



## Study and treatment of Cholielithiasis

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### Abstract:

Bile acids are secreted by active transport mechanisms across the membranes utilizing Na-K ATPase. Electrolytes are secreted across the concentration gradient by means of bile acid independent flow. Cholesterol-is the major constituent of cholesterol stones, it occurs in the crystalline form. Bile pigment- is the main component I pigment stones. It occurs as calcium billirubinate. The commonest age group is 40-50 years. Female preponderance is proved. Most patients take a mixed diet which is predominately vegetarian.7% of stones are radio opaque. Bile culture was mostly negative because of preoperative antibiotics.

**Key words:** Bile, Cholesterol, Cholielithiasis

### Introduction:

Gall stone is most common in developed countries. It is estimated that 10 million people have gall stones in USA with 5,00,000 cholecystectomies being performed yearly. Stones are rarer in Africa and south india, but not in north india.

Gall bladder is a pear shaped organ and is located in liver bed in line with anatomic division of that organ into right and left lobes. It is above 7-10 cm long, 3 cm broad in its widest portion. It has a capacity of 30-50 ml. it is divided into fundus, body, neck and infundibulum. The fundus is rounded, blind end that sometime extends beyond the livers margin and is covered extrahepatically by peritoneum and tapers into a neck, which is funnel shaped and lies in the free border of hepatoduodenal ligament. The convexity of neck may be distended into a dialation known as infundibulum or Hartmann's pouch.

The gall bladder enters CBD through ystic duct. It has variable length averaging 3-5 cm. it joins CHD at acute angle and right branch of hepatic artery resides immediately behind it. Variations in the point of union between cystic duct and CHD are surgically important.

### Mechanism of bile formation:

#### Canalicular bile formation:

Bile acids are secreted by active transport mechanisms across the membranes utilizing Na-K ATPase. Electrolytes are secreted across the concentration gradient by means of bile acid independent flow. The osmotic gradient draws the water inside the canaliculi. Bilirubin and other anions are secreted by active transport as well as using anion-binding protein. Cholesterol is synthesized from Acetyl Co-A. the rate limiting step is HMG Co-A reductase. The synthesis of phospholipids and cholesterol are from the microsomal function of hepatocytes.

#### Role of duct in secretion:

Ducts are mainly for transport of bile. The arrangement of vessels along the ducts indicate the presence of countercurrent transport mechanism.

#### Functions of bile:

The bile acids reduce surface tension and emulsifies fat in the meals. So, it enhances digestion and absorption of fatty meals. Helps for the absorption of fat soluble vitamins A,D,E and K.

Bile acids by the formation of micelles maintain cholesterol and bile pigments in solubility and are useful in excretion.

Due to presence of bicarbonate it neutralizes the acid chime and provides the optimum environment for the action of pancreatic enzymes.

#### **Functions of gall bladder:**

Concentration of bile is about 80-90% of water is reabsorbed.

Acidification of bile due to H<sup>+</sup> secretion and HCO<sub>3</sub> reabsorption to some extent.

Delivers bile into duodenum in appropriate tie in response to hormones and meals

#### **Etiological factors for Cholelithiasis:**

**Age:** Rare below 10 yr of age. The incidence increases with age.

**Sex:** The female to male ration varies from 1:7:1 to 4:1. This is because of bile acid pool decreasing after puberty in females.

**Race:** Highest incidence is in Pima Indians of south western United States.

**Diet:** The diet is considered as important factor accounting for the prevalence of gallstones in developing countries i.e., excessive consumption of refined carbohydrate, animal fat, decreased intake of vegetable fats and fiber. Recently there are conflictory reports. In fact fasting is proposed as a risk factor for gall stone formation.

**Genetics:** The striking prevalence of gallstone disease among American Indians suggests a genetic predisposition for gall stone development. It has been found that a higher frequency of saturated bile among siblings of cholelithiasis patients. The inheritance is probably polygenic.

**Parity:** There is positive association between stones and multiparity and pregnancy. It is probably because of cholesterol super saturation, decreased chenodeoxycholic acid, decreased contractility of gall bladder.

**Obesity:** It is an important risk factor. It has been found that an increased risk of gall bladder disease to be significantly associated with quetlet index. This is because of cholesterol super saturation and decreased chenodeoxycholic acid. It has been proposed earlier that a fat, fertile.flatulent female of forty is more liable to get cholelithiasis. This theory no longer holds water.

**Drugs:** O.C pills, lipid lowering agents like clofibrate, cholestyramine.

**Other illness:** Heal disorders due to defective reabsorption of bile acids. Cysti fibrosis due to abnormal mucus secretion interfering with bile flow or allowing gallstone formation. Diabetes mellitus. Cirrhosis liver and hyperlipidemia type II, IV.

#### **Classification of gall stones:**

According to site it has been classified into gall bladder, intrahepatic, extrahepatic may be sub classified into primary formed per se and secondary formed in GB. According to composition it may be classified into cholesterol, pigment and mixed. Pigment stones are usually multiple, irregular to smooth, black to brown and amorphous. Black stones cannot be manually crushed where as the brown stones are easily crushed. Mixed stones contain both cholesterol and bile pigments.

