Choledochoduodenostomy versus Choledochojejunostomy In treatment of obstructive jaundice

Prof. Dr. / Alaa El-Suity

Choledochojejunostomy

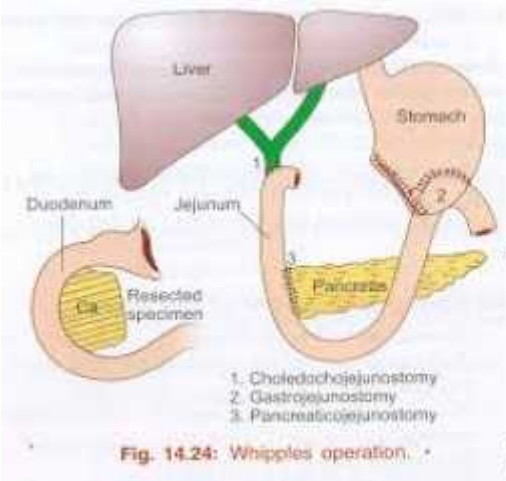
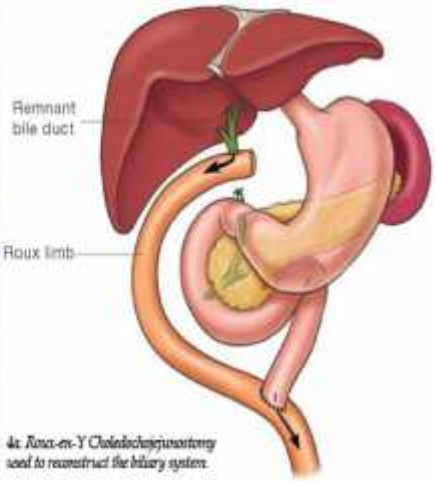


Fig. 14.24: Whipples operation.



Background

Choledochojejunostomy is an anastomosis of the common bile duct (CBD) to the jejunum, performed to relieve symptoms of biliary obstruction and restore continuity to the biliary tract. Biliary obstruction can be caused by pathology above, at, or below the level of the cystic duct; it can lead to jaundice and pruritus, as well as predispose patients to infections such as cholangitis.

Choledochojejunostomy refers specifically to anastomosis at the level of the CBD. As such, it is the procedure of choice for obstruction distal to the junction of the cystic duct and the common hepatic duct (CHD). Depending on the cause of the obstruction, choledochojejunostomy can be curative or palliative.

Indications:

Choledochojejunostomy is most often performed to relieve benign or malignant CBD obstruction or to repair benign or iatrogenic biliary strictures.The most common indication is an obstructing periampullary mass, usually of duodenal or pancreatic origin. Choledochojejunostomy is sometimes performed preemptively in combination with gastrojejunostomy in anticipation of future gastric outlet obstruction (the so-called double bypass).It also can serve a palliative role as the bypass procedure of choice in unresectableperiampullary tumors and in cases of metastatic disease that would otherwise be unresectable.

Contraindications

Patients may have concurrent disease processes related to their primary tumor that preclude the safe performance of choledochojejunostomy. These include coagulation disorders not corrected sufficiently with vitamin K, infections such as cholangitis, and poor hepatic function leading to cirrhosis and ascites. In patients with very poor functional status or short life expectancies, the morbidity of this procedure may be less acceptable.In such cases, other less invasive palliative methods, such as percutaneous biliary decompression or transduodenal stenting via endoscopic retrograde cholangiopancreatography (ERCP), are available.

Periprocedural Care

Patient education and consent

In the early postoperative period, patients should be educated on the function and importance of the biliary drainage tubes and how to care for and empty the tube upon discharge. Signs and symptoms of recurrent obstruction should also be discussed.

Preprocedural planning

The biliary anatomy must be understood prior to proceeding to the operating room. Although most patients have imaging performed as a part of their workup, this is not always the case. A preoperative or intraoperative cholangiogram with magnetic resonance cholangiopancreatography (MRCP) is helpful in identifying aberrant anatomy and extent of injury/obstruction and may prove helpful in operative planning.

In jaundiced patients, drainage can be established simultaneously via endoscopic stent placed during endoscopic retrograde cholangiopancreatography (ERCP) or percutaneous transhepatic catheter placement.

