Gallstones (Part 1/2)

Cholelithiasis is defined as the presence of gallstones. Potential causes include increased bilirubin, increased cholesterol, gallbladder stasis, and decreased bile salts. Cholesterol stones are the most common type of stones, and are seen more often in the demographic characterized by the "5 Fs". Fat, female, fertile, forty, and with fair complexion. They are also seen in patients with Crohn's disease, those who undergo rapid weight loss, those undergoing estrogen therapy, or Native Americans. Diagnosis is made with ultrasound, and the definitive treatment is with cholecystectomy.



PLAY PICMONIC

Characteristics

Cholelithiasis
Coal-Litter
Cholelithiasis is defined as the presence of stones in the gallbladder. It may be asymptomatic, or may cause biliary colic, which is transient right upper quadrant pain commonly seen after eating fatty meals and is caused by temporary occlusion of the cystic duct by a stone.

Pathophysiology

Increased Bilirubin
Up-Arrow Belly-Dancer With Ribbon
Cholelithiasis can be due to precipitation of bilirubin in bile (arises with supersaturation of bilirubin).

Increased Cholesterol
Up-Arrow Cholesterol-Burger
Gallstones can be due to precipitation of cholesterol. Under normal conditions, bile can dissolve all the cholesterol excreted by the liver. If the liver produces more cholesterol than bile can dissolve, the excess cholesterol may precipitate as crystals which are then trapped in gallbladder mucus, producing sludge. This is known as cholesterol supersaturation. These crystals may grow and form stones.

Stasis
Gallbladder With Stop-Sign
Gallbladder stasis refers to hypomotility or impaired contractility. If the gallbladder does not empty effectively, bile may become concentrated and form gallstones. Conditions such as pregnancy and long term parenteral nutrition are associated with smooth muscle relaxation, decreased and impaired gallbladder contraction, and subsequent bile stasis which increases the risk of gallstone formation. In pregnancy, progesterone causes gallbladder hypomotility and in long term parenteral nutrition, the normal stimulus for cholecystokinin secretion (which serves as a stimulus for gallbladder contraction) is loss impairing gallbladder contractility.

Decreased Bile Salts
Down-Arrow Bile-Nile With Salt-Shakers
Bile consists of water, cholesterol, conjugated bile acids, and the pigment bilirubin. Bile salts are made of bile acids that are conjugated with glycine or taurine. Bile salts in bile dissolve the unilamellar vesicles, in which cholesterol is secreted, to form soluble aggregates called mixed micelles. A deficiency of bile acids and bile salts can result in fat malabsorption and cholesterol stones in the gallbladder due to decreased solubility.

Risk Factors

Cholesterol Stones are the Most Common Type
#1 Foam-Finger Burger
Cholesterol stones are the most common type (80-90%), especially in Western countries.

Sign up for FREE at picmonic.com

Fat, Female, Fertile, Forty, Fair Complexion

White Fat-pregnant lady eating burger while drinking 40 oz alcohol with her twins

Risk factors for cholesterol stones are usually remembered by the five Fs: forties (40s), fertility (use of Oral contraceptives, multiple pregnancy), female gender, fat (obesity), fair complexion. Being overweight increases the amount of cholesterol in the bile, which increases the risk of gallstones. Rates of gallstones are much higher among females. This is most likely due to sex since estrogen increases biliary cholesterol secretion causing cholesterol supersaturation of bile. Estrogen and progesterone are also factors explaining why the use of hormonal contraceptives is a risk factor for gallstones.

Crohn's Disease

Crown-of-intestines

Crohn's disease is a risk factor for gallstone formation and is related to the concentration of substances contributing to the developing gallstone possibly from interrupted enterohepatic cycling of bilirubin. The increased prevalence of gallstones in Crohn's disease is thought to be related to bile acid malabsorption or stasis of bile in the gallbladder with depletion of the bile salt pool. Pathologies such as terminal ileal disease or after ileal resection can lead to increased conjugated, or water soluble, or unconjugated (forming precipitates with calcium creating calcium bilirubinate) formations of bilirubin concentration. The ileum is very efficient at absorbing the glyco- and taurine-conjugated forms of the bile salts and therefore any disease affecting the ileum alters bile salts recycling.

Rapid Weight Loss

Rapid-rabbit and Very-skinny-guy

Rapid weight loss such as after a gastric bypass procedure is associated with cholesterol gallstones formation. Rapid weight loss causes supersaturation of cholesterol in bile and decreased gallbladder motility. As the body metabolizes fat during rapid weight loss, it causes the liver to secrete extra cholesterol into bile, possibly causing gallstone formation. Fasting reduces cholecystokinin secretion leading to decreased gallbladder activation contributing to gallstone formation.

Estrogen Therapy

Easter-egg

Estrogen therapy is a risk factor for cholesterol gallstones since increased estrogen levels cause increased secretion of lithogenic bile (rich in cholesterol), resulting in the formation of cholesterol gallstones.

Native American

Native-American

Native American ethnicity is a risk factor for cholesterol gallstones.

Diagnosis

Ultrasound

Ultrasound-machine

The diagnosis of cholelithiasis is made with ultrasound. Right upper quadrant ultrasound is the best initial imaging modality. It has a sensitivity of 85-90% and a specificity of 99%. It shows gallstones with posterior acoustic shadow and possible sludge. Sludge corresponds to strongly thickened bile and may be a precursor for gallstones.

Treatment

Cholecystectomy

Coal-on-fire-in-gallbladder cut off by Scalpel

Cholecystectomy is the surgical removal of the gallbladder. It is indicated for symptomatic or complicated gallstone disease, for asymptomatic gallstone disease in patients with diabetes, immunosuppression, or gallbladder calcification and for gallbladder carcinoma. Most often performed laparoscopically and is usually not indicated in asymptomatic cholelithiasis.

Sign up for FREE at picmonic.com