

بسم الله الرحمن الرحيم

- دکتر حسن اصغری
- جراح عمومی
- فلوشیپ جراحی درون بین
(لاپاروسکوپی)

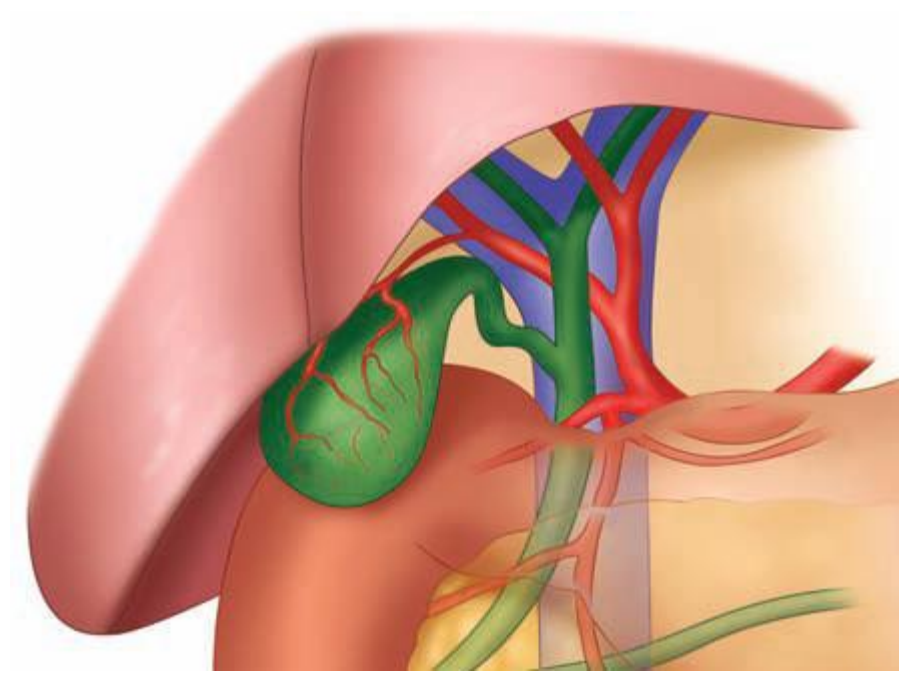
- **Gallbladder
and the
Extrahepatic
Biliary System**

Gallbladder

The gallbladder is a pear-shaped sac,
about 7 to 10 cm long,
with an average capacity of 30 to 50 mL
When obstructed, the
gallbladder can distend markedly and
contain up to 300 mL

The gallbladder is
located in a fossa on
the inferior surface
of the liver

- خطی که این حفره را به ivc متصل میکند کبد را به دو لوب راست و چپ تقسیم میکند.

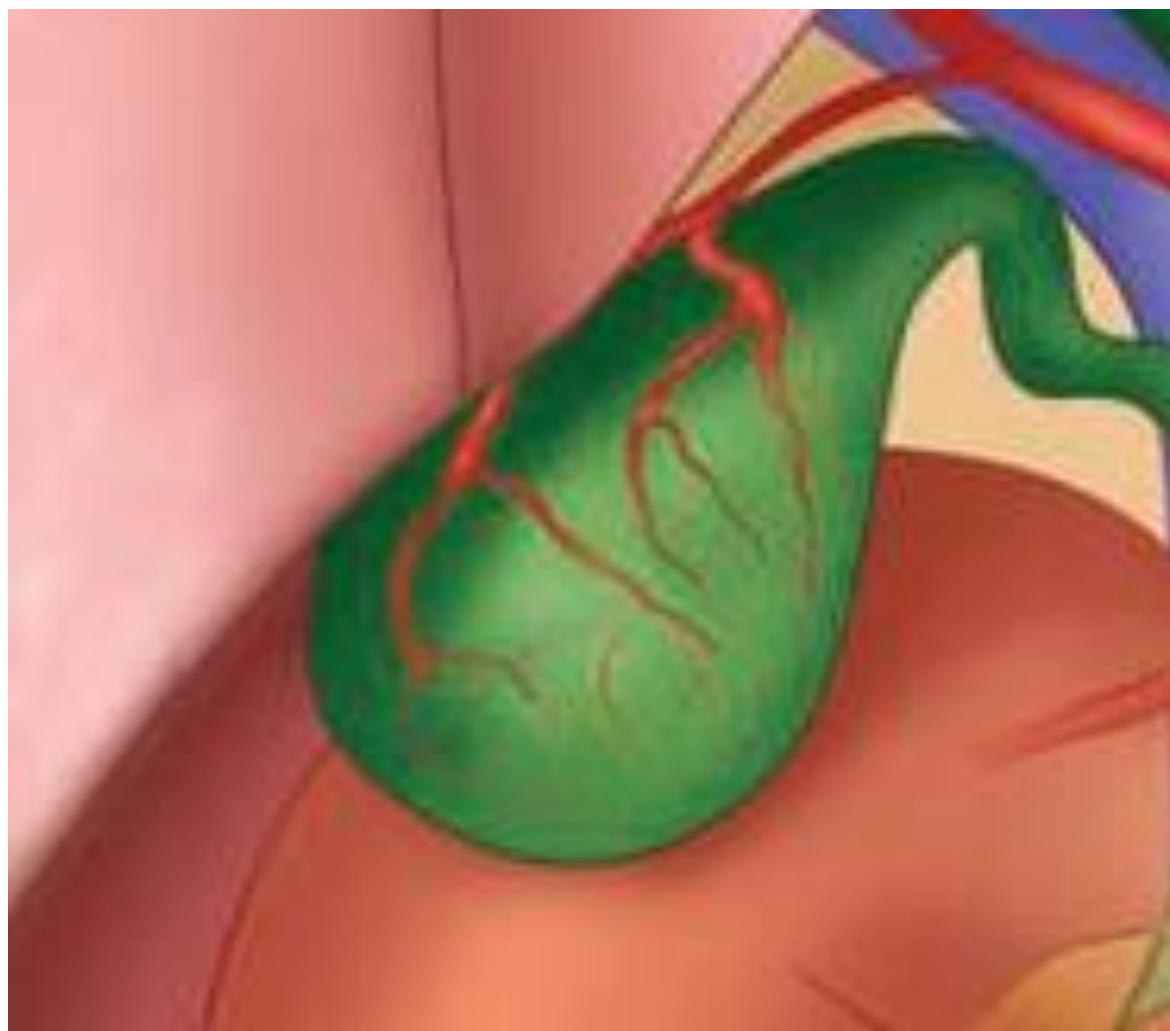


- کیسه صفرا از لحاظ آناتومی به 4 ناحیه تقسیم میشود:

The gallbladder :
fundus,
the corpus (body),
the infundibulum,
and the neck.

- فوندوس گرد و دارای انتهای برجسته است. که یک تا دوسانتی متر فراتر از حاشیه کبد گسترش مییابد. و بیشترین عضله صاف جدار کیسه صفرا در فوندوس قرار دارد. در حالی که که جسم body کیسه صفرا محل اصلی ذخیره بوده و دارای بیشترین بافت الاستیک است.

