

# European Conference on Innovations in Technical and Natural Sciences

12<sup>th</sup> International scientific conference  
02<sup>nd</sup> October 2016

Austria, Vienna



# **European Conference on Innovations in Technical and Natural Sciences**

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«East West» Association for Advanced Studies and Higher Education GmbH,  
Wien, Österreich

**Vienna, Austria  
2016**

«European Conference on Innovations in Technical and Natural Sciences». Proceedings of the 12<sup>th</sup> International scientific conference (October 02, 2016). «East West» Association for Advanced Studies and Higher Education GmbH. Vienna. 2016. 124 p.

**ISBN–13** 978-3-903115-54-5

**ISBN–10** 3-903115-54-1

The recommended citation for this publication is:

*Busch P. (Ed.) (2016). European Conference on Innovations in Technical and Natural Sciences. The 12<sup>th</sup> International scientific conference proceedings (October 02, 2016), Vienna, OR: «East West» Association for Advanced Studies and Higher Education GmbH, Vienna.*

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Typeset in Berling by Ziegler Buchdruckerei, Linz, Austria.

Printed by «East West» Association for Advanced Studies and Higher Education GmbH, Vienna, Austria on acid-free paper.

## Section 6. Medical science

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### **Morphological analysis of porcelain gallbladder**

Porcelain gallbladder is a rare manifestation of chronic gallbladder diseases, it's characterized by calcification of its wall and can be found in 0,06–0,8% cholecystectomies<sup>1</sup>. Causes of PGB are exactly unknown. Porcelain gallbladder was first described in 1929<sup>2</sup>. It is characterized by thickened and hyalin changed wall, serous membrane has grayish-white (porcelain) color. Development of the changes in the gallbladder wall is associated in 90–95% with cholelithiasis. Clinically, the disease is often asymptomatic. According to the various authors calcification of the gallbladder wall (GB) is associated with gallbladder cancer (GBC) in 12–62% of cases<sup>3</sup>. Among all GB diseases, which are accompanied by signs of pathological biomineralization (calcification), the most common are a gallstone disease, which manifests in the GB wall with the signs of chronic cholecystitis, GB carcinoma with calcifications and porcelain gallbladder (PGB)<sup>4</sup>.

The pathology is more common in women than in men (ratio 5:1). Age of patients' majority ranges between 50 and 70 years<sup>5</sup>.

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<sup>1</sup> Palermo M., Nunez M., Duza G. E., Dixon M. G., Bruno M. O., Tarsitano F. J. Porcelain gallbladder: a clinical case and a review of the literature. *Cir. Esp.* – 2011; 89 (4): 213–217.

<sup>2</sup> Opantrny L. Porcelain gallbladder. *CMAJ.* – 2002; 166: 933.

<sup>3</sup> Ashur H, Siegal B, Oland Y, Adam T. G. Calcified gallbladder (porcelain gallbladder). *Arch. Surg.* – 1978; 113:594–596.; Stephen A. E., Berger D. L. Carcinoma in the porcelain gallbladder: a relationship revisited. *Surgery.* – 2001; 129 (6): 699–703.

<sup>4</sup> Cunningham S. C., Alexander H. R. Porcelain gallbladder and cancer: ethnicity explains a discrepant literature? *The American Journal of Medicine.* – 2007; 120: 17–18.

<sup>5</sup> Palermo M., Nunez M., Duza G. E., Dixon M. G., Bruno M. O., Tarsitano F. J. Porcelain gallbladder:

There are two types of porcelain gallbladder, depending on the calcification degree: complete (covers the entire body, penetrates the muscle layer) and incomplete (multifocal, point deposits)<sup>1</sup>. The combination of gallbladder cancer and porcelain gallbladder with incomplete calcification type, according to various data, is ranging between 0 and 5%<sup>2</sup>. There was no information about the combination of complete type of porcelain gallbladder and malignant tumors. This can indicate that two types of calcification cause different risk of gallbladder cancer development.

The aim of our work was to evaluate the morphological characteristics of GB wall and to compare them with the results, which were obtained during the study of other GB pathologies with mineralization.

### **Materials and methods**

**Ethics Statement.** A written informed consent was obtained from all subjects. This research was approved by the Medical Ethics Committee of The Regional Clinical Hospital of Sumy and Medical Institute of Sumy State University (Protocol No.1, 14.01.14).