In patients with associated liver dysfunction, specifically coagulation disorders, correction of coagulopathy preoperatively will help prevent postoperative bleeding complications. Antibiotics are given routinely at the time of surgery and postoperatively based on intraoperative bile cultures.

Cholangiograms are usually performed via the biliary drainage tube placed during choledochojejunostomy.

Patient preparation

Anesthesia

General endotracheal anesthesia is administered. In patients with strict contraindications to general anesthesia, spinal or epidural anesthesia may be considered. Preoperative antibiotics are given prior to skin incision.

PositioningThe patient is placed in a supine position. Reverse Trendelenburg may improve exposure.

Technique

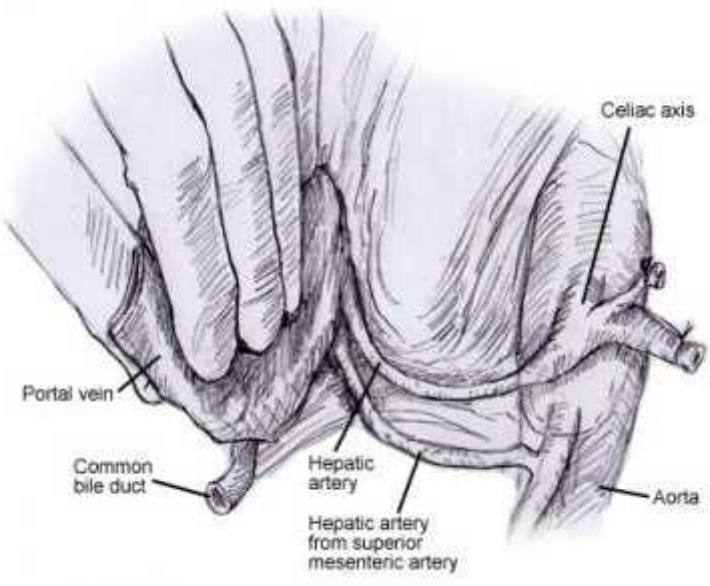
Approach considerations

A **right subcostal**, **upper midline**, **right paramedian**, or bilateral subcostal “bucket handle”incision may be used. The latter is preferred in patients with unfavorable body habitus, particularly when exposure remains poor after attempting a right subcostal approach.A self-retaining retractor is placed if needed.

Operative steps

Creating any biliary-enteric anastomosis involves three main steps: exposure, dissection, and establishment of biliary continuity.Depending on the underlying pathology, lysis of adhesions may be mandatory upon entering the abdomen and dissecting toward the area of the hepatoduodenal ligament. Blunt dissection is used to free the edge and undersurface of the liver. After the peritoneal attachments lateral to the duodenum are divided, the Kocher maneuver is used to mobilize the duodenum medially, further exposing the foramen of Winslow and the portal triad.

After careful dissection of the plane between the underside of the the right lobe of the liver and the duodenum, the portal triad comes into view. Although the hepatic artery lies to the left of the common bile duct (CBD) in the majority of people, keep in mind the anatomic variations in this anatomy. Most notably, a replaced right hepatic artery (see image below) arises from the superior mesenteric artery and courses to the right of the portal vein, the common hepatic duct (CHD), and the CBD.

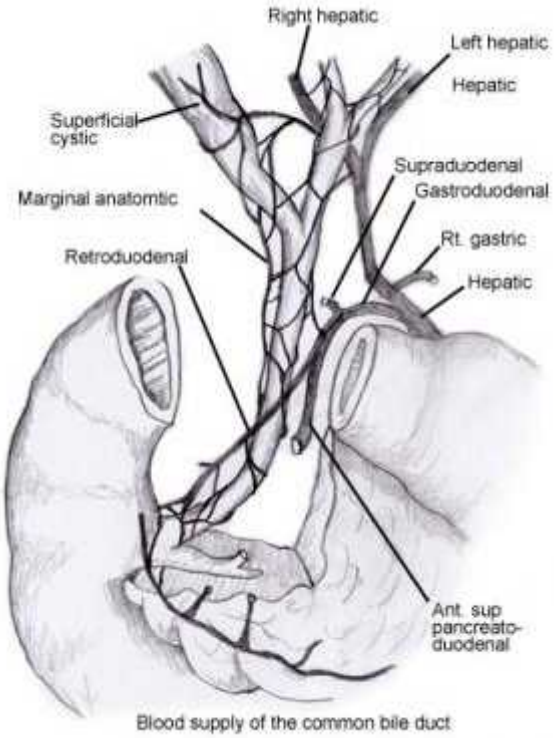


Replaced right hepatic artery.

