Gallstone Disease

Transcript

This video aims to briefly introduce the main disease processes related to gallstones within the anatomical structures of the biliary tree. For further details on assessing a patient with abdominal pain, please refer to our video on the Approach to the Acute Abdomen.

The gallbladder serves to store and concentrate bile that is produced by the liver. Bile exits the liver from the right and left hepatic ducts, which meet distally to form the common hepatic duct. Then bile reaches the cystic duct, which is connected to the neck of the gallbladder. The gallbladder itself is made up of three parts, the neck, the body and the fundus. It sits in the gallbladder fossa on the visceral face of the liver, at the level of the 9th costal cartilage in the midclavicular line.

The cystic duct and the common hepatic duct join to form the common bile duct. The bile duct passes posterior to the duodenum and the head of the pancreas. At the left part of the superior duodenum, the main pancreatic duct and the bile duct run obliquely on its wall, and join to form the hepaticopancreatic ampulla. The distal part of the ampulla opens through the wall of the duodenum, across the major duodenal papilla. A thickening in the wall of the bile duct at the ampulla is called the choledochal sphincter (aka the Sphincter of Oddi).

It’s important to keep in mind the major roles of the gallbladder and pancreas. This will be useful in understanding the pathophysiology of many diseases related to gallstones.

The gallbladder stores and concentrates bile. It also releases bile in response to cholecystokinin, which is a peptide hormone secreted from the duodenum in response to consumption of fat.

The pancreas has both endocrine and exocrine functions. On the endocrine side of things, it releases insulin, glucagon, and somatostatin into the bloodstream. On the exocrine side of things, the pancreas secretes bicarbonate ions, precursor enzymes (also known as zymogens) such as trypsinogen and chymotrypsinogen and other enzymes such as pancreatic lipases and amylases in response to a meal.

Gallstones, which are usually made up of cholesterol can form in the gallbladder without being symptomatic. There are many factors that contribute to the formation of gallstones. Cholesterol supersaturation, accelerated cholesterol crystal nucleation and impaired gallbladder motility are a few examples of factors that may affect the formation of gallstones.

In many cases, gallstones are an incidental finding on imaging studies; this is called asymptomatic cholelithiasis. Occasionally, people may have mild, repeated episodes of pain due to gallstones. This is referred to as biliary colic. More complicated disease processes related to gallstones include acute cholecystitis, choledocholithiasis, acute cholangitis, and gallstone pancreatitis. Rare complications include Mirizzi syndrome, gallstone ileus and acalculous cholecystitis

Many people with asymptomatic cholelithiasis will not require specific management, but there are a few exceptions to this. If the stones are larger than 2 cm or if the gallbladder is calcified, it is recommended to perform a cholecystectomy to remove the organ. A calcified gallbladder is suggestive of carcinoma. Other rare indications for cholecystectomy in asymptomatic cholelithiasis include patients with sickle cell disease or those who have, or are being considered for, a heart or lung transplant.

Biliary colic is characterized by repeated minor episodes of obstruction of the cystic duct leading to inflammation and scar formation in the gallbladder.

Patients with biliary colic will typically present with constant pain in the RUQ and epigastrium that radiates to the back and that lasts from a few minutes to not more than a few hours.

On physical exam, the most notable finding is tenderness on palpation in the location where the patient is complaining of pain. Pertinent negative findings are that they should not be febrile, should not have an elevated WBC, and should have a negative Murphy’s sign.

In terms of investigations, your most useful tool will be an ultrasound of the gallbladder to detect stones. In the majority of cases, you’ll be able to see the gallstones on ultrasound.

Always consider other diagnoses when seeing a patient for possible biliary colic. Occasionally cardiac or pulmonary sources of pain can mimic biliary pain. Other intra-abdominal sources of pain should also be considered.

Ask a resident.

Which additional tests should be ordered with the ultrasound to narrow the differential?

Consider ordering a chest x-ray and an ECG

The management of biliary colic is elective cholecystectomy that is typically laparoscopic.

Acute cholecystitis is the obstruction of the cystic duct that causes distention and inflammation of the gallbladder.

The pathological change in the gallbladder follows a pattern that begins with subserosal edema, subserosal hemorrhage and patchy mucosal necrosis. Then, fibrosis will develop, eventually followed by gangrene and perforation.

Patients with acute cholecystitis will present with acute right upper quadrant pain and nausea and vomiting are present in about half of patients. Most will have had similar symptoms in the past. The pain of acute cholecystitis will progress to abdominal tenderness. It will last for a longer period of time than biliary colic, which usually lasts at most 2 hours. On physical exam, patients will have tenderness on palpation. In some cases, there will be a palpable gallbladder, a positive Murphy sign and a fever.