#### **Composition of gall stones:**

Cholesterol-is the major constituent of cholesterol stones, it occurs in the crystalline form. Bile pigment- is the main component I pigment stones. It occurs as calcium billirubinate. The distribution is diffuse in

pigment stones while it is present in the centre in cholesterol stone. Calcium- is present in varying proportion ranging from 5% to 60%. It occurs as calcium bilirubinate commonly and also as calcium carbonate, phosphate and palmitate. The distribution of calcium may be peripheral or central or homogeneous. The calcium compounds contribute to the texture of stones making it soft or hard depending on the percentage of calcium compounds present. Other substances-these include compounds of sodium, potassium, phosphorous, copper, iron, manganese and fatty acids. Organic compounds such as triglycerides, polysaccharides and phospholipid are also found. These are more commonly seen in pigment stones.

#### **Structure of a gall stone:**

All gall stone have a central nucleous or core surrounded by a peripheral zone. The essential constituent is the matrix, a gel like substance that consists of large amount of glycoprotein. The central core is made up of an amorphous mass of calcium, matrix protein and bilirubin. The peripheral zone has either cholesterol crystals or conglomeration of bile pigment depending upon the type of stone. Varying amount of calcium is also present in this area.

#### **Clinical features:**

The spectrum of symptomatic gall stone diseases are chronic cholecystitis, acute cholecystitis, jaundice due to CBD stone, cholangitis with or without septicemia, acute gall stone, biliary fistula and gall stone ileus. Gall bladder stones will leads to pain-right upper abdomen radiating to tip of scapula, nausea, vomiting, dyspepsia, belching, bloating, discomfort, heart burns. It can lead to mucocele or empyema.

Common duct stones will show pain at abdomen, obstructive jaundice, cholangitis and gall stone pancreatitis.

#### **Investigations:**

The following investigations are useful for diagnosis. They are biochemical-liver function test, plain Xray abdomen, ultrasonography, CT scan, Oral cholecystography, intravenous cholangiography, percutaneous transheptic cholangiography and radioisotope study.

#### **Materials and Methods:**

Patients for this study were taken from surgical wards in Rajah Muthiah Medical College Hospital, Chidambaram. This study was conducted over a period extending over 2 years from October 1998 to December 2000. A total of 30 cases were obtained for the study.

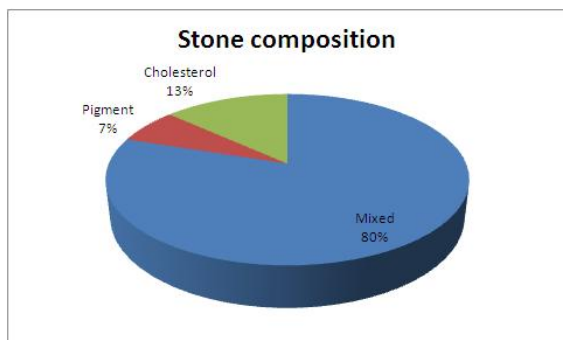
All patients admitted with a proven diagnosis of cholelithiasis were taken up for study. Asymptomatic stone detected incidentally were not operated and hence not taken up.

The epidemiological factors relevant to aetiology of gall stones like age, sex, parity, diet, obesity and drug intake were noted. The stones were sent for qualitative analysis. The bile or pus in case of empyema was collected preoperatively with aseptic precautions and sent for culture and sensitivity. The gall bladder was sent for histopathological examinations. The surgical procedures and complications for all these patients were studied. All patients were subjected to ultrasound examination of abdomen. Plain X ray abdomen was taken to know the incidence of radio opaque stones and its correlation with stone analysis.

**Results and Discussion:**

**Aetiopathological factors:**

Age- Out of 30 cases, 18 cases are seen in 4<sup>th</sup> and 5<sup>th</sup> decade. The minimum age was 35 years and the maximum was 57 years in the study. Sex- the sex ratio in the study is male : female is 1:2. Diet- all the patients were under the study used to take mixed diet. Obesity- 18 out of 30 patients were found to be obese. Drugs- there was no history of intake of drugs supposed to promote gall stone formation in any patient. Radio opaque stones- Stones were radio opaque in 2 cases (6.66%). Bile culture: 3 cases showed growth of *E-coli* and one case was *Salmonella typhi* positive. *E-coli* was sensitive to gentamycin and amikacin. *Salmonella* to ciprofloxacin and cefotaxime. Stone composition- the qualitative analysis showed predominance of cholesterol in 4cases (13.33%) and pigment stones in 2 patients (6.66%) given in chart 1.



