal hiatus of the diaphragm.
- The between the crura of lumbar part.

105. Where is the abdominal part of the thoracic duct located?

- + In the retroperitoneal space.
- Within mesentery.

- In the peritoneal cavity.
- Within lesser omentum.

106. Where is the thoracic part of the thoracic duct located?

- + In the posterior mediastinum.
- In the anterior mediastinum.
- In the middle mediastinum.
- Between pericardium and pleura.

REFERENCES

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Contents

| | P. |
|----------------------------------|-----------|
| GENERAL PART | 5 |
| THE DIGESTIVE SYSTEM..... | 5 |
| THE ORAL CAVITY | 5 |
| THE LIPS | 5 |
| THE PALATE | 6 |
| THE TEETH..... | 6 |
| THE TONGUE | 7 |
| THE MUSCLES OF THE TONGUE..... | 7 |
| GLANDS OF THE ORAL CAVITY | 8 |
| 1. THE PAROTID GLAND | 8 |
| 2.THE SUBMANDIBULAR GLAND..... | 8 |
| 3.THE SUBLINGUAL GLAND | 8 |
| THE PHARYNX..... | 8 |
| THE OESOPHAGUS | 9 |
| THE STOMACH | 10 |
| THE WALL OF THE STOMACH..... | 10 |
| THE SMALL INTESTINE | 10 |
| THE DUODEMUM..... | 10 |
| THE JEJUNUM..... | 11 |
| THE LARGE INTESTINE | 11 |
| THE CAECUM | 11 |
| THE COLON..... | 11 |
| THE ASCENDING COLON..... | 12 |
| THE TRANSVERSE COLON | 12 |
| THE DESCENDING COLON | 12 |
| THE SIGMOID COLON..... | 12 |
| THE RECTUM..... | 12 |
| THE LIVER | 12 |
| THE GALLBLADDER | 14 |
| THE PANCREAS | 14 |
| PERITONEUM..... | 14 |
| HEPATIC BURSA | 15 |
| LESSER OMENTUM | 15 |

| | |
|---|-----------|
| GREATER OMENTUM | 15 |
| RESPIRATORY SYSTEM..... | 22 |
| THE NOSE | 22 |
| THE NASAL CAVITY | 22 |
| LARYNX..... | 22 |
| MUSCLES OF THE LARYNX | 23 |
| THE CAVITY OF THE LARYNX..... | 23 |
| TRACHEA..... | 23 |
| THE MAIN BRONCHI | 23 |
| THE LUNGS..... | 23 |
| THE BOUNDARIES OF PLEURAL SACS AND LUNGS..... | 24 |
| ORGANS OF URINARY SYSTEM..... | 31 |
| KIDNEY | 31 |
| THE SUBSTANCE OF KIDNEY | 31 |
| BLOOD FLOW IN THE KIDNEYS..... | 31 |
| THE URETER | 32 |
| THE URINARY BLADDER..... | 32 |
| THE FEMALE URETHRA | 32 |
| THE GENITAL ORGANS..... | 39 |
| THE FEMALE GENITAL ORGANS | 39 |
| THE UTERUS | 39 |
| THE OVARY | 39 |
| THE UTERINE TUBE | 39 |
| THE VAGINA..... | 40 |
| THE EXTERNAL FEMALE GENITAL ORGANS..... | 40 |
| THE MALE GENITAL ORGANS..... | 40 |
| THE MALE INTERNAL GENITAL ORGANS..... | 40 |
| THE TESTES | 40 |
| THE DUCTUS DEFERENS | 40 |
| THE SPERMATIC CORD | 41 |
| THE SEMINAL VESICLES | 41 |
| THE PROSTATE | 41 |
| THE BULBOURETHRAL GLANDS | 41 |
| THE MALE EXTERNAL GENITAL ORGANS..... | 41 |
| THE SCROTUM | 41 |
| THE PENIS | 41 |