- بعد از این دو، ناحیه باریک و قیف مانند بنام گردن قرار دارد که با مجرای سیستم ارتباط دارد.
- گردن کیسه صفرا دارای انحنای ملایمی است که در ناحیه محدب آن بزرگ شده و ناحیه انفندیبولوم یا کیسه هارتمن را میدهد.



The cystic artery that supplies the gallbladder is usually a branch of the right hepatic artery (>90% of the time).

- مسیر شریان سیستم ممکن است متفاوت باشد. اما تقریباً همیشه در داخل مثلث هیپاتوسیتیک (مثلث کالوت) قرار دارد.

The cystic artery always is found within the hepatocystic triangle,
(triangle of Calot)
the area bound by the
cystic duct, common hepatic duct, and the liver margin

When the cystic artery reaches the neck of the gallbladder, it divides into anterior and posterior divisions.

Venous

return is carried either through small veins that enter directly into the liver or, rarely, to a large cystic vein that carries blood back to the portal vein

- بازگشت وریدی توسط وریدهای کوچکی که مستقیماً وارد کبد میشوند ، و یا بندرت به یک ورید سیستیک بزرگ که خون را به ورید پورت برمیگرداند انجام میشود.

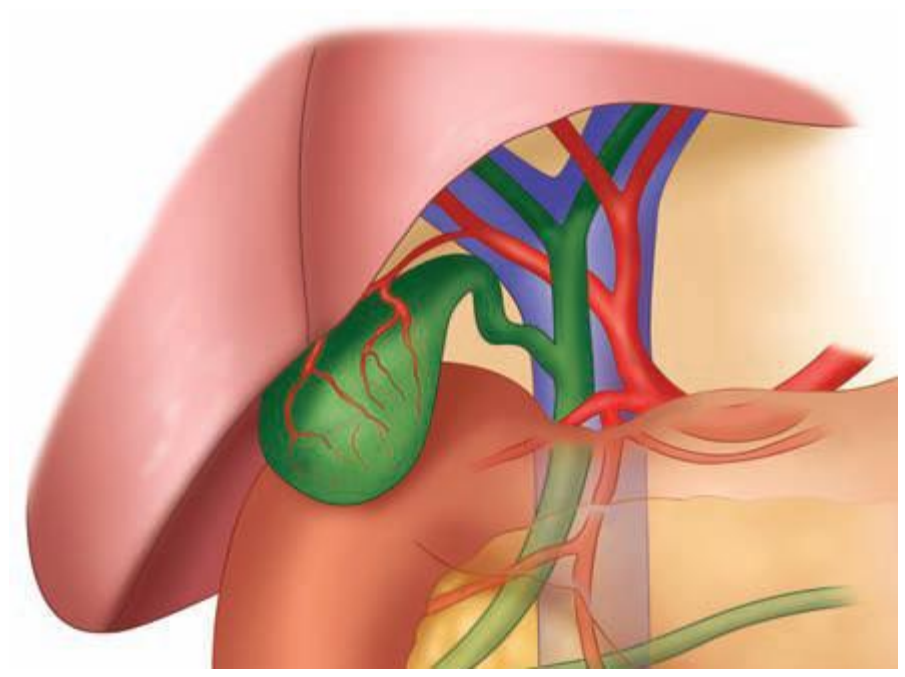
- لنف کیسه صفرا به گره های لنفاوی موجود در ناحیه گردن کیسه صفرا تخلیه میشود.
- اغلب یک گره لنفاوی قابل مشاهده زیر ورودی شریان سیستیک به دیواره کیسه صفرا قرار دارد.

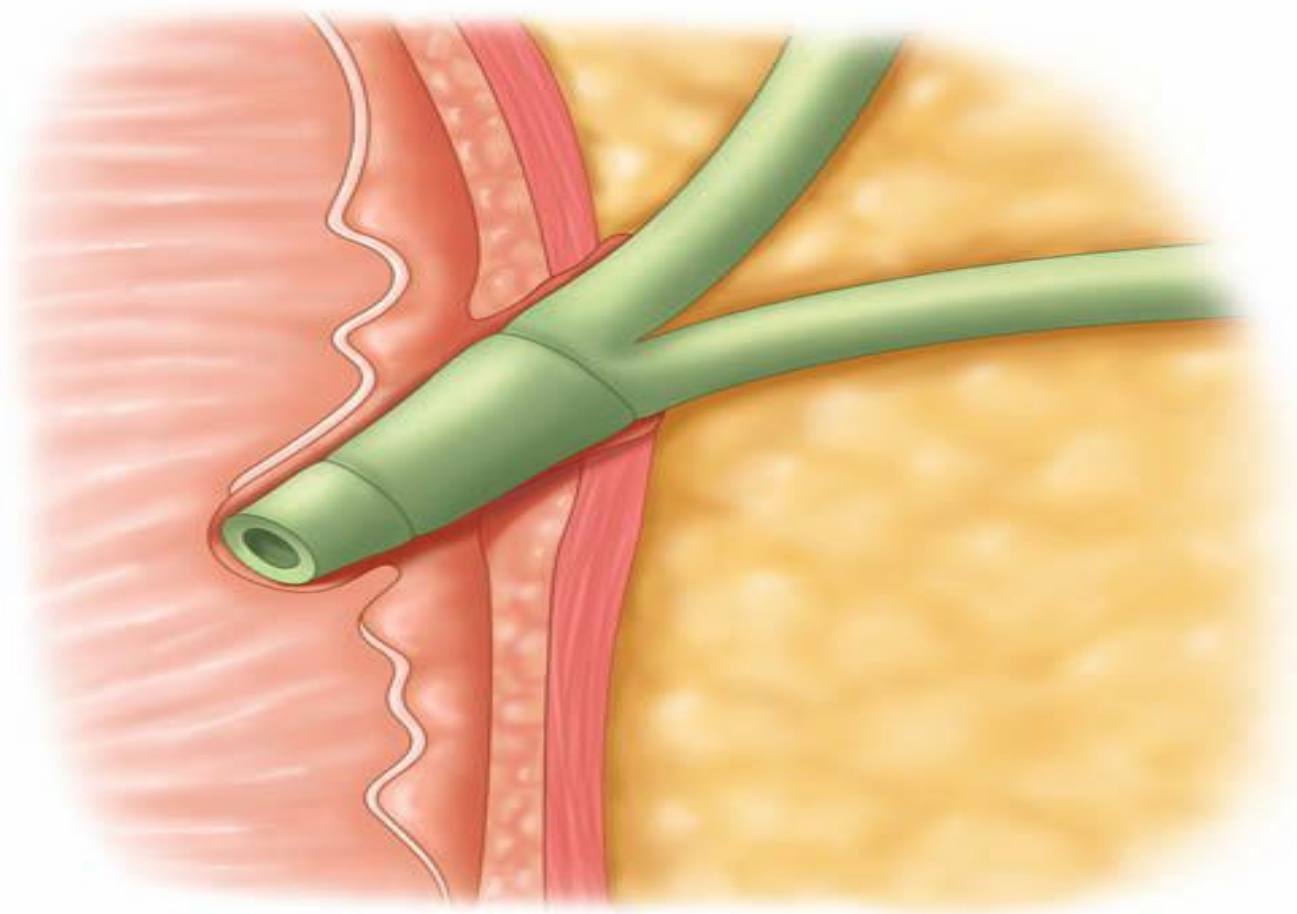
Bile Ducts

The **extrahepatic bile ducts** consist of the right and left hepatic ducts, the common hepatic duct, the cystic duct, and the common bile duct(choledochus).

