

Cholelithiasis

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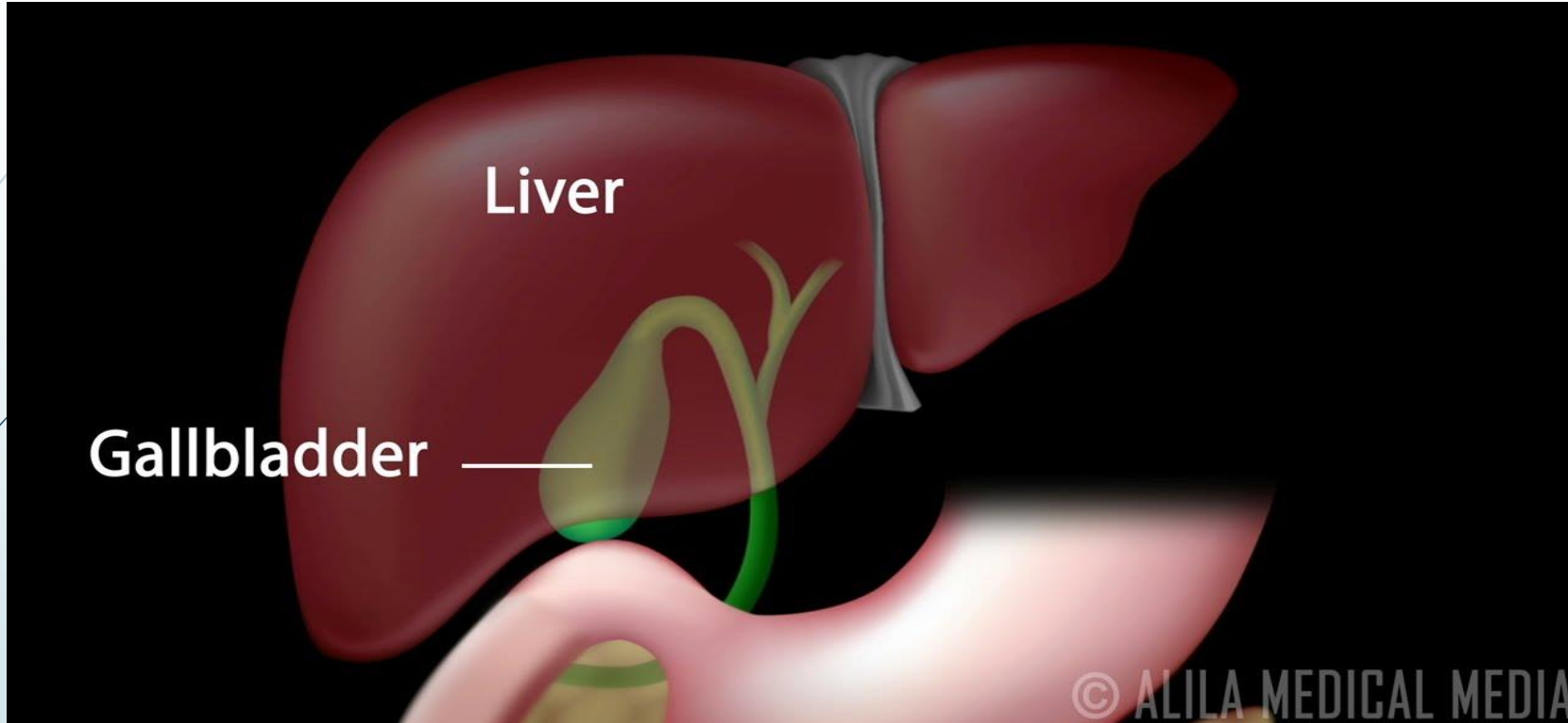
FORMATION OF STONES WITHIN THE GALLBLADDER

