

Gallstones

THE GALLBLADDER

The gallbladder is a pear-shaped muscular organ that is 1.2 to 2.4 cm long, located in the right upper side of the abdomen, under the liver . It is connected to the liver and intestine through small tubes called bile ducts .

The primary purpose of the gallbladder is to store and concentrate bile, a greenish-brown fluid that is produced by the liver. Bile is a water-based fluid that contains bile salts, cholesterol, and other fatty substances , as well as waste products such as bilirubin, a pigment that gives bile its distinctive color. Bile is needed for digestion and absorption of fatty foods, as well as for the absorption of important fat soluble vitamins.

During fasting, the gallbladder is relaxed and the sphincter of Oddi is closed, causing the bile to flow through the cystic duct into the gallbladder, where it is stored and concentrated by absorption of water through the gallbladder wall . This allows the gallbladder to take in and store more than 10 times its volume in bile.

With meals, the entrance of fatty foods into the small intestine triggers the secretion of a hormone , which stimulates contraction of the gallbladder and the opening of the sphincter of Oddi. This results in partial emptying of the concentrated gallbladder bile through the common bile duct into the upper region of the small intestine to aid in the digestion and absorption of fats and fat-soluble vitamins.

GALLSTONES

Gallstones are collections of solid material that form inside the gallbladder. Stones can form in the gallbladder if there is a change or imbalance in the composition of bile, such as too much cholesterol, increased amounts of pigment material, and/or reduced levels of bile acids, which are "detergent-like" substances that help keep cholesterol in solution. Gallstones may also result from impaired gallbladder contraction, which would lead to incomplete emptying of the gallbladder in response to a fatty meal.

Cholesterol or other bile components may precipitate or settle out from liquid bile in the form of crystals. These crystals can clump together, leading to stones.

Gallstones may be as small as tiny specks or as large as the gallbladder itself. The vast majority, however, are smaller than 1 inch (2.5 cm) and are one of two major types, cholesterol or pigment. Gallstone type is important since cholesterol stones are more likely to respond to non-surgical treatments than pigment stones.

RISK FACTORS

The exact reason gallstones develop is not known. However, there are a number of factors that increase the risk of gallstones

- **Gender** : Gallstones are more common in women.
- **Age** : The risk of gallstones increases with age. The condition is extremely rare in children and becomes progressively more frequent over time, with age 40 representing a possible cut-off between relatively low and high rates. Gallstones are present in about 10 percent of men and 20 percent of women by the age of 60.
- **Ethnicity** : Gallstones occur more frequently in Native Americans, Pima Indians, and Chileans. In contrast, there appear to be lower rates of cholelithiasis in African Americans, natives of South Africa, and Japanese populations.
- **Family history and genetics** : Studies of family histories indicate that cholelithiasis runs in certain families, suggesting that genetics has a role in gallstone development.
- **Other factors** :
 - Pregnancy
 - Use of estrogen preparations
 - Obesity
 - Frequent fasting
 - Rapid weight loss
 - Lack of physical activity
 - Diabetes mellitus
 - Sickle cell disease
 - Cirrhosis, or severe scarring, of the liver
 - Certain medications (eg, **octreotide**, clofibrate)

GALLSTONE DISEASE

The majority of people who have gallstones do not have symptoms; their stones remain "silent." Silent stones do not need to be treated since initial symptoms of gallstones are usually mild and the risk of surgical removal of the gallbladder is greater than the risk of delaying treatment. When gallstones begin to cause symptoms, the condition is referred to as gallstone disease.

SYMPTOMS

Once a patient experiences the first episode of symptoms, the chance of having further and more severe symptoms is more likely, indicating a need for treatment.

Biliary colic

Biliary colic, also known as gallstone pain or biliary pain, is the most common symptom of gallstone disease. It is characterized by episodic attacks of abdominal pain, often located in the right upper abdomen just under the lower ribs. Pain may also be felt in the back and right shoulder. Other associated symptoms include nausea, vomiting, and intolerance of fatty foods.

Biliary colic is usually caused by the gallbladder contracting in response to a fatty meal. This compresses the stones against the gallbladder outlet, blocking the opening. As the gallbladder relaxes several hours after the meal, the stones often fall back from the cystic duct and the pain subsides.

Acute cholecystitis

Recurrent biliary pain and cystic duct blockages can progress to total obstruction, causing inflammation of the gallbladder, called acute cholecystitis. Unlike biliary colic, in which symptoms abate within a few hours, pain is constant and fever is common with acute cholecystitis.

This is a serious condition that requires immediate medical attention and hospitalization. Treatment includes intravenous fluids, pain medications, and often antibiotics. Surgical removal of the gallbladder is usually recommended during the hospitalization or shortly thereafter. If not treated, acute cholecystitis can lead to gallbladder rupture, a life-threatening condition.

Complications of gallstones

Complications can develop if gallstones migrate through the cystic duct and block the common bile duct.

- Jaundice is a yellow discoloration of the skin and eyes.
- Acute cholangitis is an infection of the bile ducts that causes pain, chills, and fever.
- Acute pancreatitis is sudden onset inflammation of the pancreas, which is associated with severe abdominal pain.
- Secondary biliary cirrhosis can develop if the bile duct remains blocked for a long period of time, causing irreversible liver damage.