Ask a resident.

What are the other main diseases on the differential for acute cholecystitis?

Peptic ulcer disease, acute pancreatitis, acute appendicitis in patients with a high cecum and acute hepatitis

Patients with acute cholecystitis should be treated with IV fluids and receive antibiotics and analgesia. Definitive management is cholecystectomy. The removal of the gallbladder can be done soon after presentation and diagnosis, or in an expectant manner, but an early operation is preferred. The expectant management of acute cholecystitis is used in patients who are unfit for surgery. The principle is to wait until the patient’s symptoms are better before proceeding to surgery. If treating a patient expectantly, it’s important to keep an eye out for signs of perforation.

Choledocholithiasis is the presence of stones in the common bile duct.

Patients with choledocholithiasis may remain asymptomatic, but will usually have symptoms similar to biliary colic. Hallmark signs and symptoms of choledocholithiasis include dark urine, pale stools, and jaundice. This is due to obstruction of the biliary tree causing bilirubinemia. On physical exam, the patient may have tenderness on palpation of the RUQ.. The patient may be icteric or appear completely normal. In simple choledocholithiasis, the patient should not be febrile or appear septic – this would be concerning for acute cholangitis!

For managing patients with choledocholithiasis, patients are usually observed to see if the stones will pass on their own, but if no improvement is seen, ERCP can be done to clear the common bile duct of stones. If the patient cannot urdergo ERCP, surgical intervention by way of a common bile duct exploration plus cholecystectomy is warranted. If the stone passes on its own, the patient should also undergo cholecystectomy to prevent a recurrence in the future.

Some cases of choledocholithiasis can lead to a bacterial infection of the biliary tract. This is known as acute cholangitis. Patients with acute cholangitis may have fever, abdominal pain, jaundice, confusion and hypotenson. You’ll find that the patient has leukocytosis, elevated serum bilirubin, mildly elevated liver enzymes and elevated serum amylase.

Ask a resident.

What is Charcot’s triad? What is Reynolds pentad?

Charcot’s triad is the presentation of acute cholangitis with its most common signs: fever, right upper quadrant pain and jaundice.

Reynolds pentad is the presentation of severe or suppurative cholangitis that adds confusion and hypotension to Charcot’s triad.

In a patient with acute cholangitis, systemic antibiotics are administered and an ERCP is performed as soon as possible in order to obtain source control for the infection. Surgical common bile duct exploration is very rarely done with the advent of ERCP, however it may be necessary to obtain source control if ERCP is not possible. Cholecystectomy should be performed once the patient has recovered to prevent recurrence.

When gallstones block the ampulla of the biliary tract, they obstruct the flow of bile into the duodenum. This is one of the most common etiologies of acute pancreatitis. The mechanism for this is hypothesized to be either because of backflow of bile into the pancreatic duct; or because of edema in the pancreas due to the backpressure created by the stone.

Patients with gallstone pancreatitis will present with symptoms of pancreatitis, which are acute epigastric abdominal pain, nausea and vomiting, and some cases of severe pancreatitis may also present with dyspnea due to diaphragmatic irritation or pleural effusions. The risk of developing gallstone pancreatitis is higher in men. Gallstones are actually the most common cause of pancreatitis in North America, followed closely by alcohol abuse.

Physical findings for gallstone pancreatitis are highly dependent on the severity of the illness. In mild cases, very little can be found on physical examination. In more severe cases, the abdomen is tender on palpation with possible distention and hypoactive bowel sounds. There may be icterus, jaundice, fever, tachypnea, hypoxemia and hypotension. On one end of the spectrum, you may see patients with very mild symptoms while on the other end you may see patients who very quickly require intubation, pressor support, and could die from pancreatitis.

You should highly suspect gallstone pancreatitis in patients with a history of gallstone disease that present with symptoms of pancreatitis. Imaging with ultrasound can show stones in the gallbladder, common bile duct or ampulla. However, the diagnosis is clinched with an elevated serum lipase or amylase.

A conservative approach with symptom management is usually the first to be used. This may include analgesia and fluid resuscitation where needed. For patients with worsening pancreatitis or evidence of persistent choledocholithiasis, ERCP with sphincterotomy can be performed. Most often in gallstone pancreatitis, the stone has already passed which is why ERCP is usually not needed. An important complication of ERCP is pancreatitis – so it’s best to avoid it if you can. Cholecystectomy is most commonly performed after resolution to prevent recurrence.

The creation of this video was supported by the UGME Innovation in Undergraduate Medical Education Summer Studentship and the University of Ottawa.