

Histopathological Study of Cadaveric Gall Bladder and Gall Stones in a Medical College in Uttar Pradesh

Authors:

Dr. Kumari Sheenu Gopal¹, Dr. Nitya Nand Srivastava², Dr. Jyoti Sharma³, Dr. Nand Kishor Gupta⁴,
Dr. Sanjay Kumar Kannaujia⁵, Dr. Vishal Ramesh Jasuja⁶

¹Junior Resident – 2, Department of Anatomy, Uttarpradesh University of Medical Sciences, UP

²Professor & HOD, Department of Anatomy, Uttarpradesh University of Medical Sciences, UP

³Senior Resident, Department of Anatomy, Uttarpradesh University of Medical Sciences, UP

⁴Assistant Professor, Department of Anatomy, Uttarpradesh University of Medical Sciences, UP

⁵Associate Professor, Department of Pathology, Uttarpradesh University of Medical Sciences, UP

⁶Professor, Department of Anatomy, Uttarpradesh University of Medical Sciences, UP

Corresponding Author:

Dr. Vishal Ramesh Jasuja

<https://doi.org/10.5281/zenodo.15107535>

Article Received: 20-February-2025, Revised: 10-March-2025, Accepted: 30-March-2025

ABSTRACT:

Introduction: In developing countries, gallstones are the major health issue. It is more common in women as compare to men. Obesity with increasing age is a huge influence on gallstones formation. Septic complications are more common in patients with pigment gallstones than cholesterol gallstones.

Case report: We examined the histopathological features of a cadaveric gall bladder and gall stones. The gall bladder was resected and analysed both grossly and microscopically. Gross examination revealed a thickened, fibrosed organ with tight adhesion to the liver and the presence of 275 cholesterol stones. Histological Analysis of Gall Bladder was done.

Conclusion: These findings underscore the pathological changes associated with gall stones and their implications for gall bladder health. The study emphasizes the importance of understanding gall stone pathogenesis to improve diagnostic and therapeutic strategies.

Keywords: Gall bladder, Gall stones, Cholesterol Stones, Bile Duct, Cystic Duct.

INTRODUCTION:

The gall bladder, located undercover of the liver, serves a vital role in the human digestive system by storing and concentrating bile. This bile, a combination of bile salts, cholesterol, phospholipids, and bilirubin, is essential for breaking down fats and aiding nutrient absorption. Additionally, the gall bladder helps regulate bile composition, ensuring the balance necessary for metabolic health. Despite its critical functions, the gall bladder is prone to various disorders, among which gallstones, or cholelithiasis, are the most prevalent.

Globally, gallstones impact 10–20% of the adult population, making them a significant health burden. Developing countries, including India, report an estimated incidence rate of 5–10%, with certain regions, such as northern India, experiencing a higher prevalence. Lifestyle factors such as diet, obesity, and sedentary behavior contribute to this trend.^{1,2} Gallstones can lead to severe complications, including

acute cholecystitis, pancreatitis, and biliary obstruction, all of which significantly contribute to patient morbidity and mortality. Annually, gallstone disease accounts for over a million hospitalizations worldwide, with mortality rates ranging from less than 1% in uncomplicated cases to approximately 15% in severe conditions like gallstone pancreatitis.^{3,4}

The formation of gallstones is multifactorial, influenced by bile composition, genetic predisposition, and gall bladder motility. Risk factors include advanced age, female sex, and obesity, all of which increase the likelihood of bile becoming supersaturated with cholesterol, leading to stone formation. Hormonal influences, particularly elevated estrogen levels, play a key role in the higher prevalence of gallstones among women.^{4,5} Gallstones are generally categorized into three types: cholesterol stones, pigment stones, and mixed stones. Cholesterol stones, the most common type, are linked to obesity and diets rich in fats, whereas pigment stones are more

frequently associated with chronic hemolysis and infections⁶.

Complications arising from gallstones highlight the importance of understanding their pathogenesis and related histopathological changes. Chronic inflammation, mucosal damage, and fibrosis are commonly observed in affected gall bladder tissues. These changes result from prolonged irritation caused by the presence of stones, which may eventually compromise gall bladder function^{7,8}.

Histopathological analysis offers an in-depth understanding of these changes, aiding in the identification of disease progression and facilitating timely interventions.

This study focuses on the histopathological examination of a cadaveric gall bladder with gallstones, collected during routine medical dissection. It aims to explore the pathological alterations in the gall bladder wall and the composition of the stones to shed light on their underlying mechanisms. By analyzing these features, this research intends to contribute to the existing body of knowledge on gallstone disease, with implications for improved diagnostic and therapeutic strategies.

CASE REPORT:

This study was conducted during a routine cadaveric dissection of the M.B.B.S 2023 Batch at Uttar Pradesh University of Medical Sciences, Saifai, Uttar Pradesh, India. The gall bladder was carefully resected from the liver surface and subjected to gross and histopathological analysis.

