SURGICAL ANATOMY

A Student's Manual

SURGICAL ANATOMY

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Foreword
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CHAPTER

Abdomen

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SHORT NOTES

RECTUS SHEATH (FIG. 4.1)

It is an aponeurotic envelope for the rectus abdominis muscle on each side of linea alba. This aponeurotic envelop is derived from three flat muscles present on anterolateral abdominal wall namely: (1) external oblique, (2) internal oblique and (3) transversus abdominis.

Anterior Wall

- *Above the costal margin:* Wall is thin and formed by external oblique aponeurosis
- *From costal margin to midway between umbilicus and symphysis pubis:* The wall is thicker. It is formed by anterior lamella of internal oblique aponeurosis with external oblique aponeurosis
- From rest part (midway between umbilicus and symphysis pubis) to symphysis pubis

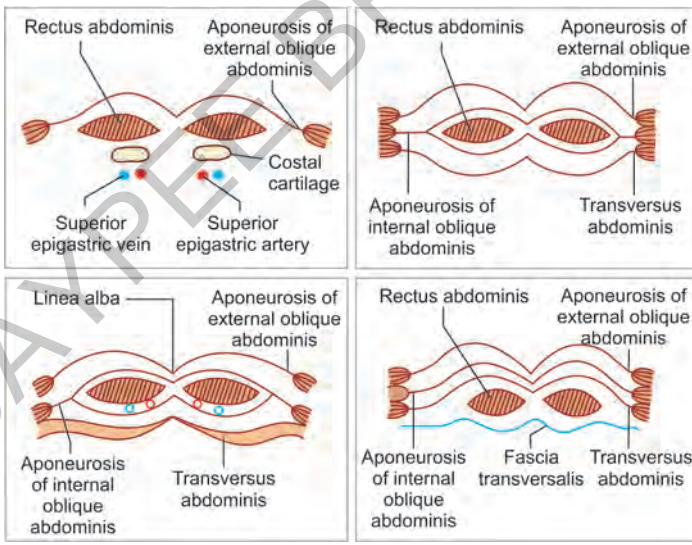


Fig. 4.1: Formation of rectus sheath at different level

Wall is thickest and formed by fusion of aponeurosis of the three muscles: (1) external, (2) internal oblique and (3) abdominis transversus.

Posterior Wall

1. *Above costal margin:* The wall is deficient and muscles rest on 5th, 6th, 7th costal cartilage
2. From the costal margin to midway between umbilicus and symphysis pubis. It is complete rectus sheath. Posterior layer is formed by posterior layer of internal oblique and transversus abdominis
   - *Medial margin:* It is formed by linea alba
   - *Lateral margin:* It is formed by linea semilunaris.
3. *Below the arcuate line:* The rectus muscle is covered posteriorly by fascia transversalis only.

Content

- Rectus abdominis
- Pyramidalis, if present
- Inferior epigastric and superior epigastric vessels
- Lower five intercostal nerves and the subcostal nerve.

INGUINAL CANAL

It is a muscular canal 4 cm long extending from deep inguinal ring to the superficial inguinal ring (Figs 4.2 and 4.3).

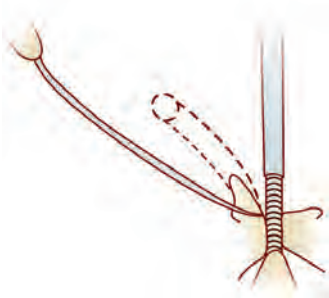


Fig. 4.2: Inguinal canal

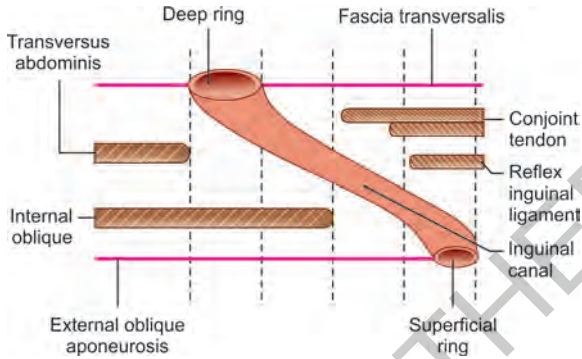


Fig. 4.3: Inguinal canal: Schematic representation of structures forming the anterior and posterior walls

Direction

Downwards, forwards and medially.

Boundary (Box 4.1)

Box 4.1: Inguinal canal boundaries

This canal is 4 cm long and extends from deep ring to superficial inguinal ring.