| | |
|---|-----------|
| THE MALE URETHRA | 41 |
| THE PERINEUM | 42 |
| ENDOCRINE GLANDS..... | 48 |
| THE PITUITARY GLAND..... | 48 |
| THE ADENOHYPOPHYSIS | 48 |
| THE NEUROHYPOPHYSIS | 48 |
| THE PINEAL GLAND..... | 49 |
| THE THYROID GLAND..... | 49 |
| THE PARATHYROID GLANDS | 49 |
| THE ADRENAL GLANDS..... | 49 |
| THE PANCREATIC ISLETS..... | 49 |
| THE GONADS | 49 |
| THE THYMUS..... | 49 |
| THE CARDIOVASCULAR SYSTEM | 54 |
| THE BLOOD VASCULAR SYSTEM..... | 54 |
| THE ARTERIES | 54 |
| THE VEINS..... | 54 |
| THE SYSTEMIC AND PULMONARY CIRCULATION ROUTES | 55 |
| THE HEART..... | 55 |
| THE CARDIAC CHAMBERS | 56 |
| THE RIGHT ATRIUM..... | 57 |
| THE RIGHT VENTRICLE | 57 |
| THE LEFT ATRIUM | 58 |
| THE LEFT VENTRICLE..... | 58 |
| THE INTERVENTRICULAR SEPTUM..... | 58 |
| STRUCTURE OF THE HEART WALLS | 58 |
| THE CONDUCTING SYSTEM OF THE HEART | 61 |
| THE PERICARDIUM | 62 |
| TOPOGRAPHY OF THE HEART..... | 62 |
| THE CORONARY ARTERIES | 64 |
| THE CARDIAC VEINS | 65 |
| DEVELOPMENT OF THE HEART IN HUMANS | 67 |
| THE VESSELS OF PULMONARY CIRCULATORY ROUTE..... | 68 |
| THE ARTERIES OF PULMONARY CIRCULATION | 68 |
| THE VEINS OF PULMONARY CIRCULATION | 68 |
| THE VESSELS OF SYSTEMIC (GREATER) CIRCULATION | 69 |

| | |
|---|-----|
| THE ARTERIES OF SYSTEMIC CIRCULATION. THE AORTA | 69 |
| THE COMMON CAROTID ARTERY | 70 |
| THE INTERNAL CAROTID ARTERY | 70 |
| THE BRANCHES OF THE INTERNAL CAROTID ARTERY | 70 |
| THE EXTERNAL CAROTID ARTERY | 73 |
| THE SUBCLAVIAN ARTERY | 77 |
| THE AXILLARY ARTERY | 80 |
| THE BRACHIAL ARTERY | 80 |
| THE RADIAL ARTERY | 81 |
| THE ULNAR ARTERY | 81 |
| THE THORACIC AORTA..... | 84 |
| THE ABDOMINAL AORTA..... | 86 |
| THE UNPAIRED VISCERAL BRANCHES | 86 |
| THE PAIRED VISCERAL BRANCHES OF THE ABDOMINAL AORTA | 90 |
| THE PARIETAL BRANCHES OF THE ABDOMINAL AORTA..... | 90 |
| THE COMMON ILIAC ARTERY | 92 |
| THE INTERNAL ILIAC ARTERY | 92 |
| THE EXTERNAL ILIAC ARTERY | 95 |
| THE FEMORAL ARTERY | 95 |
| THE POPLITEAL ARTERY | 97 |
| THE ANTERIOR TIBIAL ARTERY | 97 |
| THE DORSAL ARTERY OF THE FOOT | 97 |
| THE POSTERIOR TIBIAL ARTERY | 98 |
| THE PLANTAR ARTERIES | 98 |
| THE VEINS OF SYSTEMIC CIRCULATION | 99 |
| THE SUPERIOR VENA CAVA | 99 |
| THE BRACHIOCEPHALIC VEIN | 99 |
| THE INTERNAL JUGULAR VEIN | 100 |
| THE INTRACRANIAL TRIBUTARIES OF THE INTERNAL JUGULAR VEIN:..... | 100 |
| THE EXTRACRANIAL TRIBUTARIES OF THE INTERNAL JUGULAR VEIN..... | 102 |
| THE EXTERNAL JUGULAR VEIN..... | 103 |
| ANTERIOR JUGULAR VEIN | 103 |
| THE SUBCLAVIAN VEIN | 103 |
| THE AXILLARY VEIN..... | 104 |
| THE VEINS OF UPPER LIMBS | 104 |