Macroscopic Findings:

The gall bladder displayed significant pathological alterations, including a thickened, fibrotic wall and strong adhesions to the liver. The organ contained 275 cholesterol gallstones, confirmed by their yellowish colour and crystalline appearance. The stones ranged in size from a few millimeters to over one centimeter, imposing considerable mechanical stress on the surrounding tissue. The wall thickness, measuring 5-7 mm, showed advanced fibrosis, mucosal erosion, and necrotic areas, consistent with chronic inflammation and prolonged irritation caused by the stones (Fig 1 & Fig 2).



Fig 1 : Gross Dissection of the Gall Bladder



Fig 2 : 275 Cholesterol stones of varying sizes

Microscopic Findings:

Histopathology using H&E staining revealed (Fig 3 & Fig 4) :

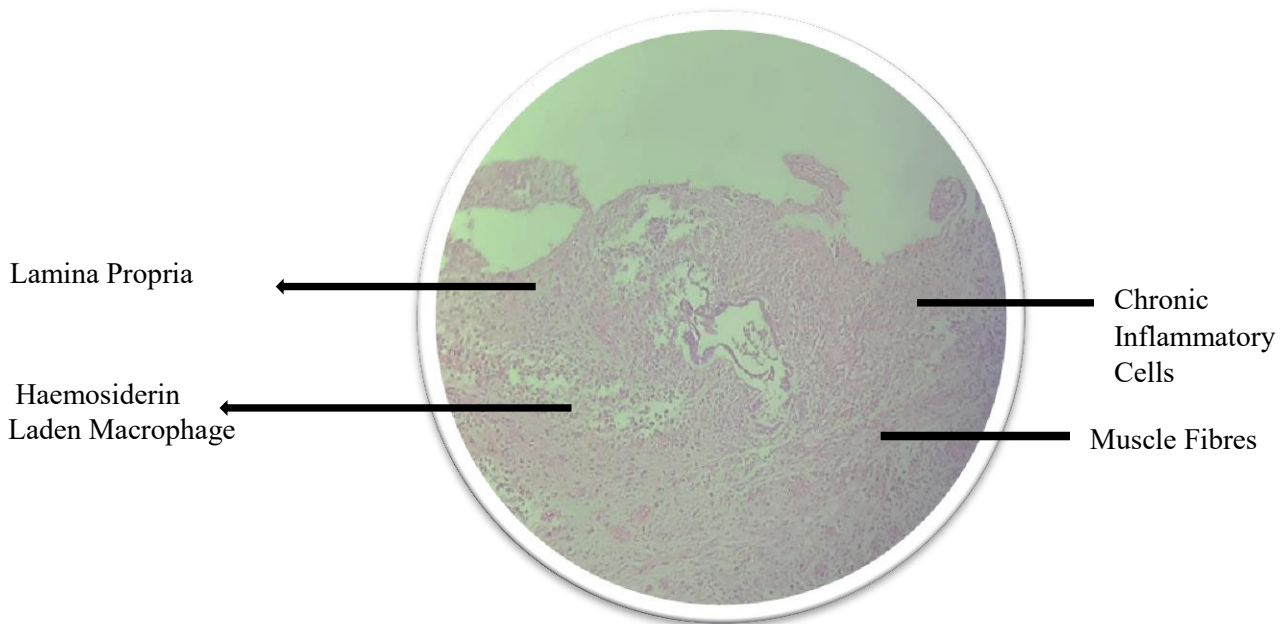


Fig 3 : Haematoxylin & Eosin staining of the Gallbladder

1.Epithelial Damage: Widespread loss of the mucosal lining due to chronic erosion and irritation, with evidence of disorganized repair processes attempting to restore the integrity of the epithelium.

2.Chronic Inflammation: Lymphocyte-predominant infiltrates in the lamina propria, indicated prolonged irritation with an ongoing immune response.

3.Macrophages with Pigments: Hemosiderin-laden macrophages near damaged areas suggested ongoing tissue breakdown, recurrent bleeding, and active phagocytic activity.

4.Muscle Changes: Smooth muscle hypertrophy indicated an adaptive response to prolonged mechanical strain and increased workload.

These findings reflect the chronic inflammation, mechanical stress, ischemic damage, and adaptive responses caused by persistent cholesterol gallstone disease. The interplay between these factors underscores the severity and complexity of the pathological processes affecting the gall bladder.

DISCUSSION:

The findings of this study align with existing literature, where gall stones are predominantly classified as cholesterol, pigment, or mixed types by Trotman and Rosai et al study^{6,7}. Chronic inflammation and mucosal changes in the gall bladder wall were common, reflecting the persistent irritation caused by gall stones which was seen in Ransohoff et al study⁸.