In some instances, aspiration with a 25-gauge needle may help identify the CBD.

Once isolated, the CBD is encircled and transected above the level of obstruction. The distal CBD is then doubly ligated. Bile cultures are taken

at this time, and if appropriate, the duct is irrigated and/or explored for stone or debris. The proximal end is then inspected and trimmed to healthy, even edges as needed. The CHD and CBD receive their blood supply from axial arteries just lateral and medial to the duct (see the image below).



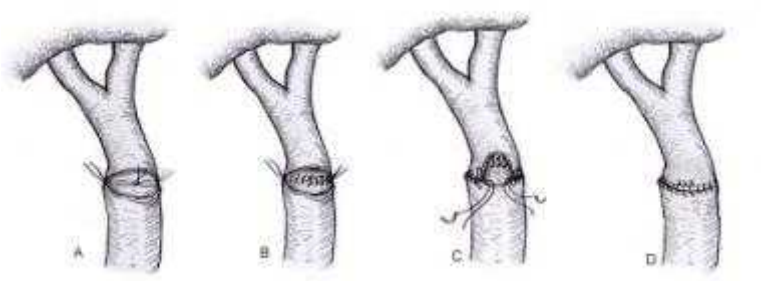
Common bile duct blood supply.

These arteries originate from the intrahepatic arterial collaterals feeding the biliary tree superiorly and from the gastroduodenal artery inferiorly. With this in mind, skeletonization of the CBD should be avoided, as this can compromise the blood supply and lead to ischemic stricturing.

The ligament of Treitz is then identified, and a proximal loop of jejunum that comfortably reaches the subhepatic space is identified. After assessing the jejunal arcades for adequacy of blood supply, this loop is transected using a gastrointestinal anastomosis (GIA) stapler. Alternatively, if the jejunum is divided between bowel clamps, the distal end closed with two layers of interrupted silk suture.

The distal jejunum is rotated through the avascular space just to the right of the middle colic artery up into the porta. The proximal (afferent) divided end of jejunum is then sutured to the distal end of the jejunum 45 cm aborally from the divided end where the choledochojejunostomy will be created. After the choledochojejunostomy is complete, the defect in the transverse mesocolon is closed, and several interrupted absorbable sutures are used to anchor the afferent limb to the mesocolon.

In the case of a very dilated CBD, the choledochojejunostomy may be performed in an end-to-end fashion (see the image below).



End-to-end choledochojejunostomy.

The author prefers a single-layered closure using 3-0 absorbable suture. Two “stay” sutures are placed at the corners, dividing the anterior and posterior halves. The posterior wall of the anastomosis is fashioned first, starting with a single suture placed midway, followed by a meticulously placed row of interrupted sutures, each with the knot tied intraluminally and the suture held on slight tension to assist in placement of the subsequent stitch.

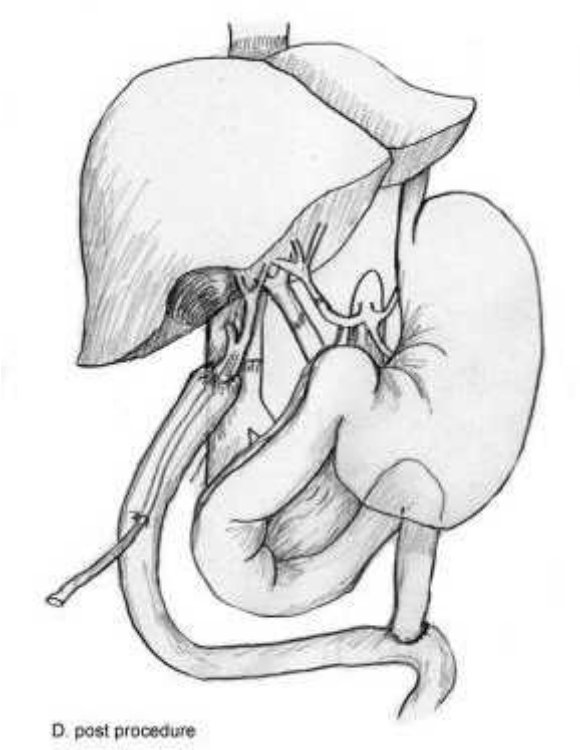
Starting at each corner, alternating interrupted sutures are then placed and tied to approximate the anterior wall of the anastomosis. These sutures are placed in an inside-outside-outside-inside fashion so that the knot lies within the lumen. The final few stitches at the center of the anterior wall of the anastomosis are tied on the outside. The most important principle in fashioning this anastomosis is taking full-thickness bites of the duct and the jejunum with the placement of each suture.