DIAGNOSIS

There are two aspects to the diagnosis of gallstones: determining if gallstones are present, and determining whether they are responsible for symptoms.

Gallstones are most commonly detected using ultrasound, a painless test that uses sound waves to create an image of the gallbladder. Gallstones can also be seen on other imaging tests such as CT scan, ERCP, or endoscopic ultrasonography.

TREATMENT

Surgical treatment

Cholecystectomy

Cholecystectomy is surgical removal of the gallbladder. It is one of the most commonly performed surgical procedures. Cholecystectomy requires the use of general anesthesia (medicine is given into a vein to induce sleep and prevent pain) and an operating room.

The gallbladder is an important organ, but is not essential for life. Therefore, the standard treatment for symptomatic patients who suffer from gallstones has been to surgically remove the gallbladder and gallstones. Removing the gallbladder generally has little or no effect on digestion. Loose stools, gas, and bloating may develop in about half of patients who undergo surgery; in most patients these symptoms are mild and do not require treatment.

- **Open cholecystectomy** : Open cholecystectomy requires a 4 to 6 inch (6 to 15 cm) incision in the abdomen, one to three nights in the hospital, and three to four weeks to recover. The operation is safe and major complications are rare. However, the risk increases with age and in patients with other medical problems.
- **Laparoscopic cholecystectomy** : Laparoscopic cholecystectomy uses instruments and a small video camera, inserted into the abdomen through three or four small incisions. The instruments are used to view and remove the gallbladder. Patients may be able to go home the same day as the surgery or may stay in the hospital for one night. Patients are usually able to return to work in one to two weeks.

Laparoscopic cholecystectomy is now the standard operation for removing the gallbladder, performed in over 90 % of patients who undergo cholecystectomy. It is safe and well tolerated, and the risk of major complications is similar to that of open cholecystectomy.

Non-surgical treatments

Nonsurgical approaches are available for the treatment of gallstones. These require no surgical incision or general anesthesia and eliminate the stones while preserving the

gallbladder. Four non-surgical approaches are currently available for the treatment of gallstones.

Oral bile acid pill

An oral bile acid pill is a medication that contains a natural bile acid. About two-thirds of patients who take it become symptom free within two to three months after starting treatment, and remain symptom free. However, it may take several years for the stones to disappear completely.

Because of its slow action, bile acid treatment is not practical in patients with recurrent or acute (sudden onset) symptoms. It is safe and well tolerated, but mild, temporary diarrhea occurs in some patients. Its use is limited to patients with small cholesterol stones and requires that the patient has a functioning gallbladder. It is effective in eliminating stones in about 50 percent of patients.

Percutaneous electrohydraulic lithotripsy

The second non-surgical approach is percutaneous electrohydraulic lithotripsy. In this procedure, a catheter is inserted into the gallbladder under local anesthesia .

This is the only non-surgical approach that is effective for all types of stones, including pigment stones. The main disadvantage is that it is a prolonged procedure requiring three to four outpatient visits over several weeks. It is also labor intensive and, therefore, only done in high-risk patients who have pigment stones and no other viable treatment alternative.

Extracorporeal shock wave lithotripsy

The third approach is extracorporeal shock wave lithotripsy (ESWL). Shock waves generated outside the body are focused on the gallstones to fracture them into smaller fragments and "sand," which can then be dissolved more efficiently by an oral bile acid pill. It is most effective in patients with fewer than 3 stones, patients who are normal weight and those with good gallbladder function.

Topical gallstone dissolution

The fourth non-surgical approach is topical gallstone dissolution, which is available in a limited number of centers in the United States and Europe. It involves dissolving the stones by bathing them with a gallstone dissolving solution (solvent). It is effective only with cholesterol gallstones.

Endoscopic retrograde cholangiopancreatography (ERCP)

ERCP may be recommended when gallstones are suspected in the bile ducts . A flexible tube with a video camera (endoscope) is inserted through the mouth and small

intestine while the patient is under sedation. A smaller tube is then advanced through the first tube into the bile duct through which contrast is injected and an x-ray is taken to visualize the stones. This procedure also allows the extraction of stones from the ducts without the need for surgery.

GALLSTONE RECURRENCE

The main disadvantage of the non-surgical treatment options is that gallstone recurrence is possible. With oral therapy, stones recur in about 50 % of patients in the first five years; recurrence occurs less often after topical gallstone dissolution. However, patients whose stones recur do not always have symptoms or require treatment.

In patients whose gallbladder is removed, stones rarely recur in the bile ducts, leading to symptoms that would require an ERCP procedure .

Gallstone prevention

- Eat three well-balanced meals daily, with each meal containing some fat to ensure gallbladder emptying. This prevents collection of bile in the gallbladder, which is one of the risk factors for gallstone formation in susceptible individuals.
- Eat a diet that is high in fiber and calcium and low in saturated fats (fat that is solid at room temperature, eg butter, shortening, lard, meat fat).
- Maintain a normal body weight by eating an appropriate number of calories and exercising for at least 30 minutes five days per week. Obese people (with and without known gallstones) who are planning a rapid weight-loss program should be supervised by a healthcare provider and may require treatment with oral bile acids to prevent gallstone development during weight loss.