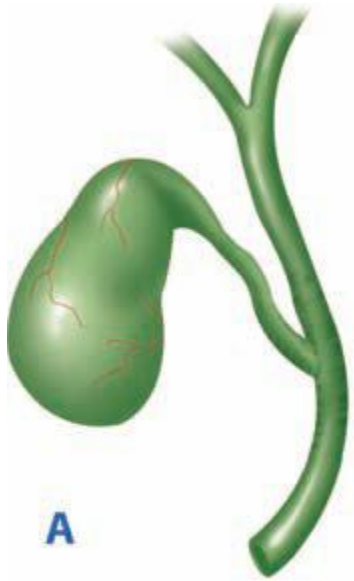
The common bile duct enters the second portion of the duodenum through a muscular structure,
the sphincter of Oddi.

- مجرای کبدی چپ بلند تر از راست است. و تمایل زیادتری برای گشاد شدن در زمان انسداد و تنگی دیستال دارد.





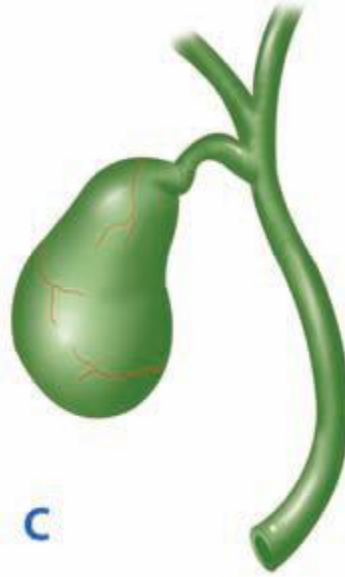
- طول مجرای سیستم کاملاً متغیر است. ممکن است کوتاه باشد یا اصلاً نباشد. مجرای سیستم ممکن است موازی با مجرای هیپاتیک مشترک قرار گیرد. یا ممکن است بسیار طولانی باشد بطوری که در دئودنوم به مجرای هیپاتیک پیوندد.