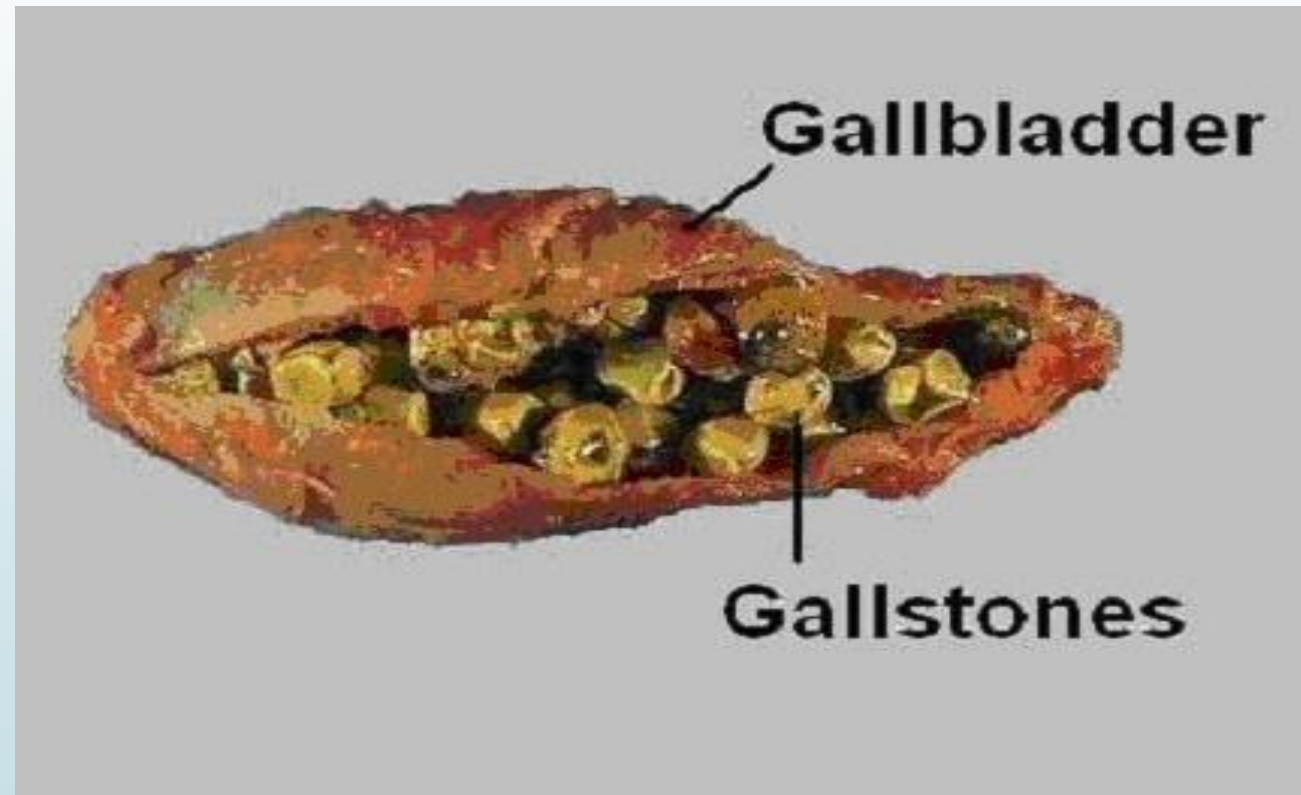
- ❑ **Very common; estimated to develop in about 20% of the population.**
- ❑ **Most gallstones are composed entirely or predominantly of cholesterol**
- ❑ **They are formed because the bile contains more cholesterol than can be held in solution by the available bile salts and lecithin.**

Factors Affecting the Solubility of Cholesterol in Bile

- ❑ Cholesterol is not soluble in an aqueous solution, such as bile, because it is a lipid
- ❑ It is brought into solution by bile salts and lecithin and accumulate in clusters called micelle.
- ❑ In a micelle, the lipid-soluble (hydrophobic) parts of the bile salt molecules are oriented towards the center of the cluster, and the opposite water-soluble (hydrophilic) ends face outward.

- cholesterol becomes soluble by dissolving in the hydrophobic center of the micelles, and cholesterol containing micelles becomes dissolve in bile because peripheral hydrophilic parts of the bile salts are water soluble.**
- Lecithin participates in the formation of the micelles by fitting between the molecules of the bile salts.**
- Approximately Seven molecules of bile salts interspersed between lecithin molecule in a micelle are required to dissolve one molecule of cholesterol.**





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- ❑ The solubility of cholesterol in bile not only depends on its cholesterol content, but also on its content of bile salts and lecithin, because these substances are needed to hold cholesterol in solution.
- ❑ If there is an excess of cholesterol as compared to bile salts and lecithin, the bile becomes supersaturated with cholesterol crystals may precipitate.
- ❑ On the other hand if there is an excess of bile salts and lecithin relative to cholesterol, more cholesterol dissolve in the bile.

