

Gallstones (cholelithiasis)

Gallstones are the most common biliary pathology. Gallstones are classified according to their chemical composition into:

- 1) Cholesterol stones,
- 2) Mixed stones and
- 3) Pigment stones.

Cholesterol stones consist almost entirely of cholesterol and are often solitary.

Mixed stones account for 90 per cent of gallstones. Cholesterol is the major component. Other components include calcium bilirubinate, calcium phosphate, calcium carbonate, calcium palmitate and proteins. Usually they are multiple, and they are often faceted ذو نتوء مسطح.

Pigment stones are most common in the Far East and are composed almost entirely of calcium bilirubinate. They are mostly small and multiple. Some are hard and coral-like قرفلي غامق, whereas others are soft and really concretions of sludge rather than stones.

Gas in gallstones

Here the centre of a stone may contain radiolucent gas in a triradiate or biradiate fissure and this gives rise to characteristic dark shapes on a radiograph — the 'Mercedes Benz' or 'seagull' signs.

Limey bile

'Lime-water' bile is revealed on a plain radiograph more clearly than if the gall bladder has been visualised by cholecystography. The opacity is the result of the gall bladder becoming filled with a mixture of calcium carbonate and calcium phosphate, usually the consistency of toothpaste. The condition tends to occur when there is a gradual obstruction of the cystic or common bile duct, for example due to chronic pancreatitis or carcinoma of the pancreas.

Incidence of gallstones

A 'fat, fertile, flatulent, female of fifty' is the classical sufferer from symptomatic gallstones. Cholelithiasis occurs in both sexes from childhood to the centenarian البالغ من العمر ١٠٠ سنة. In men the disease tends to occur in the older age groups at which point the incidence is equal to that of women.

Causal factors in gallstone formation

The aetiology of gallstones is probably multifactorial. Factors implicated are: **(1)** metabolic; **(2)** infective; and **(3)** bile stasis.

Cholesterol and mixed stones

Metabolic

Cholesterol, insoluble in water, is held in solution by a detergent action of bile salts and phospholipids with which it forms micelles. Bile containing cholesterol stones has an excess of cholesterol relative to bile salts and phospholipids, thus allowing cholesterol

crystals to form. Such bile is termed 'supersaturated' or 'lithogenic'. Bile cholesterol increases with age and is raised in women, particularly those taking the contraceptive pill, in obesity and by clofibrate — a drug used in the treatment of certain hyperlipoproteinaemias. The concentration of bile salts in bile is reduced by oestrogens, and also by factors which interrupt the intrahepatic circulation of bile salts (e.g. ileal disease, resection or bypass and cholestyramine therapy).

Infection

The role of infection in causing stones is unclear. Often bile from patients with gallstones is sterile, but organisms have been cultured from the centres of gallstones. *Helicobacter pylori* antigens have been isolated within gall bladders containing stones.

Bile stasis

Gall bladder contractility is reduced by oestrogens, in pregnancy and after truncal vagotomy, situations in which the incidence of gallstones is increased. Patients on long-term parenteral nutrition have a high incidence of stones. Lack of good oral intake precludes the release of cholecystinin, the hormonal stimulant of gall-bladder contraction released from the duodenal mucosa.

Black Pigment stones are seen in patients with haemolysis in which bilirubin production is increased. Examples are hereditary spherocytosis, sickle cell anaemia, thalassaemia, malaria and mechanical destruction of red cells by prosthetic heart valves. **Brown Pigment stones** are found in the ducts of patients with benign and malignant bile duct strictures. *Escherichia coli* is often found in the bile of these patients. This bacterium produces the enzyme glucuronidase which converts the bilirubin into its unconjugated insoluble form. These stones are often present throughout the biliary tree including the intrahepatic ducts.

The effects and complications of gallstones

- **In the gall bladder:**
 - Silent stones
 - Chronic cholecystitis
 - Acute cholecystitis
 - Gangrene
 - Perforation
 - Empyema
 - Mucocele
 - Carcinoma
- **In the bile ducts:**
 - Obstructive jaundice
 - Cholangitis
 - Acute pancreatitis
- **In the intestine:**
 - Acute intestinal obstruction ('gallstone ileus')

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