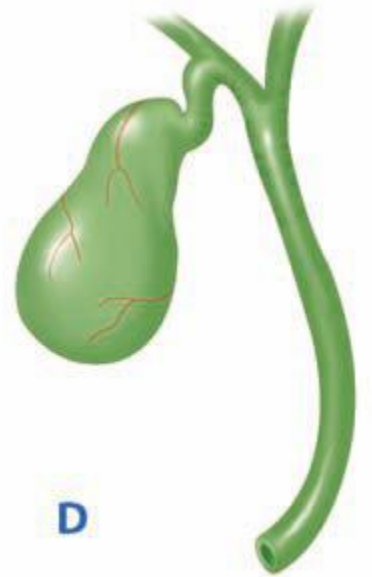
A



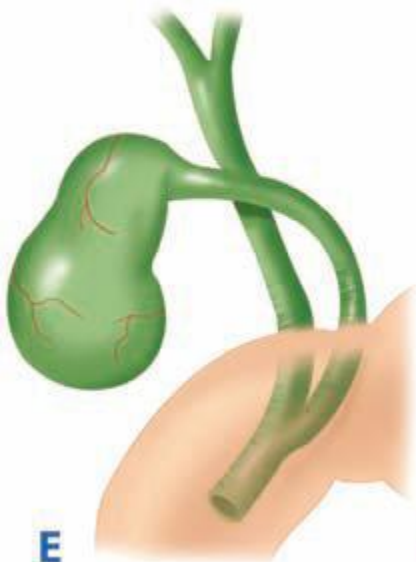
B



C



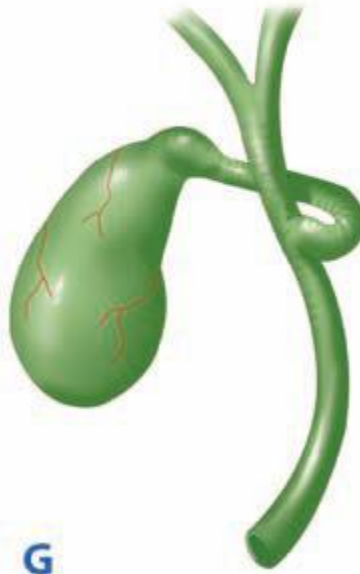
D



E



F



G

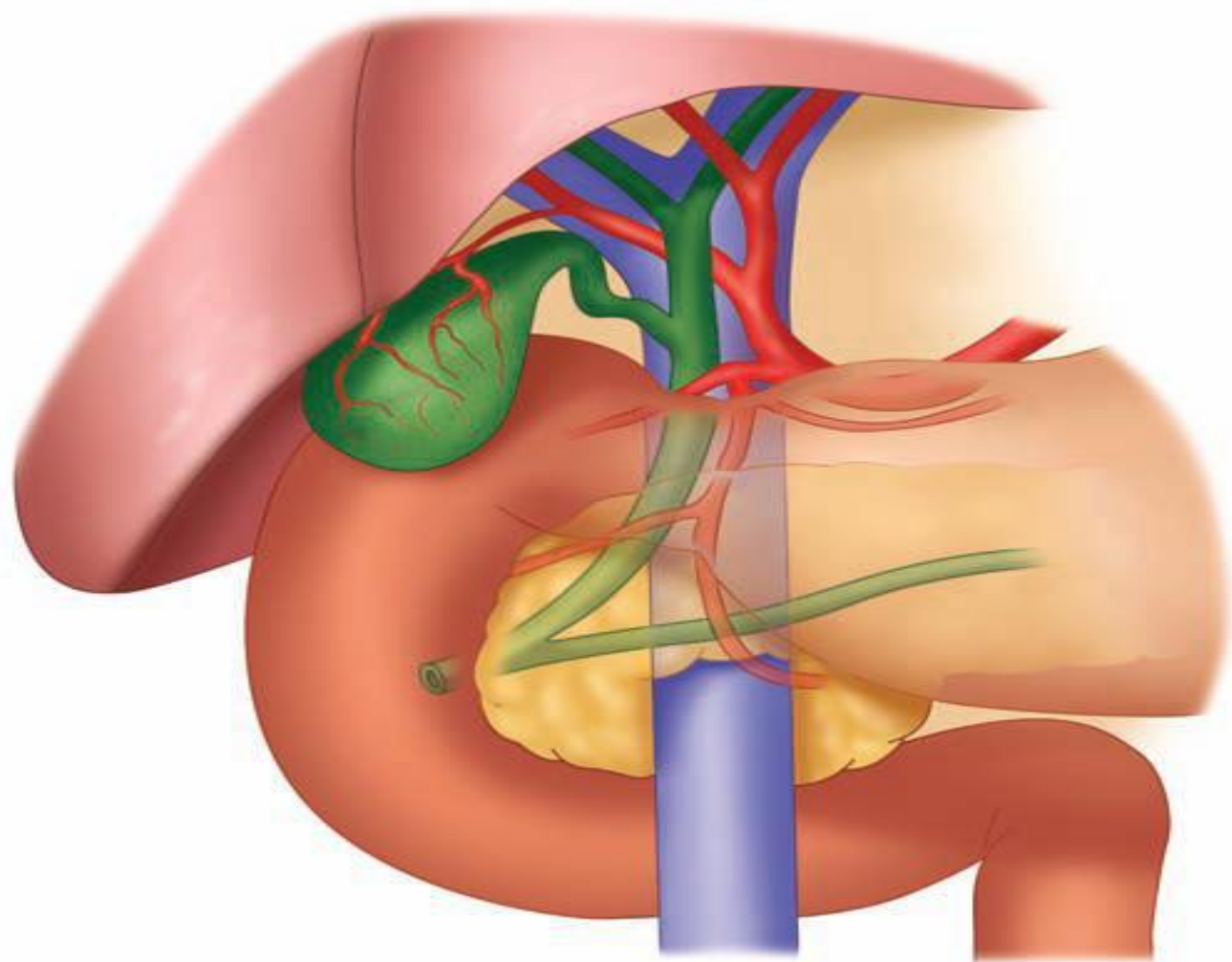


H

The common bile duct is about 7 to 11 cm in length and 5 to 10 mm in diameter

- مجرای صفراوی مشترک (کلدوک) از طریق یک ساختار عضلانی وارد قسمت دوم دئودنوم میشود: اتصال مجرای صفراوی مشترک و مجرای اصلی پانکراتیک به سه حالت رخ میدهد:
- در حدود 70 درصد موارد این دو مجرا در خارج از دئودنوم به هم وصل شده و سپس از دیواره دئودنوم به صورت یک مجرای مشترک عبور میکنند.
- در 20 درصد موارد در داخل دیواره دئودنوم به هم متصل شده و یک مجرای مشترک کوتاه دارند. اما در دئودنوم به سوراخ مشترکی باز میشوند.
- در 10 درصد موارد بصورت دو سوراخ مجزا به دئودنوم باز میشوند.

- دریچه اودی oddi یک پوشش ضخیمی از عضله صاف حلقوی مجرای صفراوی مشترک را در آمپول و اثر احاطه میکند.



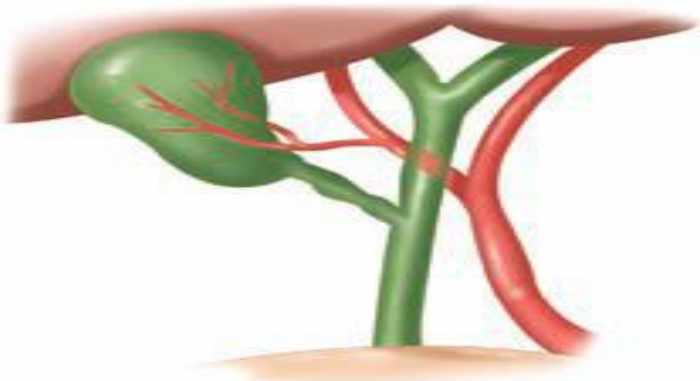
Anomalies

- تعریف کلاسیک درخت صفراوی خارج کبدی و شریانهای آن تنها در یک سوم بیماران کاربرد دارد.

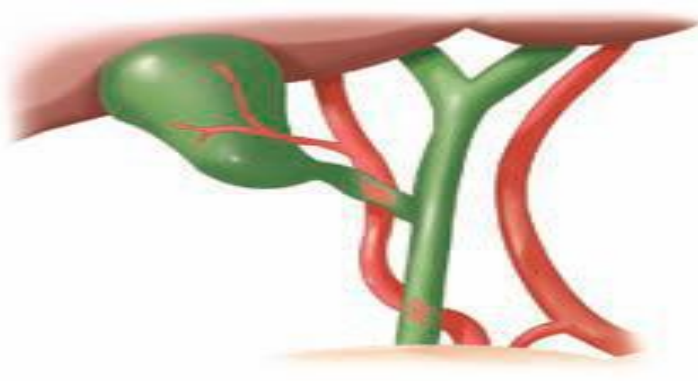
The gallbladder
may have abnormal positions, be
intrahepatic, be rudimentary, have
anomalous forms, or be duplicated.

- مجاری کوچک لوشکا ممکن است بطور مستقیم از کبد بداخل بدنه کیسه صفرا تخلیه شود. اگر این حالت وجود داشته باشد، اما در زمان کله سیستکتومی تشخیص داده نشود یک نشت صفراوی با تجمع صفرا در شکم (بایلوما) اتفاق میفتد.
- بهر حال دایسکشن در plan نادرست باعث نشت صفرا بعد از عمل از بستر کیسه صفرا اتفاق میفتد.

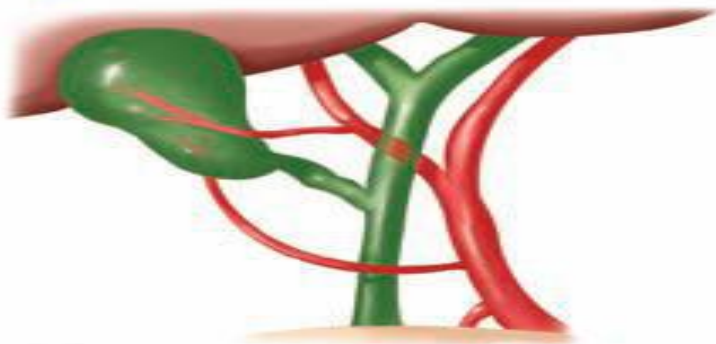
- انواع مختلف تغذیه شریانی کیسه صفرا:



A



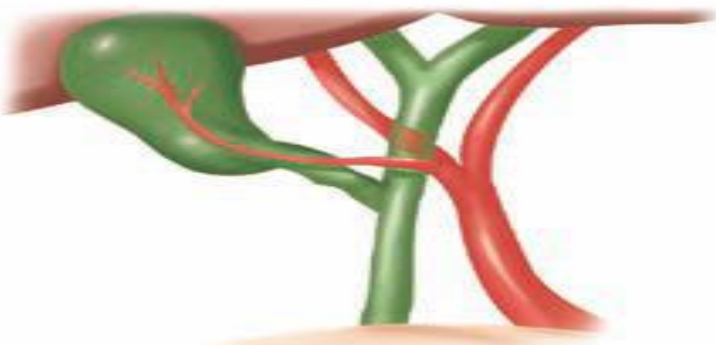
B



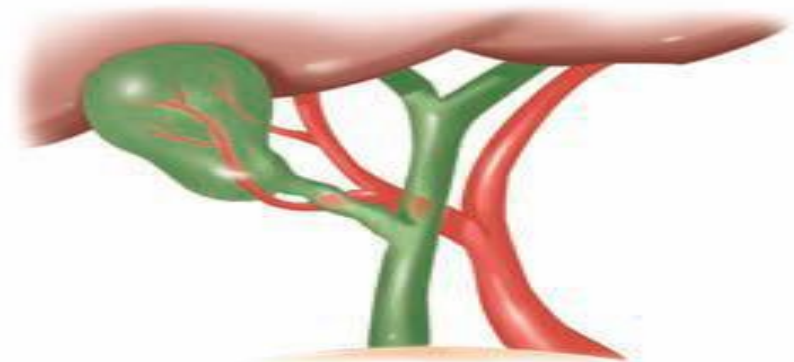
C



D



E



F

فیزیولوژی

- کبد دائما در حال ساخت صفرا میباشد. و آنرا به کانالیکولهای صفراوی تخلیه میکند. افراد نرمال با رژیم غذایی مناسب روزانه حدود 500 تا 1000 میلی لیتر صفرا تولید میکنند.
- کیسه صفرا و مجاری صفراوی و اسفنکتر اودی با فعالیت هماهنگ خود عمل ذخیره سازی و تنظیم جریان صفرا را برعهده دارند.
- عملکرد اصلی کیسه صفرا تغلیظ کردن و ذخیره کردن صفراوی کبدی و فرستادن صفرا به دئودنوم در پاسخ به غذای خورده شده میباشد.

- در پاسخ به غذای خورده شده کیسه صفرا با انقباضات هماهنگ خود و شل شدن اسفنکتر اودی oddi محتویاتش تخلیه میشود. یکی از اصلی ترین محرک ها برای تخلیه صفرا هورمون کله سیستوکینین است که از مخاط دئودنوم به گردش خون رها میشود. در پاسخ به غذا حدود 60 تا 70 درصد محتویات کیسه صفرا در عرض 30 تا 40 دقیقه تخلیه میشود. و بدنبال آن در عرض 60 تا 90 دقیقه بتدریج کیسه صفرا پر میشود.

DIAGNOSTIC STUDIES

- امروزه روشهای تشخیصی گوناگونی برای بیماران مشکوک به بیماریهای کیسه صفرا و مجاری صفراوی بکار برده میشود.

Blood Tests

When patients with suspected diseases of the gallbladder or the extrahepatic biliary tree are evaluated: a CBC and LFT are routinely requested. An elevated (WBC) count may indicate or raise suspicion of cholecystitis. If associated with an elevation of bilirubin, alkaline phosphatase, and aminotransferase, cholangitis should be suspected.

Cholestasis, an obstruction to bile flow, is characterized by an elevation of bilirubin (i.e., the conjugated form) and a rise in alkaline phosphatase. Serum aminotransferases may be normal or mildly elevated.

An **ultrasound** is the initial investigation of any patient suspected of disease of the biliary tree.

It is:

noninvasive,

painless,

does not submit the patient to radiation,

and can be performed on critically ill patients

- این روش در بیماران چاق و بیماران دارای آسیت و بیماران با روده متسع ممکن است دشوار باشد و نتایج رضایت بخشی را در اختیار ما قرار ندهد.

Ultrasound will show stones in the gallbladder with sensitivity and specificity of >90%.

Stones are acoustically dense and reflect the ultrasound waves back to the ultrasonic transducer.

(acoustic shadow)



Stones move with changes in position. Polyps may be calcified and reflect shadows, but do not move with change in posture.

The extrahepatic bile ducts are also well visualized by ultrasound, except for the retroduodenal portion

Frequently, the site and, sometimes, the cause of obstruction can be determined by ultrasound. Small stones in the common bile duct frequently get lodged at the distal end of it, behind the duodenum, and are, therefore, difficult to detect.

Periampullary tumors can
be difficult to
diagnose on ultrasound

Ultrasound can be helpful in **evaluating tumor invasion**

and **flow in the portal vein**, an important guideline for resectability of periampullary and pancreatic head tumors

A thickened gallbladder wall
and local tenderness
indicate cholecystitis

The patient has acute **cholecystitis** if a **layer of edema** is seen within the wall of the gallbladder or between the gallbladder and the liver in **association with localized tenderness.**

When a stone obstructs the neck of the gallbladder,
the gallbladder may become very large, but thin walled.(hydropse)

A contracted, thick-walled
gallbladder is indicative of
Chronic cholecystitis

Oral Cholecystography

کله سیستوگرافی خوراکی

- در گذشته کاربرد داشت.
- امروزه با سونوگرافی جایگزین شده است.
- یک ترکیب حاجب بصورت خوراکی به بیمار داده میشود ابتدا توسط دستگاه گوارش جذب شده و سپس توسط کبد بداخل مجاری صفراوی ترشح میشود. در این روش سنگ ها به صورت نقایص پرشدگی در کیسه صفرايي که قابل رویت شده مشاهده میشود.
- بدیهی است این روش در بیماران دارای سوئ جذب روده ای استفراغ نارسایی کبدی و... کاربرد ندارد.

Biliary Radionuclide Scanning (HIDA Scan)

Biliary scintigraphy provides a noninvasive evaluation of the liver, gallbladder, bile ducts, and duodenum with both anatomic and functional information.

^{99m}Tc derivatives of dimethyl iminodiacetic acid (HIDA) are injected intravenously, cleared by the Kupffer cells in the liver, and excreted in the bile.

Uptake by the liver is detected within 10 minutes,

And the gallbladder, the bile ducts, and the duodenum are visualized within 60 minutes in fasting subjects.

- کاربرد اولیه سینتی گرافی صفراوی در تشخیص کله سیستیت حاد میباشد که در آن پرشدن سریع مجرای صفراوی مشترک و دئودنوم مشاهده شده در حالی که کیسه صفرا (به علت التهاب) قابل مشاهده نمیباشد.

**primary use of
biliary scintigraphy is in the
diagnosis of acute cholecystitis,
which appears as a nonvisualized
gallbladder,**

- به کمک سینتی گرافی میتوان نشت صفراوی را به عنوان یکی از عوارض جراحی کیسه صفرا یا درخت صفراوی تایید کرد و در اغلب موارد محل آنرا تعیین نمود.

Computed Tomography

Abdominal CT scans are inferior to ultrasonography in diagnosing gallstones.