More commonly, given the size mismatch of the CBD and jejunum, an end-to-side mucosa-to-mucosa choledochojejunostomy is performed. The stump of the jejunal limb, previously divided by a GIA stapler, is oversewn with a layer of interrupted absorbable sutures. Electrocautery is then used to the divide the jejunum longitudinally on the antimesenteric border approximately 5 cm distal to this closure. The size of this jejunostomy is determined by the size of the transected end of the CBD. The anastomosis is then carried out in a single layer, mucosa to mucosa, using the Blumgart technique.

Interrupted, absorbable monofilament 4-0 or 5-0 sutures are placed on the anterior wall of the proximal bile duct inside out and clamped with rubber shods. Lifting of this row of sutures then increases the visibility for placement of the posterior layer sutures in a similar fashion. These are placed full thickness inside-out-outside-in from bile duct to jejunum and tied, weaving knots intraluminally, affording exact mucosal apposition.

The anterior wall is then completed using the needles previously passed through the bile duct wall. Starting at each corner, the needle is passed from outside in, tied, and cut, again with the knot facing the lumen. The final few stitches at the center of the anterior wall are placed so the knot lies on the outside. The key to a successful choledochojejunostomy is creating a tension-free anastomosis with direct mucosa-to-mucosa apposition at this stage. A few anchoring stitches may be placed between the jejunum and surrounding structures of the hepatoduodenal ligament.

If internal stenting is desired, it is placed through a separate opening in the bile duct or retrograde through an opening in the duodenum (see the image below).



Retrograde stenting of choledochojejunostomy through an opening in the jejunum.

The stent is then brought out through the abdominal wall at the conclusion of the operation. An alternate maneuver is to pass a Silastic tube with multiple holes through the liver parenchyma, into the biliary tree, and across the anastomosis prior to completion. The decision to leave an internal stent varies with physician preference. The author finds stenting most successful when used for management of biliary reconstructions after iatrogenic bile duct injury.

Monitoring and follow-up

Postoperatively, antibiotics should be tailored to the bile cultures taken intraoperatively. If bile cultures are negative, antibiotics are not necessary after the immediate postoperative period.

When performed for the repair of a stricture, a postoperative cholangiogram is usually obtained prior to the removal of the T-tube or stent. The T-tube is left in place at least 6 weeks postoperatively.

Long-term imaging is not necessary unless return of symptoms or laboratory abnormalities suggest a recurrent stricture. Cancer patients should undergo surveillance imaging per current guidelines.

Complications

1-Intraoperative/postoperative bleeding

Careful attention must be taken to identify the arteries related to the biliary system at the time of initial dissection. Surgeon familiarity with biliary anatomy and the most common aberrances is crucial. If the arteries to the bile duct are not identified early and preserved, intraoperative bleeding may further obscure a challenging operative field, making it difficult to identify key structures and avoid inadvertent injury. If injury to these arteries is not identified early, postoperative anastomotic bleeding may also occur.

2-Stricture

Injury to the arteries feeding the bile duct, either by direct division or heat injury from extensive electrocautery, can lead to duct ischemia. Such an injury could manifest early as a bile leak or late as a bile duct or anastomotic stricture.

3-Biliary drainage tube dislodgment

Care should be taken to allow enough laxity of the T-tube intra-abdominally and to anchor the tube to the skin adequately to prevent inadvertent dislodgment of the tube, which in addition to causing a bile leak or enterostomy, may cause a narrowing of the anastomosis in cases where stenting was used across a narrow or difficult anastomosis.

