

## GALLSTONES

D KAHN

### EPIDIMIOLOGY

Gallstones are extremely common and occur in all societies and races, in young and old people, and in both sexes. The prevalence increases with age and occurs in 10-15% of the adult population. The prevalence is also influenced by gender and is 3x more common in females.

The prevalence of gallstones is also influenced by ethnicity, and is common in certain South American countries, in Scandinavia, and in Red Indian Americans. Gallstones are uncommon in rural African populations.

Gallstones can occur in anybody, and therefore the "5 F's" (fat, fair, fertile, female, forty) is not entirely true.

### PATHOGENESIS

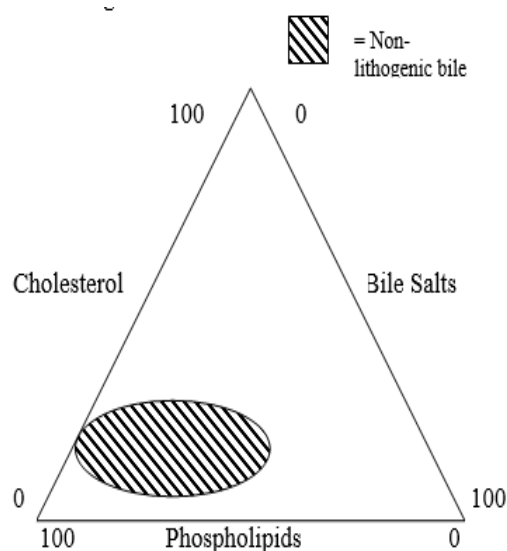
Gallstones are composed mainly of cholesterol, bilirubin and calcium salts. The majority of gallstones (75%) are cholesterol stones. Non-cholesterol stones are categorized as either black or brown pigment stones. Black pigment stones consist of bilirubin and large amounts of mucin glycoproteins. Black pigment stones occur commonly in patients with chronic haemolytic conditions and in cirrhosis of the liver. Brown pigment stones are thought to be related to worm infestation. About 15% of gallstones are calcified enough to be seen on an abdominal x-ray, and of these two-thirds are pigmented stones. Calcification that is visible only on the rim of the stones are usually cholesterol based stones.

Cholesterol stones form when the concentration of the cholesterol in the bile exceeds the ability of bile to hold it in solution. Bile consists of water, cholesterol, bile salts and phospholipids (lecithin). Cholesterol is

insoluble in water. However, in bile it is made soluble by association with

bile salts and phospholipids which form micelles and vesicles. Cholesterol will precipitate out when there is an imbalance between the concentrations of cholesterol against bile salts and phospholipids.

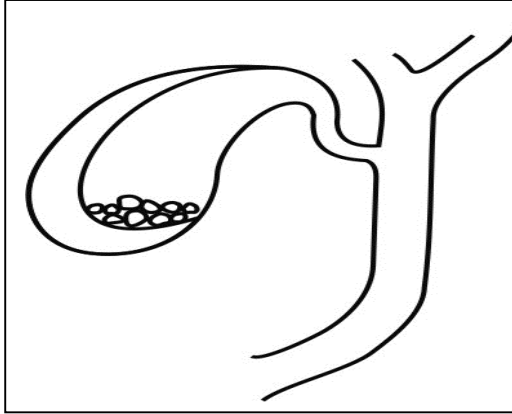
The concentrations of cholesterol, phospholipids and bile salts in bile can be represented on triangular coordinates as shown in Figure 1 below.



Bile, which contains high concentrations of cholesterol and lower concentrations of phospholipids and bile salts, is said to be lithogenic bile. In contrast, bile with low concentrations of cholesterol and high concentrations of phospholipids and bile salts is said to be non-lithogenic bile.

### ASYMPTOMATIC GALLSTONES

Most patients with gallstones have no symptoms. Increasingly, asymptomatic stones are discovered incidentally during investigations for other conditions. This is as a result of the increased use of abdominal imaging, such as ultrasonography, for non-specific abdominal symptoms.



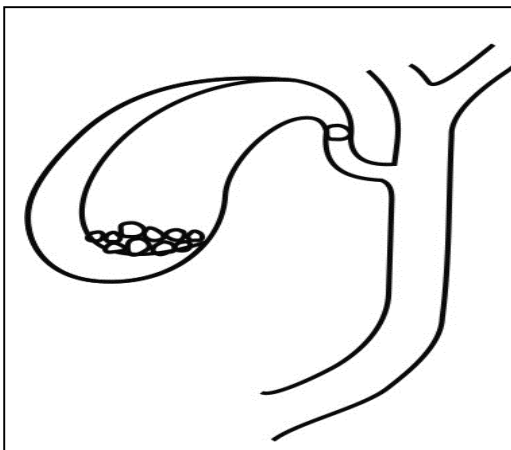
The majority of asymptomatic stones will remain so throughout life. Approximately, 2% of patients with asymptomatic gallstones will develop symptoms per year. Furthermore, patients present initially with minor symptoms rather than a serious complication.