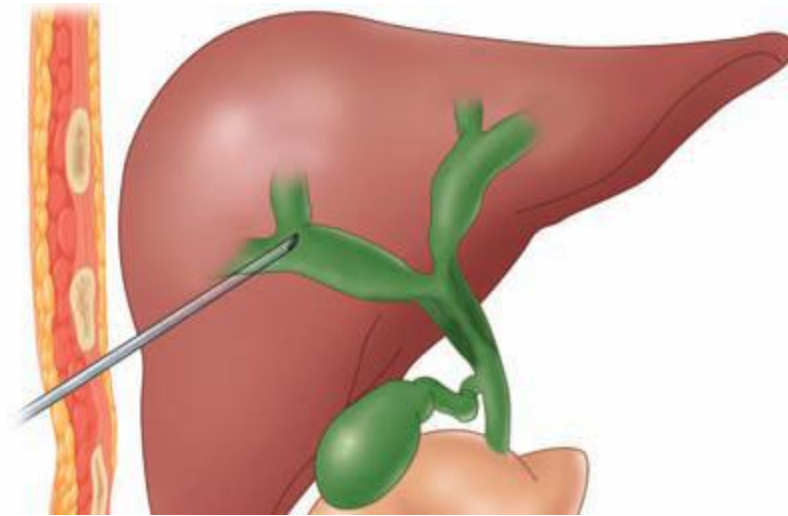
The major application of CT scans is to define the course and status of the extrahepatic biliary tree and adjacent structures.

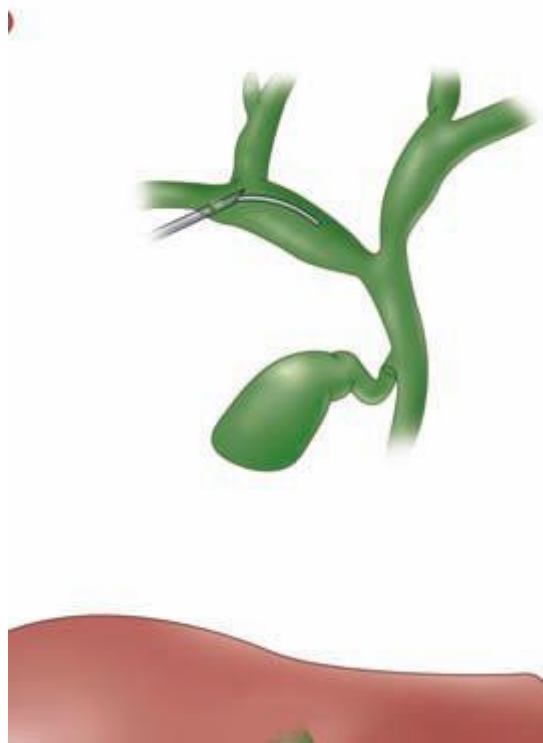
It is the test of choice in evaluating the patient with suspected malignancy of the gallbladder, the extrahepatic biliary system, or nearby organs, in particular, the head of the pancreas

Percutaneous Trans hepatic Cholangiography

PTC

- مجاری صفراوی داخل کبدی بایک سوزن کوچک تحت هدایت فلوروسکوپ مورد دسترسی قرار میگیرند. و بعد از تعبیه کاتتر داخل یکی از مجاری صفراوی داخل کبدی با تزریق ماده حاجب یک کلانژیوگرام تهیه میشود و مداخلات درمانی لازم مانند درناژ صفراوی و کارگذاری استنت صورت میگیرد.
- این مدالیته تشخیصی و درمانی در بیماران با تنگی های مجاری صفراوی و تومورها بسیار مفید است.