- *Anterior wall:*
  - Throughout its whole extent formed by external oblique aponeurosis
  - Anterolaterally reinforced by internal oblique and transversus abdominis
- *Posterior wall:* Throughout its whole extent, it is formed by fascia transversalis. Medial part of this wall is reinforced by conjoint tendon
- *Roof:* Formed by arched fibers of internal oblique and transversus abdominis
- *Floor:* Inguinal ligament

Contents

- The spermatic cord in male and round ligament of uterus in female
- *Ilioinguinal nerve:* (Partial content) enters the canal through roof and comes out through superficial inguinal ring, so the nerve is the partial content.

Development

The inguinal canal is formed in the intrauterine life during the descend of gonads. The gonads are developed in lumbar region of the posterior

abdominal wall. It descends with gubernaculum (rudder) and in male, it reaches the scrotum and in females it descends up to lesser pelvis. The processus vaginalis is a peritoneal sac that follows the course of gubernaculum.

- *Shutter mechanism or protection of inguinal canal:* It is the weak part of abdominal wall. So, there are some natural mechanisms, which protect the inguinal canal from developing hernia. The mechanisms are:
  - *Obliquity of inguinal canal:* Facilitates the closure during raised of intra-abdominal pressure
  - The contraction of cremaster provides an effective plug to the superficial inguinal ring
  - The internal oblique muscle lies in front, above and posterior wall and hence its contraction obliterate the canal.

HESSELBACH'S TRIANGLE

It is a triangular area situated in lower part of anterior abdominal wall (Fig. 4.4).

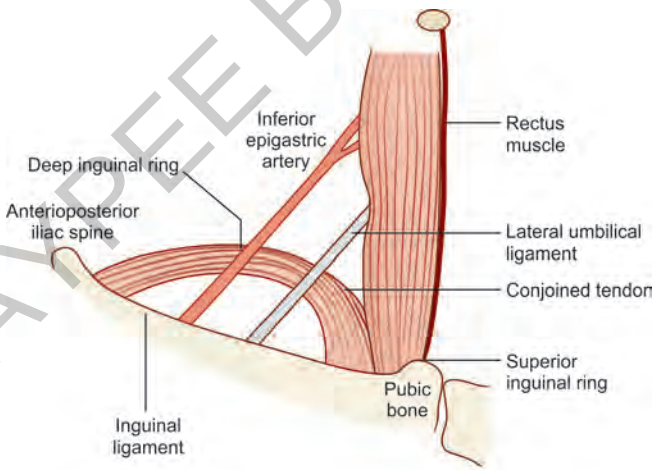


Fig. 4.4: Direct hernia arises through Hesselbach's triangle

Boundary

- Inferior epigastric artery (laterally)
- Lateral border of rectus abdominis (medially)
- Inguinal ligament (below).

Subdivisions

This triangle is also divided into medial and lateral parts by passage of obliterated umbilical artery. So, direct hernia is also divided into medial direct hernia and lateral direct hernia.

Clinical Importance

Direct inguinal hernia enters into inguinal canal through this triangle. So, the neck of direct inguinal hernia lies medial to inferior epigastric artery. By this, direct inguinal hernia is differentiated from indirect inguinal hernia.

GASTRIC TRIANGLE

This is an area overlying anterosuperior surface of stomach, which is not in relation with any viscera.

Boundary

- Above and to the right—inferior border of the liver
- Above and to the left—left costal margin
- Below—transverse colon.

Importance

This part of the anterosuperior surface the stomach is not in relation with any viscera and directly in relation with anterior abdominal wall.

Applied Anatomy

In gastrostomy operation, a Ryle's tube is introduced through this triangle into the stomach under local anesthesia to maintain nutrition in case of malignancy esophagus where the lumen is irreversibly obstructed.

STOMACH BED

Stomach bed is defined as the collection of structures on which stomach rests in supine posture separated by a cavity of lesser sac.

Structures

- Left crus of diaphragm
- Left suprarenal gland
- Anterior surface of left kidney
- Anterior surface of body of pancreas
- Tortuous splenic artery
- Transverse mesocolon
- *Spleen*—but always separated from stomach by a cavity of greater sac.

BARE AREA OF LIVER

It is the largest nonperitoneal area on the posterior surface of the right lobe of liver (Fig. 4.5).

Boundary

- Base is formed by groove for inferior vena caval
- Apex is formed by meeting of the two layers of the coronary ligament forming the right triangular ligament
- Above by superior layer of coronary ligament
- Below by inferior layer of coronary ligament.