In view of the fact that only a small proportion of asymptomatic gallstones become symptomatic, and that the patients develop minor symptoms before complications, the policy is to treat asymptomatic gallstones conservatively.

### **SYMPTOMATIC GALLSTONES**

(Chronic cholecystitis, biliary colic)

This is the most common mode of presentation of symptomatic gallstones. The gallstone impacts in the cystic duct or Hartman's Pouch causing colicky abdominal pain and inflammation in the gallbladder wall.



The stone eventually disimpacts resulting in resolution of the inflammatory process and fibrosis. As a result of repeated attacks of biliary colic, the gallbladder eventually becomes chronically scarred.

The patient typically presents with biliary colic which consists of colicky pain in the right upper quadrant radiating to the tip of the scapula. The pain can be extremely variable with regard to site, severity, duration, radiation, and associated symptoms. Usually, the pain is in the right upper quadrant, but can be epigastric or periumbilical. It may be mild dyspepsia, but could be severe pain requiring morphine for relief of pain. The duration of the pain varies from minutes to hours and it usually radiates to the tip of the scapula. The patient may complain of associated symptoms such as nausea and vomiting.

### **THE DIAGNOSIS OF GALLSTONE DISEASE**

The investigation of choice for suspected gallstone disease is the abdominal ultrasound scanning. The sensitivity and specificity of ultrasonography in the detection of gallbladder stones exceeds 90%.

Abdominal x-ray is not particularly useful in the detection of gallstones since only 10% of gallstones are calcified. Oral cholecystography requires the patient to take oral contrast material the night before. This test is cumbersome and unreliable, and is hardly performed since the advent of ultrasonography. The liver function tests are usually normal.

### **TREATMENT OF GALLSTONES**

Cholecystectomy remains the treatment of choice for symptomatic patients with gallstone related problems confined to the gallbladder. Cholecystectomy can be performed as

an open operation requiring an upper abdominal laparotomy. However, it is now routine to perform cholecystectomy as a laparoscopic operation. Both methods require a general anaesthetic. With either procedure, the surgical objectives are the same, namely, to eliminate the gallbladder, to eliminate the gallstones, to exclude stones in the biliary tree and to ensure that the bile ducts are not damaged.

The procedure involves dissection in Calot's Triangle, ligation and division of the cystic artery, ligation and division of the cystic duct, and removal of the gallbladder from the gallbladder bed.

Although intraoperative cholangiography is no longer performed routinely, the option should always be available. All surgeons performing cholecystectomy should be skilled in cholangiography and interpreting the result. The incidence of asymptomatic common bile duct stones detected on routine operative cholangiography is 5-10%. Intraoperative cholangiography is also useful in clarifying the biliary anatomy.

## **MEDICAL TREATMENT OF GALLSTONES**

There are other non-surgical treatment options for gallstones. However, it is important to emphasize that these are not alternatives for symptomatic gallstones. Surgery remains the treatment of choice for patients with symptomatic gallstones.

### **1. Medical Dissolution Therapy**

Gallstone dissolution can be achieved by expanding the bile acid pool. Treatment with chenodeoxycholic acid or ursodeoxycholic acid will result in dissolution of the gallstones.

This treatment is only applicable to cholesterol stones which are non-

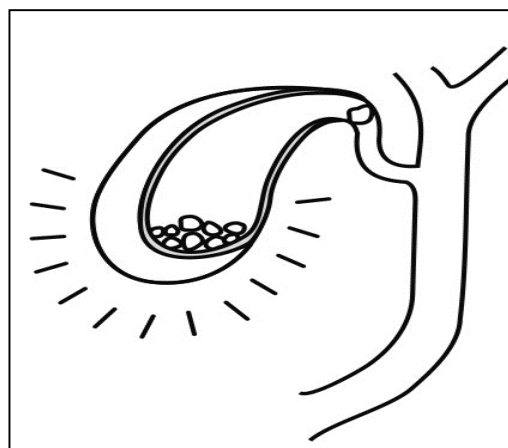
calcified and in the presence of a functioning gallbladder. It is also only applicable to small gallstones, since large stones take too long to dissolve. Medical dissolution therapy is contraindicated in patients with severe symptoms, in pregnancy, in patients with liver disease, and in patients with severe atherosclerosis. The disadvantages of dissolution therapy are that it takes approximately 2 years to achieve complete dissolution, and recurrence of the gallstones after stopping treatment.