- ❑ Whenever bile contains a relative excess of cholesterol, it becomes supersaturated with cholesterol, and under proper conditions the cholesterol may precipitate to form the beginnings of gallstones.
- ❑ This situation may arise because of an increased excretion of cholesterol in the bile, a reduced excretion of bile salts and lecithin, or a combination of both factors.
- ❑ As long as bile remains supersaturated, cholesterol crystals continue to accumulate around those that have already precipitated, and gallstones slowly increase in size. Eventually the gallbladder may become filled with gallstones, the end stage of a process that began several years earlier

Risk Factors

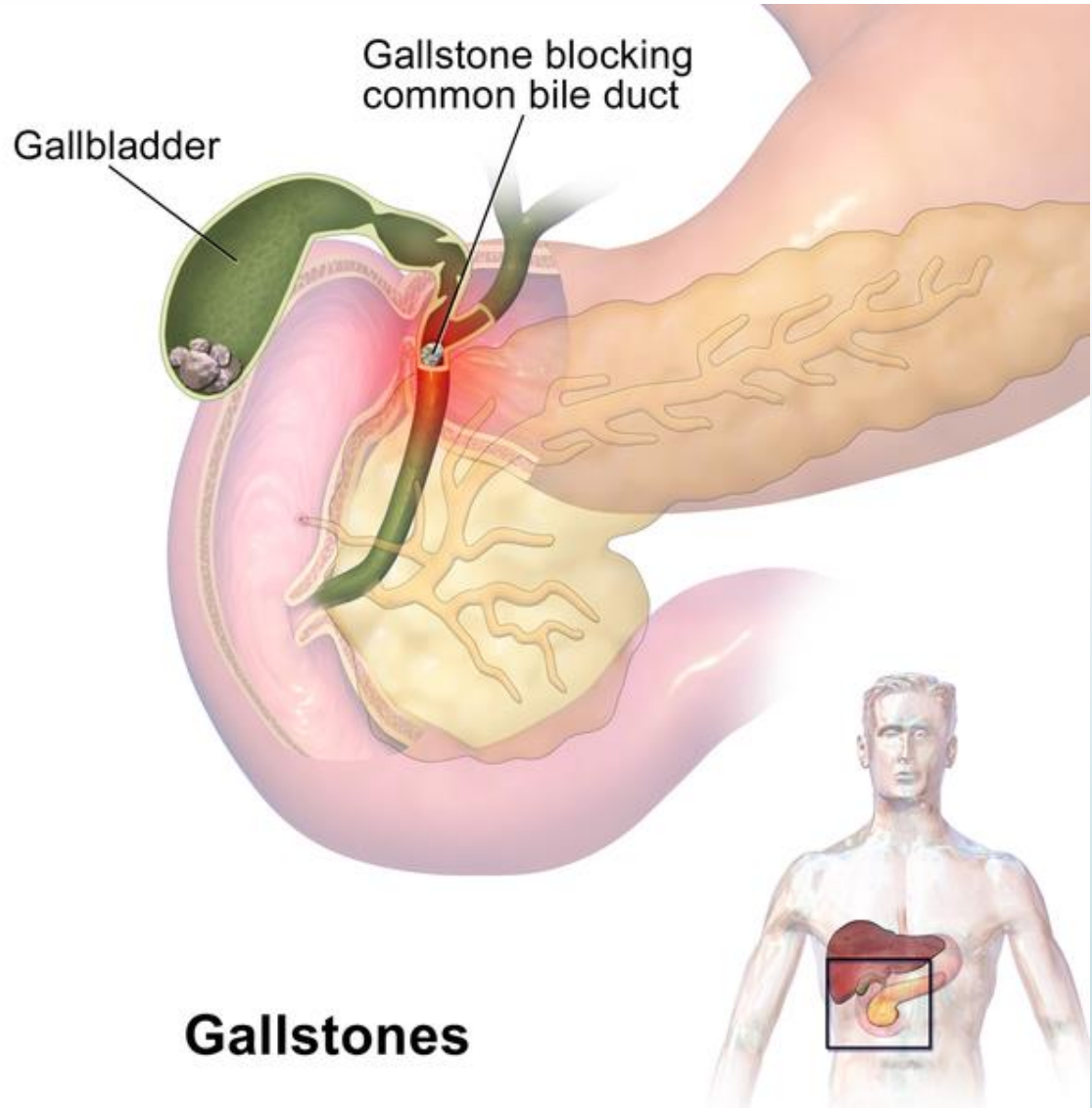
Some people are known to have an increased risk of forming gallstones. The incidence of gallstones is:

- Higher in women than in men
- Higher in women who have borne several children than in childless women
- Twice as high in women who use contraceptive pills, as in women who use other types of contraception.
- Higher in obese women than in women of normal weight.