4-Anastomotic leakage

Leaks of the anastomosis present most commonly as bilomas or peritonitis from a noncontained leak of bile and/or enteric content. The key to prevention of this complication is performing a tension-free anastomosis. This is achieved by preparing a long-enough jejunal loop that is well vascularized, passed in a retrocolic fashion, and anchored to surrounding tissue after anastomosis. Attention to direct mucosa-mucosa apposition during anastomosis will also improve healing and help prevent a postoperative leak.

5-Distal common bile duct stump leak

Failure to ligate the distal CBD stump or poor ligature placement may lead to leakage of enteric contents from the duodenum. This complication can be severe, leading to peritonitis or abscess and the need for reexploration. Leakage of gastric content in this area also threatens the anastomosis.

This complication can be avoided by careful dissection and ligation of the distal duct. Intimate knowledge of aberrant ductal anatomy, such as an accessory bile duct running in parallel to the CBD, may decrease incidence of stump leaks.

Less common, but equally consequential, are iatrogenic portal vein injuries, hepatic artery injuries, and right hepatic artery ligation. These

injuries can be prevented by meticulous dissection early during exposure in order to properly identify all major vessels prior to any transection.

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Choledochoduodenostomy: simple side-to-side anastomosis

choledochoduodenostomy

Definition:
The surgical formation of a communication between the common bile duct and the duodenum.

Introduction

The main indications for a biliary bypass operation are benign biliary strictures and malignant obstruction of the biliary system caused by pancreatic or biliary ductal carcinomas. Among the techniques for dealing with common bile stones, choledochoduodenostomy represents a useful alternative. This operation is indicated mainly in patients with recurrent stones, giant stones, or concomitant common bile stricture and duct stones. This procedure is also useful for preventing cholangitis caused by recurrent stones in patients with chronic disease, such as chronic heart failure, chronic respiratory failure, and diabetes.

The standard operative procedure for the biliary bypass operation is choledochojejunostomy with Roux-en-Y reconstruction using a jejunal loop.[1]Choledochoduodenostomy has not been generally used in simple biliary bypass operation because of the risk of cholangitis; however, recent studies in Japan have reported minimization of this risk.

Technique

A cholecystectomy with choledochoduodenostomy was performed approximately 7 weeks later. With the patient under **general anesthesia**, and in the **supine position, a right subcostalincision** was made; the adhesion was released, and the area of the hepatoduodenal ligament was dissected. The cholecystectomy was performed in the usual manner. Two traction sutures (3-0 silk) were passed through the common duct, and a 2-cm-longitudinal incision was made in the duct. Multiple stones were removed through the incision. A longitudinal incision was made in the adjacent first portion of the duodenum. The anastomosis was performed with one layer of interrupted 4-0 synthetic adsorbable sutures.

The first sutures to be placed were the two corner sutures of the posterior anastomotic wall (Fig. 1a). Each such interrupted suture was tied and used as a holding suture. The posterior wall was completed with sutures placed every 3 mm, care being taken to include the full thickness of both the duodenum and the common bile duct. The anterior wall of the anastomosis was constructed in a similar manner. Starting on each corner, we placed sutures in an outside-inside-inside-outside manner, gradually working from the ends toward the center. The abdomen was irrigated in the usual manner.

