

Cholesterolosis

Incidence, correlation with serum cholesterol level and the role of laparoscopic cholecystectomy

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ABSTRACT

Objective: To report the incidence of cholesterolosis in the surgically removed gallbladders, its association with serum cholesterol level and to review the role of laparoscopic cholecystectomy in the treatment.

Methods: This retrospective study included all patients who had consecutive cholecystectomies for various gallbladder disorders, performed by 2 consultants during a 5-year period from January 1997 through to December 2002, in the College of Medicine and King Khalid University Hospital, King Saud University, Riyadh, Kingdom of Saudi Arabia. The clinical records of those found to have cholesterolosis on histopathological examination were reviewed, and the data were analyzed for their age, sex, fasting serum cholesterol level and the final outcome of cholecystectomy.

Results: The study group was comprised of 549 patients and out of which, 74 (13.4%) had cholesterolosis

of the gallbladder. There were 59 (79.9%) female and 15 (20.1%) male patients. Age ranged from 18-64-years with a mean of 35.7-years. Sixty-three (85.1%) cases were reported to have abnormally high fasting serum cholesterol levels (≥ 5.5 mmol/L), whereas 11 (14.9%) had normal serum cholesterol level. Cholesterolosis with coexistent gallstones was documented in 47 (63.3%) patients while 27 (36.5%) subjects showed acalculous cholesterolosis. Laparoscopic cholecystectomy was performed in 71 (95.9%) individuals, whereas 3 patients ended up with open cholecystectomy (conversion rate of 4.2%). There were no postoperative complications.

Conclusion: Cholesterolosis of the gallbladder is a distinct pathologic entity and carries a positive correlation with high serum cholesterol level. Laparoscopic cholecystectomy is effective, safe and a feasible treatment modality for cholesterolosis.

Cholesterolosis is an acquired histological abnormality of the gallbladder epithelium, consisting of an excessive accumulation of cholesterol esters within the epithelial macrophages.¹ This lesion of the gallbladder has remained an enigma for over a century² and it is still controversial whether cholesterolosis is an important cause of biliary symptoms³ or just an incidental histological finding.⁴ Cholesterolosis is

frequently encountered in the gallbladders exposed to bile that is supersaturated with cholesterol, just as cholesterol stones invariably form under the same circumstances.⁵ The reported incidence of cholesterolosis of the gallbladder varies from 2.7-28.6%,^{6,7} which is similar to that found in a large autopsy series.⁸ Such a frequent occurrence of cholesterolosis demands further evidence based on clinical research to testify its clinical significance.

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Our study presents the incidence of cholesterolosis in the surgically excised gallbladders and demonstrates its coexistence with hypercholesterolemia. The role of laparoscopic cholecystectomy (LC) in the management of cholesterolosis is discussed.

Methods. This retrospective review was conducted at the College of Medicine and King Khalid University Hospital, King Saud University, Riyadh, Kingdom of Saudi Arabia. The medical records of all patients who underwent consecutive cholecystectomies for gallbladder stones and other lesions, from January 1997 to December 2002, were reviewed. The case reports of the patients documented to have histological evidence of cholesterolosis of the gallbladder were further examined. The parameters considered were patient's age, sex, fasting serum cholesterol level and the outcome of cholecystectomy. The diagnosis of cholesterolosis of the gallbladder was established on macroscopic and microscopic criteria.¹ On naked eye examination, the gall bladder mucosa shows characteristically pale yellow linear streaks running longitudinally (strawberry gallbladder). The most striking microscopic feature is the abundance of macrophages stuffed with lipid droplets giving rise to foam cells. Serum cholesterol level of ≥ 5.5 mmol/L was considered abnormally high.

Results. A total of 549 patients were included in this series, 433 (78.9%) were female and 116 (21.1%) male. The age ranged from 18 to 64 years with a mean of 35.7 years. Out of 549 patients, 74 (13.4%) were found to have cholesterolosis of the gallbladder. The characteristics of the patients with cholesterolosis are shown in **Table 1**. Laparoscopic cholecystectomy was performed in 71 (95.9%) cases, while open cholecystectomy (OC) was carried out in 3 (4.1%) individuals (conversion rate of 4.2%). Open cholecystectomy was undertaken in 2 patients due to obscure anatomy in the Calot's triangle and due to uncontrolled bleeding in one patient. No postoperative complication was recorded. Forty-seven (63.4%) patients had coexistent gallstones, whereas 27 (36.6%) were reported to have acalculous cholesterolosis. Sixty-three (85.1%) patients with cholesterolosis showed abnormally high serum cholesterol levels, while 11 (14.9%) had normal serum cholesterol levels.