- ▶ **The incidence of gallstones is higher in these groups because their bile is more highly saturated with cholesterol.**
- ▶ **Estrogen in women promotes increases excretion of cholesterol in the bile while decreasing excretion of bile salts.**

Gallbladder

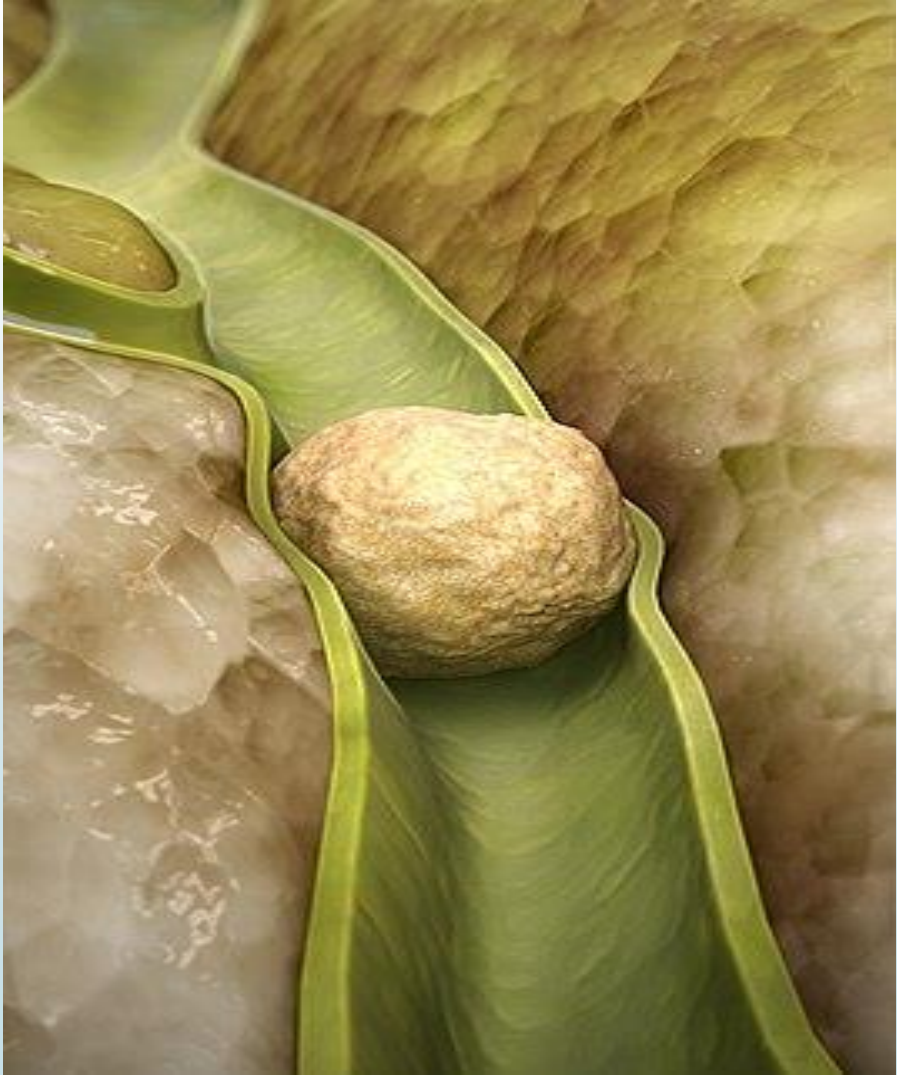
Gallstone blocking
common bile duct



Gallstones

Complications of Gallstones

- ❑ Gallstones that remain in gallbladder do not cause symptoms. Gallstones are sometimes extruded into the cystic duct or common bile duct when the gallbladder contracts after a fatty meal, and they may become impacted within the biliary ducts. This event causes severe abdominal pain called biliary colic
- ❑ The pain results from the spasm of smooth muscles in the ducts combined with forceful contractions of gallbladder that attempts to propel the stone through the ducts.
- ❑ Sometimes a stone can be passed through the ducts into the duodenum but often it becomes impacted. If the stone lodges in the cystic duct bile can neither enter nor leave the gallbladder but of bile from the duodenum is not disturbed even though storage of bile in gallbladder is no longer possible.



Treatment of Gallstones

- ❑ The standard treatment of gallstones providing symptoms is surgical removal of the diseased gallbladder
- ❑ Now mostly cholecystectomy can be performed by means of laparoscopic procedure through a very small incision in the abdomen.
- ❑ Its is possible however to dissolve cholesterol gallstones in some carefully selected patients who want to avoid a surgical procedure.
- ❑ This is accomplished by administering a bile salt either ursodeoxycholic acid or chenodeoxycholic acid or a combination of both, which decrease the amount of cholesterol excreted in the bile.

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- ❑ **As the cholesterol amount decreases, the bile becomes more unsaturated with cholesterol and cholesterol can be dissolved in bile. As a result cholesterol contained in the bile becomes soluble in unsaturated bile and the gallstones slowly dissolve.**
- ❑ **Even if the stones are dissolved successfully, new stones often form within the gallbladder after the treatment is discontinued.**