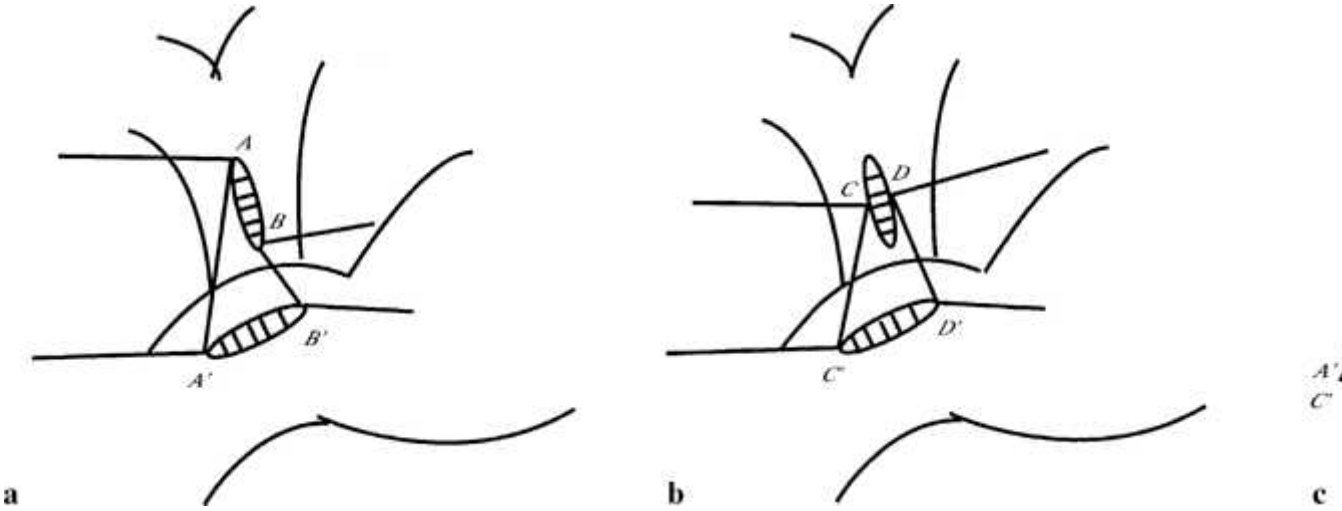

Figure 1. aSimple side-to-side choledochoduodenostomy. The longitudinal incision in the common bile duct and adjacently placed duodenum is converted by placing two anchor sutures. The posterior wall of the choledochoduodenostomy is initiated by placing the corner (*AA′* and *BB′*) sutures. The posterior wall is a one-layer anastomosis of interrupted synthetic absorbable sutures 2- to 3-mm apart. The anterior wall is sewn with interrupted outside-inside-inside-outside sutures. bConventional side-to side choledochoduodenostomy. Two anchor sutures are placed, one from the center of the right side of the common bile duct to the anal side corner of the duodenum (*CC′*), and the other from the center of the left side of the common bile duct to the oral side corner of the duodenum (*DD′*). cSchema. With our procedure, the anastomosis of the anal end has less tension than with the conventional procedure. In practice, the advantage of the decrease in tension on the anal end of the anastomosis overcomes the disadvantage caused by the increased tension on the oral end

Results

Operation time was 2 h and 40 min, and the estimated blood loss was 110 g. Stomal patency is the most important factor for preventing classic complications such as cholangitis and sump syndrome. Recovery was uneventful; the patient had no complaints of abdominal pain or high fever for up to 9 months after surgery.

Discussion

A side-to-side choledochoduodenostomy was first performed by Riedel in 1888. The patient died 9 h after surgery, and autopsy disclosed leakage of the anastomosis. The first successful side-to-side choledochoduodenostomy was performed by Sprengel in 1891. Sasse encouraged use of the operation, and it became well accepted in Europe.[3]

Side-to-side choledochoduodenostomy for the relief of distal duct obstruction has numerous advantages. It is technically simpler than sphincteroplasty or choledochojejunostomy. It can be performed rapidly, making it of real value in the aged and infirm. Side-to-side choledochoduodenostomy is useful as a rapid and effective method of bypassing malignant disease obstructing the distal end of the common duct, and it is also useful in treating benign distal ductal structures. Side-to-side choledochoduodenostomy has been recommended for the prophylaxis or treatment of residual common duct stones, as well as for the management of papillary stenosis.[4]

Usually, in conventional side-to-side choledochoduodenostomy, the adjacent longitudinal incisions in the common duct and duodenum are converted by placing two anchor sutures (one from the center of the right side of the common duct to the anal side corner of the duodenum, and the other from the center of the left side of the common duct to the oral side corner of the duodenum) into the incision (Fig. 1b.). With our method, the anal end of the anastomosis has less tension than with the

conventional method. The diagram in Fig. 1c may help to explain the lower tension exerted on the anal end of the anastomosis.

Important advances have been made in nonoperative approaches to the difficult problems of hepatobiliarylithiasis, such as endoscopic sphincterotomy, lithotripsy, and endoscopic extraction. However, the surgical approach will continue to be necessary, depending on individual patient needs.

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