Discussion. Cholesterolosis of the gallbladder is a form of local disturbance of lipid metabolism. The possible pathogenic mechanism that triggers the development of cholesterolosis is the stimulation of cholesterol acyltransferase by the biliary cholesterol. This leads to increased deposition of

Table 1 - Characteristics of patients with cholesterolosis (n=74)

Feature	n (%)
Gender	
Female	59 (79.9)
Male	15 (20.1)
High serum cholesterol	63 (85.1)
Normal serum cholesterol	11 (14.9)
Laparoscopic cholecystectomy	71 (95.9)
Open cholecystectomy*	3 (4.1)
Calculous cholesterolosis	47 (63.4)
Acalculous cholesterolosis	27 (36.6)
* Procedure started as laparoscopic cholecystectomy	

esterified cholesterol in the gallbladder mucosa.⁹ More recent data has unequivocally predicted that venous and lymphatic stasis may be the etiological factors causing disturbance in secretory or absorptive functions of the gallbladder epithelium.¹⁰ Lamont and Carey¹¹ have suggested that the absorption of cholesterol esters and triglycerides from the gallbladder lumen leads to muscle dysfunction: G proteins are not activated when cholecystokinin binds to its receptors on smooth muscle cells of a lithogenic gallbladder.

The published literature has revealed 0-28.6% incidence of cholesterolosis of the gallbladder in various studies.^{12,13} However, Kmiot et al¹⁴ have documented a much higher incidence of 62% in their study of 55 patients. No obvious reason could be detected for such a profound discrepancy from the reported figures. Our study showed 13.4% incidence, which is in accordance with the published reports. The epidemiology of cholesterolosis is analogous to that of cholesterol gallstone disease: cholesterolosis is uncommon in children and shows a marked predilection for women up to 60 years.¹⁵ Similarly, the present series reported a female:male ratio of 3.9:1 and a mean age of 35.7 years, which further substantiates this previously held observation. Nahum et al¹³ have reported 90 patients with cholesterolosis, in their retrospective study of 636 cases. In the same series, 53 (58.8%) individuals with cholesterolosis were found to have concomitant gallstones, whereas 37 (41.2%) cases had acalculous cholesterolosis. Our study demonstrated 63.4% calculous and 36.6% acalculous cholesterolosis. These figures reaffirm the observation that although gallstone disease and cholesterolosis share the same etiological pathway, the 2 lesions occur independently and do not always

coexist in the same individual. Cholesterolosis of the gallbladder is a rare manifestation of persistently raised serum cholesterol level, more common being atherosclerosis of the coronary and carotid vessels. Hypercholesterolemia has an established correlation with the pathogenesis of cholesterolosis.¹⁶ The present study elucidated this finding and revealed 85.1% incidence of coexistent cholesterolosis and hypercholesterolemia.

Since the introduction of LC in 1989, this procedure is being offered to almost all the patients with different gallbladder disorders.¹⁷ High safety profile, early discharge from the hospital, rapid return to normal activity and cosmesis are the outright benefits of LC.^{18,19} In the present study, 71 (95.9%) patients with cholesterolosis of the gallbladder had successful treatment with LC with a conversion rate to OC being 4.1%. The published conversion rate²⁰⁻²² of LC to OC ranges from 2.7 to 13.9%, where the indications for LC encompassed almost all gallbladder affections. Our conversion rate is similar to the reported results and thus, further elaborates the established efficacy of LC in the surgical treatment of cholesterolosis.

In conclusion, the incidence of cholesterolosis of the surgically removed gallbladders is significant. Hypercholesterolemia and cholesterolosis invariably coexist in the same individual and LC is the recommended surgical therapy for cholesterolosis of the gallbladder.

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