Pathogenesis of Gall Stones:

Gall stone formation involves a multifactorial process, including bile supersaturation, nucleation of crystals, and stasis^{5,9}. Cholesterol stones are often associated with hyperlipidemia, obesity, and dietary factors, while pigment stones are linked to chronic hemolysis and biliary infections^{3,10}. Mixed stones represent a combination of these mechanisms. The presence of 275 cholesterol stones in a single gall bladder underscores the pathological significance of bile saturation and stasis in stone formation which is very similar to Lam et al study¹¹.

Histopathological Correlation:

The chronic inflammatory changes observed in this study reflected the relationship between gall stones and gall bladder pathology which is suggested in Johnston et al study¹². The histological findings, such as denuded mucosa and pigment-laden macrophages, highlight the chronic irritation caused by gall stones. The fibrosed and thickened gall bladder wall reflects the long-term effects of these pathological processes were seen in Afdal et al study¹³.

The detection of hemosiderin-laden macrophages suggests chronic extravasation of red blood cells due to prolonged congestion and inflammation. Additionally, fibro-collagenous tissue proliferation signifies advanced fibrosis, which could eventually lead to loss of gall bladder functionality¹⁴. The presence of 275 cholesterol stones in this study provides evidence of prolonged bile stasis and abnormal bile composition, pivotal in gall stone pathogenesis.

Clinical Implications:

Understanding the histopathological features of the gall bladder and the composition of gall stones provides crucial insights for clinicians. Early detection of pathological changes, such as chronic inflammation and fibrosis, could facilitate timely interventions, reducing the risk of complications like gall bladder perforation or carcinoma^{7,15}. Furthermore, addressing modifiable risk factors, such as diet, obesity, and sedentary lifestyle, could significantly reduce the prevalence of gall stone disease^{3,8}.

Public health initiatives focusing on dietary modifications and regular health check-ups could play a pivotal role in preventing gall stone formation. Additionally, the findings emphasize the importance of routine histopathological examination of gall bladder

specimens, even in asymptomatic individuals, to identify early pathological changes^{10,14}.

This is a unique case, as usually in Asia population the most common calculus is pigment stone which occurs mainly in case of haemoglobinopathies like spherocytosis, sickle cell disease, liver cirrhosis, splenomegaly etc. Whereas, Cholesterol stone is usually common in western population. Also 275 cholesterol presence is itself a very rare anomaly. Understanding such cases is important for surgeons for better prognosis.

CONCLUSION:

This histopathological examination of a cadaveric gall bladder reveals notable pathological alterations, such as chronic inflammation, fibrotic changes, and a high prevalence of cholesterol gallstones. These findings underscore the importance of further investigations into the pathogenesis of gallstone formation and its impact on gall bladder health. A deeper understanding of these mechanisms could enable clinicians to devise more effective strategies for prevention and treatment, ultimately enhancing patient care in conditions related to gallstones.

REFERENCES:

1. Shaffer EA. Epidemiology and risk factors for gallstone disease: Has the paradigm changed in the 21st century? *Curr Gastroenterol Rep*. 2018;20(5):1-9.
2. Stinton LM, Shaffer EA. Epidemiology of gallbladder disease: Cholelithiasis and cancer. *Gut Liver*. 2012;6(2):172-87.
3. Portincasa P, Moschetta A, Palasciano G. Cholesterol gallstone disease. *Lancet*. 2006;368(9531):230-39.
4. Channa NA, Khand FD, Khand TU. Analysis of human gallstones by Fourier transform infrared spectroscopy. *J Ayub Med Coll Abbottabad*. 2010;22(3):41-5.
5. Chen W, et al. Biliary cholesterol hypersecretion in gallstone formation: Pathogenic insights and implications. *Front Physiol*. 2016;7:65.
6. Trotman BW. Pigment gallstone disease. *Gastroenterology*. 1981;81(2):439-49.
7. Rosai J. *Rosai and Ackerman's Surgical Pathology*. 10th ed. Elsevier; 2011.
8. Ransohoff DF, Gracie WA. Treatment of gallstones. *Ann Intern Med*. 1993;119(6):606-19.
9. Diehl AK. Epidemiology and natural history of gallstone disease. *Gastroenterol Clin North Am*. 1991;20(1):1-19.

10. Strasberg SM. Clinical practice. Acute calculous cholecystitis. *N Engl J Med.* 2008;358(26):2804-11.
11. Lam CM, et al. Gallbladder cancer: the role of cholecystectomy. *Ann Surg.* 1999;229(1):16-22.
12. Johnston DE, Kaplan MM. Pathogenesis and treatment of gallstones. *N Engl J Med.* 1993;328(6):412-21.
13. Afdhal NH. Gallstone disease and its complications. *Gastroenterology.* 2001;120(3):995-1001.
14. Shrestha HG, et al. Histopathological changes in gallbladder due to cholelithiasis. *Kathmandu Univ Med J.* 1991;3(4):308-13.
15. Siddiqui FG, et al. Histological changes in the gallbladder due to gallstones. *Pak J Med Sci.* 2007;23(4):536-39.