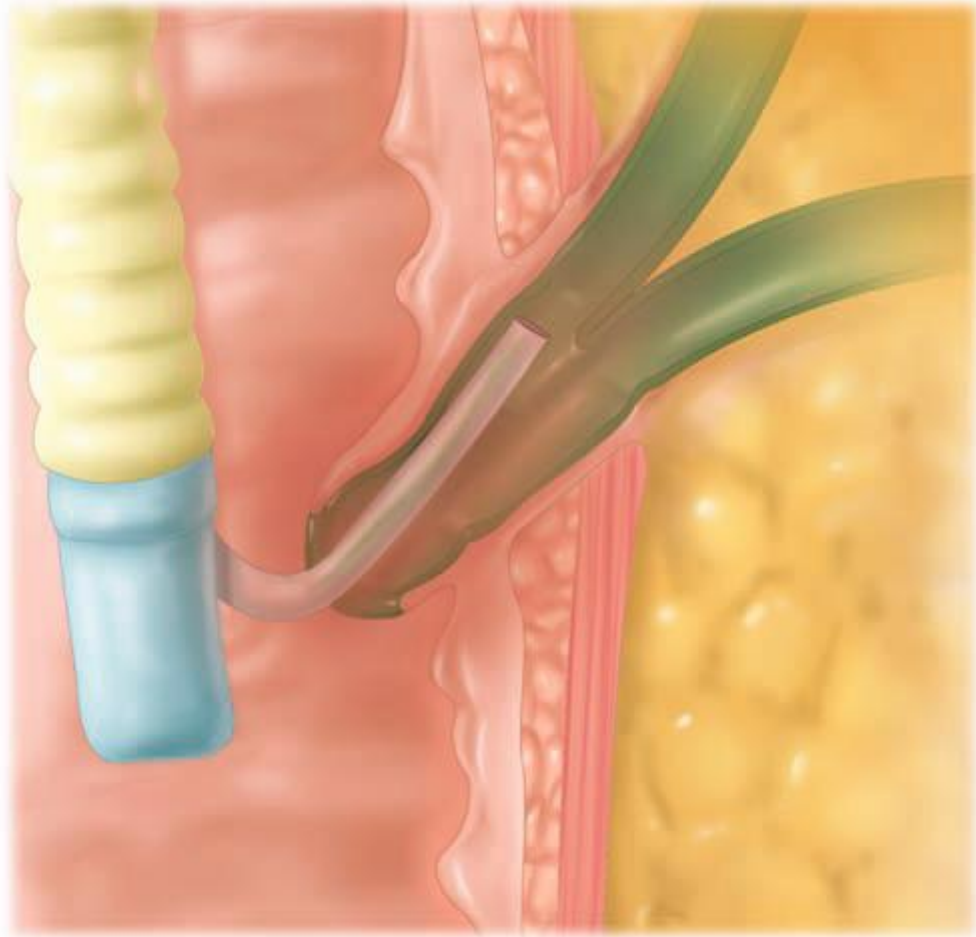
MRI

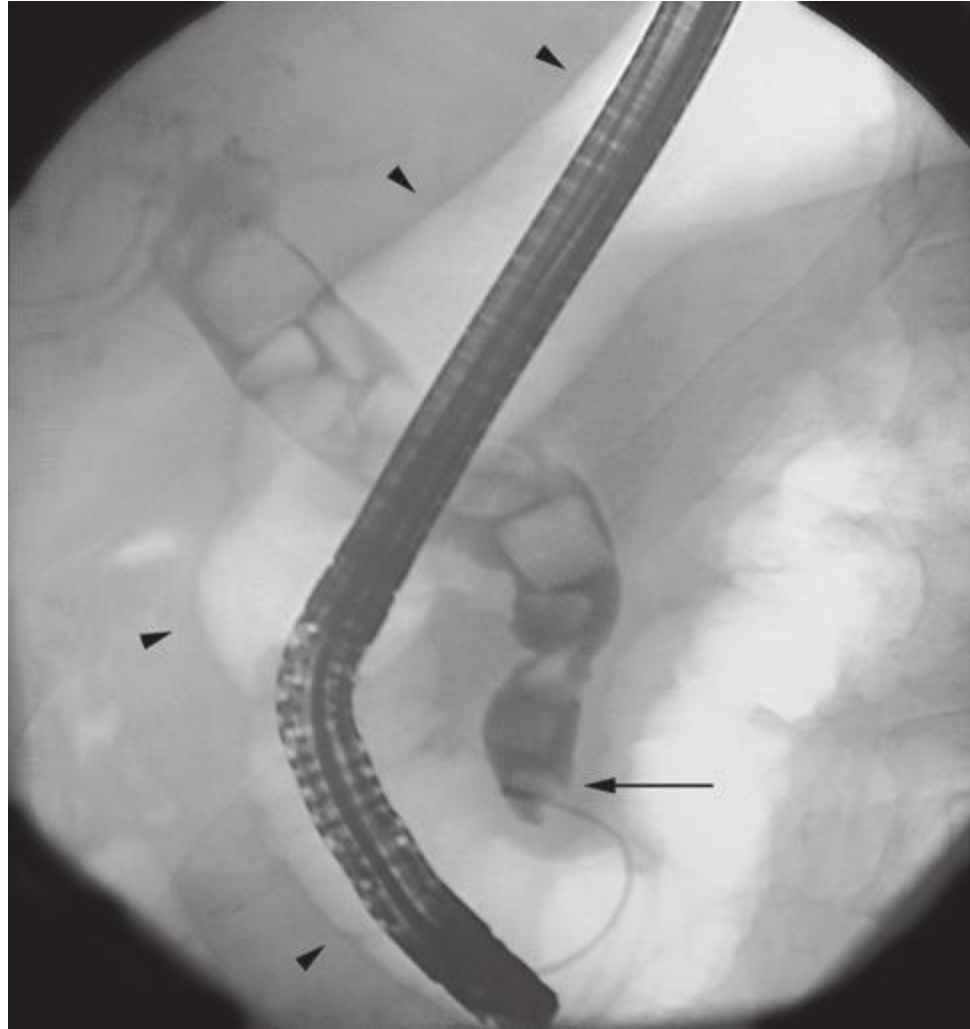
- در این روش جزئیات آناتومیکی مشابه سی تی اسکن از کبد، کیسه صفرا و پانکراسی را فراهم میکند.
- MRI با MRCP یک روش غیر تهاجمی برای تشخیص بیماریهای پانکراس و مجاری صفراوی فراهم میکند.

Endoscopic Retrograde Cholangiopancreatography(ERCP)

the common bile duct can be
cannulated and a cholangiogram performed

The advantages of ERC include direct visualization of the ampullary region and direct access to the distal common bile duct, with the possibility of therapeutic intervention.





Endoscopic Ultrasound

- تصاویر غیر تهاجمی مجاری صفراوی و ساختارهای مجاور را میتوان از آن دریافت کرد.
- ارزش ویژه ای در ارزیابی تومورها و قابل برداشت بودن دارد.
- یک کانال برای بیوپسی دارد که اجازه تهیه بیوپسی تحت راهنمایی (گاید) اولتراسوند را میدهد.

Acute Cholecystitis

- Acute cholecystitis is secondary to gallstones in 90% to 95% of cases.
- Acute acalculous cholecystitis is a condition that typically occurs in patients with other acute systemic diseases.
- In <1% of acute cholecystitis, the cause is a tumor obstructing the cystic duct.

Obstruction of the cystic duct by a gallstone is the initiating event that leads to gallbladder distention, inflammation, and edema of the gallbladder wall

In ***acute cholecystitis***, the gallbladder wall becomes grossly thickened and reddish with subserosal hemorrhages. Pericholecystic fluid often is present

In severe cases, about 5% to 10%, the inflammatory process progresses and leads to ***ischemia and necrosis*** of the gallbladder wall

More frequently,
the gallstone is dislodged and the
inflammation resolves

When the gallbladder remains obstructed and secondary bacterial infection supervenes, an acute gangrenous cholecystitis develops, and an **abscess** or **empyema** forms within the gallbladder.

Clinical Manifestations

The pain is typically in the right upper quadrant or epigastrium and may radiate to the right upper part of the back or the interscapular area. The patient is often febrile, complains of anorexia, nausea, and vomiting, and is reluctant to move, as the inflammatory process affects the parietal peritoneum.

On physical examination:

**focal tenderness and guarding
in the right upper quadrant.**

*A mass, the gallbladder and
adherent*

omentum, is occasionally palpable.

**A Murphy's sign, an inspiratory
arrest with deep
palpation in the right subcostal
area,**

**is characteristic of acute
cholecystitis.**

A mild to **moderate leukocytosis** (12,000–15,000 cells/mm³)

is usually present. However, some patients may have a normal

WBC. ***A high WBC count (above 20,000)*** is suggestive of a

complicated form of cholecystitis such as gangrenous cholecystitis, perforation, or associated cholangitis

Serum liver chemistries:
are usually normal, but a mild elevation of
serum bilirubin,
<4 mg/mL, may be present along with mild
elevation of alkaline phosphatase,
transaminases, and amylase.

Severe jaundice:

is suggestive of **common bile duct stones** or obstruction of the bile ducts by severe pericholecystic inflammation secondary to impaction of a stone in the infundibulum of the gallbladder that mechanically obstructs the bile duct (**Mirizzi's syndrome**).

In elderly patients and in those with diabetes mellitus, acute cholecystitis may have a subtle presentation resulting in a delay in diagnosis.

The differential diagnosis:

peptic ulcer with or without perforation,
pancreatitis,
appendicitis,
hepatitis,
perihepatitis (Fitz-Hugh–Curtis syndrome),
myocardial ischemia, pneumonia, pleuritis, and
herpes zoster involving the intercostal nerve.

Diagnosis

Ultrasonography

It has a sensitivity and specificity
of 95%.

it will show the
thickening of the gallbladder wall and the pericholecystic fluid

Focal tenderness over the gallbladder
when compressed
by the sonographic probe (sonographic
Murphy's sign)
also is suggestive of acute cholecystitis

Biliary radionuclide scanning (HIDA scan) :

Lack of filling of the gallbladder after 4 hours indicates an obstructed cystic duct and specific for acute cholecystitis

Treatment

need IV fluids, antibiotics,
and analgesia

Cholecystectomy is the **definitive treatment** for acute cholecystitis.

In the past, the timing of cholecystectomy has been a matter of debate. Early cholecystectomy performed within

2 to 3 days of the illness is preferred over interval or delayed cholecystectomy that is performed **6 to 10** weeks after initial medical treatment and recuperation.

early cholecystectomy

(Laparoscopic)

should be recommended, as it
offers the patient a definitive
solution in one hospital
admission,

- در بیمارانی که برای جراحی آمادگی ندارند (بیماران بسیار بدحال و پرخطر بستری در ICU...) کله سیستوستومی پرکوتانه یا کله سیستوستومی باز با بی حسی موضعی میتواند انجام شود.