**Chart1:** Composition of stones

All remaining stones were mixed containing both cholesterol and pigment in addition to phospholipid and calcium. Biopsy- One case came out as an Adenocarcinoma of the gall bladder. 3 cases showed features of acute superimposed on chronic cholecystitis. Remaining gall bladders showed features of chronic cholecystitis. CBD stones- 3 cases had associated CBD stones and they were mixed stones in composition. Treatment- All patients were given preoperative antibiotics – Ciprofloxacin 200 mg. for 22 cases,

subcoastal incision was used 8 cases were operated with a RPM incision. All cases were dealt in the retrograde manner of cholecystectomy. For 3 cases of CBD stones, a supraduodenal choledochotomy was done and a T-tube kept. One case had post operative infection dealt with accordingly.

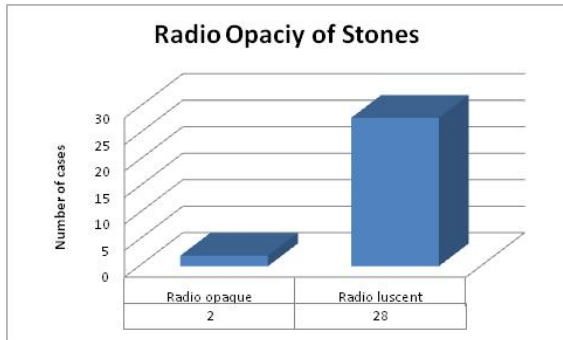
The highest incidence of stone was found in 4<sup>th</sup> decade in classical description and in 5<sup>th</sup> decade in data from heart disease epidemiology study of residents of Framingham, Massachusetts. In this study, highest number of case was found in the 4<sup>th</sup> decade. Sex ratio in this study is 1:2 and is consistent with most other studies showing preponderance presented in table 1.

**Table 1:Sex ratio of Cholelithiasis occurrences**

	Female	Male
Bainton et al	2.82	1
Sampliner et al.	2.38	1
S.K.Bhansali	3	2
Vijaypal	2.4	1
RMMCH study	2	1

The non-vegetarian diet (animal fat) consumption is wide spread in patients with gall stone disease in westerners. In this study, all patients were found to take a mixed diet, but predominantly vegetarian. 15 females out of 20 were multiparous. 5 patients were diabetic. 8 patients were obese. Not a single case of ideal resection, by pass, hypercholesterolemia or hemolytic anemia was obtained in our study. The incidence of radio opaque stones was 7% which is less than the classical description of 10-15%. These radioopaque stones on analysis were having mixed composition and excess of calcium. No CBD stone was radio opaque.the radio opacity of stones were presented in chart 2. One incidence of carcinoma gall bladder was reported in a 54

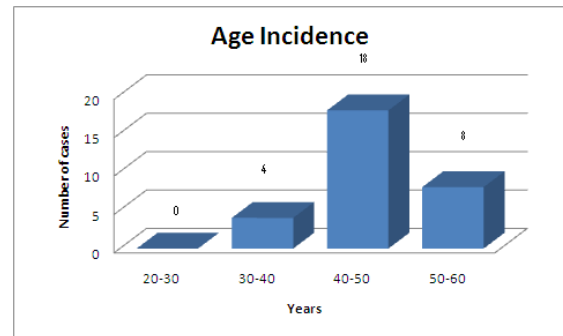
year old male patient who has operated for a calculous cholecystitis. It was found to be stage III adenocarcinoma and the patient is on chemotherapy.



**Chart2:** Radio opacity of stones

The recovery of bacteria from bile is 30% for chrome and 60% for acute cholecystitis according to literature. In the present study, the bile culture was negative in 90% probably because of preoperative antibiotic which could interfere with isolation of organism. All 4 positive bile culture were associated with chronic cholecystitis. The bile sent for culture in the adenocarcinoma gall bladder came as sterile. The patient with *salmonella typhi* in bile was not having bacteria in urine, blood and stool and widal test was negative. The various age group were presented in chart 3.

World wide mixed stones account for majority of gall stones. In this study also 80% were found to be mixed stones and only 13% were cholesterol stones. The patients with pigment stones did not have hemolytic disease – hemogram was normal. Both cases were positive for coliform organisms. So, infection may have been the cause of pigment stones.



**Chart3:** Age incidence

In this study we have mostly done cholecystectomy through subcoastal incision. The approach is quite satisfactory, visualization adequate with a satisfactorily less opening and closing time. There was no case of incisional hernia following single layer interrupted closure with 1-0 polypropylene. The two cases of bile leak could have been avoided by a drain kept in right Morrison's pouch. The other cases in which drain was kept were discharged satisfactorily with no infections or postoperative pulmonary complications due to pain in Dt site.

In all three cases of CBD stones a T-tube was kept. This tube was removed on 10<sup>th</sup> day after two to three days of intermittent clamping with no bile leak following the removal.

**Conclusion:**

The commonest age group is 40-50 years. Female preponderance is proved. Most patients take a mixed diet which is predominately vegetarian. 7% of stones are radio opaque. Bile culture was mostly negative because of preoperative antibiotics. Mixed stones form 80% of the total study and are consistent with world wide literature. Pigment stones were seen in two patients in whom infectious status was confirmed. There was no evidence of hemolysis. Right subcoatal incision was quite satisfactory. We feel that the

conventional T-tube technique after CBD exploration yields satisfactory results.

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