| | |
|--|------------|
| THE AZYGOS VEIN..... | 105 |
| THE HEMI AZYGOS VEIN..... | 105 |
| THE INFERIOR VENA CAVA | 108 |
| THE COMMON ILIAC VEIN | 109 |
| THE INTERNAL ILIAC VEIN | 109 |
| THE EXTERNAL ILIAC VEIN | 111 |
| THE HEPATIC PORTAL VEIN..... | 111 |
| THE INTRINSIC VASCULATURE OF THE LIVER..... | 112 |
| THE VEINS OF THE LOWER LIMB | 113 |
| THE CAVA-CAVAL ANASTOMOSES..... | 115 |
| THE PORTOCAVAL ANASTOMOSES | 116 |
| SPECIFIC FEATURES OF BLOOD CIRCULATION OF THE FETUS | 116 |
| THE LYMPHATIC SYSTEM..... | 121 |
| LYMPHATIC CAPILLARIES | 121 |
| LYMPHATIC VESSELS AND REGIONAL LYMPH NODES OF THE BODY REGIONS . | 121 |
| LYMPHATIC VESSELS AND LYMPH NODES OF THE LOWER EXTREMITIES | 122 |
| LYMPHATIC VESSELS AND LYMPH NODES OF THE PELVIS | 123 |
| LYMPHATIC VESSELS AND LYMPH NODES OF ABDOMINAL CAVITY..... | 123 |
| LYMPHATIC VESSELS AND LYMPH NODES OF THORACIC CAVITY..... | 125 |
| LYMPHATIC VESSELS AND LYMPH NODES OF THE HEAD AND NECK..... | 126 |
| LYMPHATIC VESSELS AND LYMPH NODES OF THE UPPER EXTREMITY | 127 |
| SUPERFICIAL LYMPH NODES | 127 |
| THE ORGANS OF IMMUNE SYSTEM..... | 129 |
| THE THYMUS | 129 |
| STRUCTURE OF THE THYMUS | 129 |
| THE TONSILS | 131 |
| THE LINGUAL TONSIL..... | 131 |
| THE PHARYNGEAL TONSIL | 131 |
| THE PALATINE TONSIL..... | 131 |
| THE TUBAL TONSIL..... | 131 |
| THE APPENDIX | 131 |
| THE SOLITARY LYMPHOID NODULES | 132 |
| THE LYMPH NODES..... | 133 |
| THE SPLEEN | 134 |
| TESTS..... | 135 |
| LIST OF QUESTIONS OF KROK– 1 | 135 |
| CAVITY OF THE MOUTH..... | 152 |

| | |
|---|-----|
| THE ORGANS OF THE ORAL CAVITY: THE PALATE, THE TEETH, THE TONGUE, SALIVARY GLANDS, PHARYNX, OESOPHAGUS | 153 |
| THE STOMACH, SMALL AND LARGE INTESTINE | 162 |
| THE LIVER, THE PANCREAS. THE PERITONEUM..... | 168 |
| THE RESPIRATORY SYSTEM: THE NOSE, THE NASAL CAVITY, TRACHEA, BRONCHI..... | 176 |
| THE LUNGS, PLEURA, MEDIASTINUM..... | 181 |
| URINARY ORGANS | 186 |
| GENITAL ORGANS..... | 190 |
| PERINEUM. ENDOCRINE GLANDS | 194 |
| HEART | 195 |
| AORTA. EXTERNAL AND INTERNAL CAROTID ARTERIES | 202 |
| THORACIC AORTA. ARTERIES OF THE UPPER LIMB..... | 208 |
| ABDOMINAL AORTA. ARTERIES OF PELVIC CAVITY | 214 |
| THE ARTERIES OF THE LOWER LIMB..... | 220 |
| THE SYSTEMS OF SUPERIOR AND INFERIOR VENA CAVA..... | 223 |
| LYMPHATIC AND IMMUNE SYSTEMS | 237 |

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Сулим Людмила Григорівна,
Приходько Ольга Олексіївна,
Ярмоленко Ольга Сергіївна

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