- از توجه دوستان و همکاران عزیزم بسیار سپاسگزارم

Choledocholithiasis

Common bile duct stones may be small or large and single or multiple, and are found in 6% to 12% of patients with stones in the gallbladder

The incidence increases with age. About 20% to 25% of patients above the age of 60 with symptomatic gallstones have stones in the common bile duct as well as in the gallbladder

The vast majority of ductal stones in Western countries are formed within the gallbladder and migrate down the cystic duct to the common bile duct. These are classified as ***secondary*** common bile duct stones, in contrast to the ***primary*** stones that form in the bile ducts.

The ***secondary*** stones are usually cholesterol stones, whereas the ***primary*** stones are usually of the brown pigment type.

The **primary stones** are associated with biliary stasis and infection and are more commonly seen in Asian populations.

The causes of biliary stasis that lead to the development of primary stones include ***biliary stricture, papillary stenosis, tumors,***

Clinical Manifestations

They may cause **obstruction**, complete or incomplete, or they may manifest with **cholangitis** or gallstone **pancreatitis**.

The pain caused by a stone in the bile duct is very similar to that of biliary colic caused by impaction of a stone in the cystic duct. **Nausea** and **vomiting** are common.

Physical examination

may be normal,

but

mild epigastric or right upper quadrant tenderness

mild icterus are common.

The symptoms may also be intermittent, such as pain and transient jaundice caused by a stone that temporarily impacts the ampulla but subsequently moves away, acting as a ball valve

A small stone may pass through the ampulla spontaneously with resolution of symptoms.
Finally, the stones may become completely impacted, causing severe progressive jaundice.
Elevation of serum bilirubin, alkaline phosphatase, and transaminases are commonly seen in patients with bile duct stones.

Commonly, the first test, ultrasonography, is useful for documenting stones in the gallbladder (if still present), as well as determining the size of the common bile duct.

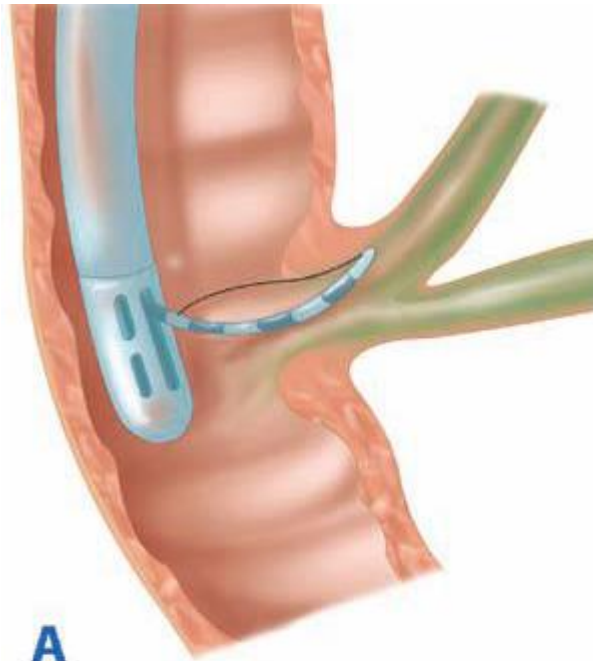
A dilated common bile duct (>8 mm in diameter) on ultrasonography in a patient with gallstones, jaundice, and biliary pain is highly suggestive of common bile duct stones.

Magnetic resonance cholangiography (MRC)
provides excellent
anatomic detail at detecting
choledocholithiasis >5 mm in
diameter

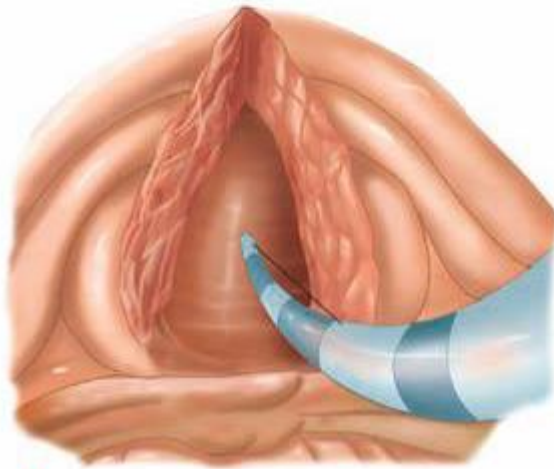
Endoscopic cholangiography(ERCP) is the gold standard for diagnosing common bile duct stones. It has the distinct advantage of providing a therapeutic option at the time of diagnosis.

*Treatment For patients with symptomatic gallstones and suspected common bile duct stones, either **preoperative endoscopic cholangiography** or an **intraoperative cholangiogram** will document the bile duct stones*

If an endoscopic cholangiogram reveals stones, sphincterotomy and ductal clearance of the stones is appropriate, followed by a laparoscopic cholecystectomy



A



B

An intraoperative cholangiogram at the time of cholecystectomy will also document the presence or absence of bile duct stones

Cholangitis

Cholangitis is **one** of the two main complications of choledochal stones, **the other** being gallstone pancreatitis.

Acute cholangitis is an ascending bacterial infection in association with partial or complete obstruction of the bile ducts

combination of

both significant *bacterial contamination and biliary obstruction* is required for its development. Gallstones are the most common cause of obstruction in cholangitis;

Clinical Presentation Cholangitis may present as anything from a mild, intermittent, and self-limited disease to a fulminant, potentially life-threatening septicemia. The patient with gallstone-induced cholangitis is typically older and female. The most common presentation is fever, epigastric or right upper quadrant pain, and jaundice. These classic symptoms, well known as *Charcot's triad*, are present in about two thirds of patients.

The illness may progress rapidly with septicemia and disorientation, known as *Reynolds' pentad* (e.g., fever, jaundice, right upper quadrant pain, septic shock, and mental status changes).

***Diagnosis and Management Leukocytosis,
hyperbilirubinemia,***

and elevation of alkaline phosphatase and transaminases are common and, when present, support the clinical diagnosis of cholangitis.

The **definitive diagnostic** test is **ERC**

allow the removal of stones if present,
and allow drainage of the bile ducts with drainage catheters
or stents

The initial treatment of patients with cholangitis includes:

IV antibiotics and **fluid resuscitation**. These patients may require **intensive care unit** monitoring and vasopressor support.

Most patients will respond to these measures.

However,

the obstructed bile duct must be drained as soon as the patient has been stabilized

TREATMENT

Patients with choledocholithiasis or periampullary malignancies are best approached endoscopically, with sphincterotomy and stone removal, or by placement of an endoscopic biliary stent

OR

percutaneous transhepatic drainage

When neither ERC nor PTC is available,
an emergent operation for decompression of
the common bile
duct with a T tube may be necessary and
lifesaving

Biliary Pancreatitis

Gallstones in the common bile duct are associated with acute pancreatitis. Obstruction of the pancreatic duct by an impacted stone or temporary obstruction by a stone passing through the ampulla may lead to pancreatitis

If gallstones are present and the pancreatitis is severe, an ERC with sphincterotomy and stone extraction may abort the episode of pancreatitis.

Once the pancreatitis has subsided, the gallbladder should be removed during the same admission.