### **Sample collection**

There were 3 female patients (1, 2, 3 case — respectively 58, 66 and 64 years old) in the surgical department of Sumy Regional Hospital during 2012–2014 years. Porcelain gallbladder was revealed in these patients. All patients were routinely hospitalized with a diagnosis of cholelithiasis and chronic calculous cholecystitis. All 3 cases of PGB are estimated as random clinical findings.

Surgical material was fixed in neutral 10% formalin with further processing in alcohols at aparataus of carousel type AT-4M (Ukraine) and filling in paraffin blocks from which the sections with thickness of 4–6 microns were produced by a rotary microtome «Shandon Finesse 325». Histological sections were stained with hematoxylin-eosin and examined using an optical microscope by the firm «Carl Zeiss Primo Star» (Germany). Micrographs were obtained using a digital image output system «SEO Scan ICX 285 AK-F IEE-1394» (Ukraine).

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a clinical case and a review of the literature. *Cir. Esp.* – 2011; 89 (4):213–217; Sun H., Tang H., Jiang S. et al. Gender and metabolic differences of gallstone diseases *World Journal of Gastroenterology.* – 2009; 15 (15): 1886–1891; Towfish S., McFadden D.W., Cortina G. R. et al. Porcelain gallbladder is not associated with gallbladder carcinoma. *Am. Surg.* – 2001; 67:7–10.; Kwon A. H., Inui H., Matsui Y., Uchida Y., Hukui J., Kamiyama Y. Laparoscopic cholecystectomy in patients with porcelain gallbladder base dont he preoperative ultrasound findings. *Hepatogastroenterology.* – 2004; 51: 950–953.

<sup>1</sup> Stephen A. E., Berger D.L. Carcinoma in the porcelain gallbladder: a relationship revisited. *Surgery.* – 2001; 129 (6):699–703.; Towfish S., McFadden D.W., Cortina G. R. et al. Porcelain gallbladder is not associated with gallbladder carcinoma. *Am. Surg.* – 2001; 67: 7–10.

<sup>2</sup> Eun Joo Yun, Dae Young Yoon, Chul Soon Choi et al. Calcified carcinoma of the gallbladder with calcified nodal metastasis presenting as a porcelain gallbladder: a case report. *Cancer Res Treat.* – 2011; 43(1): 71–74.

### Research results

Gallbladder macropreparations differed in the degree of the spread of the biomineralization processes in the wall of the organ, ranging from the calcification of large areas of the gallbladder wall (more than 50% of the wall in the second case and 70% of the wall in the third case) to the total wall calcification (the first case). The common features of gallbladders' macropreparations were grayish or whitish-pink color, firm walls' texture and save of the organ's form. Macropreparation of the first case looked like a «porcelain jug», which has a rigid wall, did not drop during the palpation. The gallbladder wall is thickened to 1.0–1.2 cm at the section. Mineralized areas of mucous membrane were whitish-yellowish color, smooth, shiny and hard. During the mechanical intervention the mucous membrane exfoliated as thin mineralized plates. On the surface of the calcified mucous membrane cracks, which were similar to those that can be in porcelain or glazed crockery, were detecte

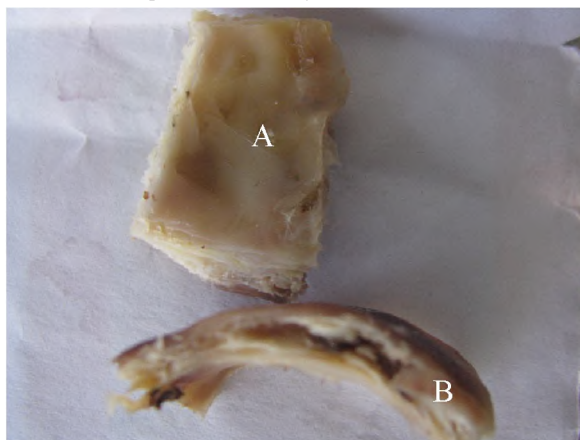


Fig. 1. The porcelain gallbladder wall from the side of mucous membrane (A) and at the section (B) (sample was fixed in formalin). Case 1

Histological examination of the gallbladder shows typical pathological changes in organ's tissues. In the mucous membrane of all investigated cases moderate chronic inflammatory infiltration was detected. Deposits of calcium compounds deposited mainly in the muscular layer. Calcified mass located along the muscle and connective tissue fibers, formed biomineral formation ranging from small sand like to roughly dispersed fragments (Fig. 2). Also the signs of fibrosis, muscular hypertrophy, congestion, hemorrhage, hyalinosis were found.