### **2. Contact Dissolution Therapy**

This involves the percutaneous insertion of a catheter into the gallbladder and irrigation with methyl tertbutyl ether which rapidly dissolves the gallstones. The disadvantages again, include the recurrence of gallstones after stopping treatment, and problems related to the spilling of the solvent into the duodenum.

### **3. Extracorporeal Shockwave Lithotripsy**

This involves the use of computer focused shock waves produced by electromagnetic or ultrasound sources to fragment gallstones. The fragments then either pass down the common bile duct, or can be dissolved using oral dissolution therapy. The selection criteria are



the same as for medical dissolution therapy.

The disadvantages are related to severe pain as a result of the passage of stone fragments down the common bile duct and recurrence of the gallstones after stopping treatment.

## ACUTE CHOLECYSTITIS

In acute cholecystitis a gallstone becomes impacted in the cystic duct or Hartman's pouch and there is inflammation and infection in the gallbladder wall. The symptomatology consists of severe colicky abdominal pain in the right upper quadrant which radiates round to the tip of the scapula. There is associated nausea and vomiting. On examination the patient is pyrexial, there is tenderness and guarding in the right upper quadrant and Murphy's sign is positive.

The investigation of choice is the ultrasound which will show the stones in the gallbladder, the stone impacted in the cystic duct, the thick walled gallbladder and the point of maximal tenderness. The abdominal radiograph may show the gallstones if they are radio-opaque. There is usually a leucocytosis of between 10 and 15,000. The liver function tests are usually normal.

The natural history of acute cholecystitis includes:

1. In the majority of instances the stone will disimpact and the inflammatory process will resolve with resultant fibrosis.
2. Formation of an abscess (empyema) of the gallbladder; these patients are extremely ill with high spiking fevers, rigors, and a leucocytosis >15,000.
3. Perforation of the gallbladder which can be either localized, free (causing generalized

peritonitis), or into an adjacent viscus (causing a cholecysto-enteric fistula).

The treatment of acute cholecystitis consists of resuscitation, analgesia and antibiotics. However, the definitive treatment consists of cholecystectomy, which can be performed either:

### 1. *Elective cholecystectomy*

After resolution of the acute inflammatory process, the patient is discharged and readmitted 6-12 weeks later for an elective cholecystectomy.

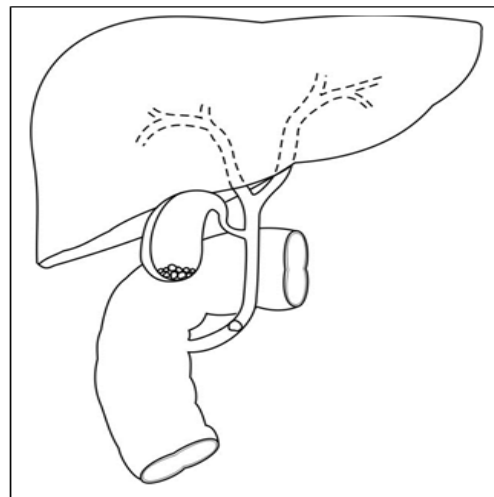
### 2. *Early cholecystectomy:*

Cholecystectomy is performed on the first elective operating list after admission to hospital. The advantage of the latter includes a shorter total duration of the illness, a shorter hospital stay, and decreased costs. The morbidity and mortality of early and elective cholecystectomy are similar.

## CHOLEDOCHOLITHIASIS

(Stones in the common bile duct)

Choledocholithiasis occurs in 10-15% of patients with gallstones. Stones in the common bile duct usually originate in the gallbladder, although there is an entity of primary duct stones.



Approximately 10% of stones in the common bile duct are asymptomatic and are detected incidentally at the time of performing an intra-operative cholangiogram. The symptomatology of choledocholithiasis consists of biliary colic, jaundice and fever/rigors. Courvoisier's Law states that obstructive jaundice and a palpable gallbladder cannot be due to gallstones.

The liver function tests show increased serum bilirubin, serum alkaline phosphatase and serum gamma GT levels. The abdominal radiograph may show gallstones if they are radio-opaque. The ultrasound will show the stones in the gallbladder, the dilated common bile duct, and stones in the common bile duct. The investigation of choice in choledocholithiasis is the ERCP, which is both diagnostic and therapeutic. If stones are found in the common bile duct, a papillotomy or sphincterotomy can be performed and the stones removed by means of balloons or baskets.



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