### Discussion

PGB is a rare pathology, is more common in women than in men. Perhaps this reflects the general statistics, because the GB diseases and directly cholelithiasis are more common in women.

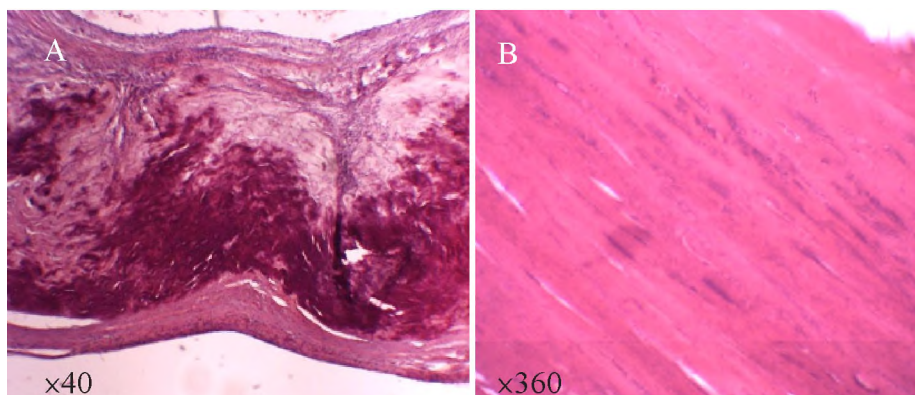


Fig. 2. Histological examination of the removed wall of porcelain gallbladder. Calcified material deposits mainly in the muscular layer of the gallbladder wall in the form of coarse sediment (A) and small deposits by the type of sand (B). Staining with hematoxylin-eosin. The magnification is shown in the left lower corner of the micrographs

It is believed that PGB is a complication of chronic cholecystitis due to long-term inflammation. It is proved by the thing, that the frequency of PGB prevalence increases with age and duration of disease more than 10 years<sup>1</sup>.

Historically, the idea about the link between the PGB and the risk of GB cancer has changed. First works of 60–70's XX century described a rather high incidence of malignancy (malignant transformation) of GB — up to 62%<sup>2</sup>. In recent researches it is shown that the incidence of carcinomas on the background of PGB ranges from 0 to 5%<sup>3</sup>. Some studies show that the complete type of PGB is not associated with GB cancer<sup>4</sup>.

<sup>1</sup> Patel S, Roa J.C, Tapia O. et al. Hyalinizing cholecystitis and associated carcinomas: clinicopathologic analysis of a distinctive variant of cholecystitis with porcelain-like features and accompanying diagnostically challenging carcinomas. *Am J Surg Pathol.* – 2011; 35(8):1104–13.

<sup>2</sup> Ashur H, Siegal B, Oland Y, Adam T. G. Calcified gallbladder (porcelain gallbladder). *Arch. Surg.* – 1978; 113: 594–596.

<sup>3</sup> Stephen A. E., Berger D.L. Carcinoma in the porcelain gallbladder: a relationship revisited. *Surgery.* – 2001; 129 (6):699–703.; Towfish S., McFadden D.W., Cortina G. R. et al. Porcelain gallbladder is not associated with gallbladder carcinoma. *Am. Surg.* – 2001; 67: 7–10.

<sup>4</sup> Stephen A. E., Berger D.L. Carcinoma in the porcelain gallbladder: a relationship revisited. *Surgery.* – 2001; 129 (6):699–703.; Eun Joo Yun, Dae Young Yoon, Chul Soon Choi et al. Calcified carcinoma of the gallbladder with calcified nodal metastasis presenting as a porcelain gallbladder: a case report. *Cancer Res Treat.* – 2011; 43 (1): 71–74.; Patel S, Roa J.C, Tapia O. et al. Hyalinizing cholecystitis and associated carcinomas: clinicopathologic analysis of a distinctive variant of cholecystitis with porcelain-like features and accompanying diagnostically challenging carcinomas. *Am J Surg Pathol.* – 2011; 35(8):1104–13.

Conclusion. Gallbladder cancer was not found in our study of three clinical cases of PBC (one full and two partial types). Based on research and analysis of modern literature sources, we can conclude that biomineral formations in considerable size and distribution in the gallbladder are relatively prognostic favorable and they are not associated with gallbladder cancer.

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