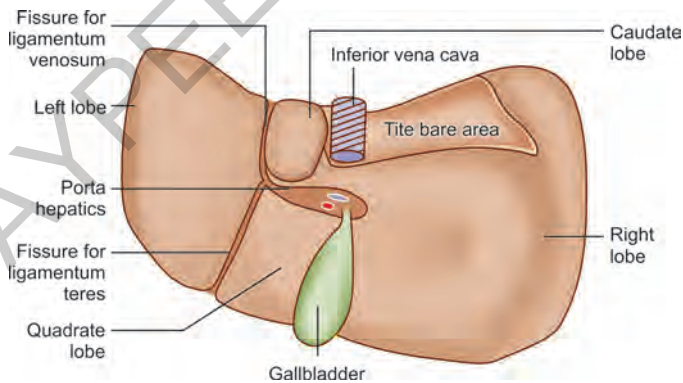


Fig. 4.5: Bare area of liver

Relations

- Part of right suprarenal gland comes to the relation with the bare area
- *Clinical importance:* Anastomosis between portal vein with the veins of diaphragm (systemic).

COMMON BILE DUCT (FIG. 4.6)

Formation

Common hepatic duct after joining with the cystic duct forms the common bile duct (CBD).

Length

It is 8 cm long and has a diameter of 6 mm.

Structures

It has four parts:

1. Supraduodenal
2. Retroduodenal
3. Infraduodenal
4. Intraduodenal.

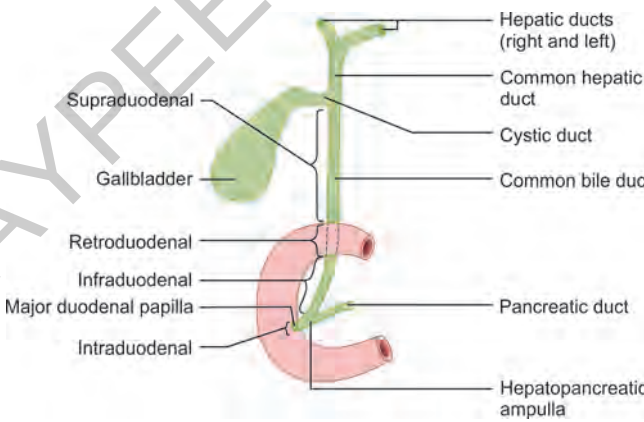


Fig. 4.6: Common bile duct

Draining At

Ampulla of Vater in the major duodenal papilla of second part of duodenum.

Blood Supply

Cystic artery

Clinical Anatomy

- *Cholangitis*—infection of CBD
- Bile duct obstruction causes obstructive jaundice
- *Choledocolithiasis*—stone in the CBD
- Stricture of CBD may occurs during cholecystectomy.
- Bile duct can be assessed by ERCP (endoscopic retrograde cholangiography).

CALOT'S TRIANGLE

The triangle presents in the abdomen in relation to billiary system. This triangle is very important for surgeons during cholecystectomy.

Boundary

- Above—inferior border of liver
- Below—cystic duct
- Medially—common hepatic duct.

Contents

- Cystic artery
- Cystic lymph node
- Autonomic fibrous supplying in the gallbladder.

Triangle present in the right lumbar region.

EXTRAHEPATIC BILIARY APPARATUS (FIG. 4.7)

Biliary apparatus is subdivided into two parts: (1) intrahepatic and (2) extrahepatic.

Extrahepatic

The extrahepatic biliary apparatus collects the bile from the liver, by common hepatic duct, stores and concentrate the bile in the gallbladder and then transmit it to second part of duodenum by CBD. It consists of:

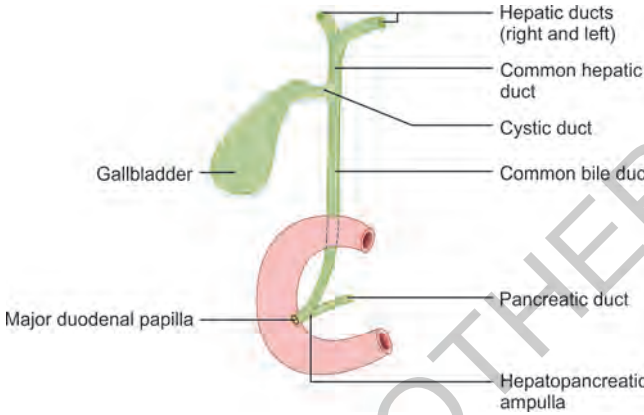


Fig. 4.7: Extrahepatic biliary apparatus

- Common hepatic duct
- Gallbladder
- Cystic duct
- CBD.

Clinical Importance

- Gallstone is very common. Stone may be impacted within cystic duct or CBD. Obstruction of CBD by gallstone produces obstructive jaundice
- Ultrasound is the widely used imaging technique for the diagnosis of a suspected gallstones and biliary tract disease.

PORTAL VEIN

The hepatic portal system collects blood from digestive tract and is valveless. The superior mesenteric vein unite with splenic vein and form a trunk—the portal vein, which enter into the liver and breaks up into capillaries (Fig. 4.8).

Important Portosystemic Anastomosis

Under normal condition, portal blood passes through the liver and drains in the inferior vena cava, by hepatic veins. But when this route is blocked some communication exists at:

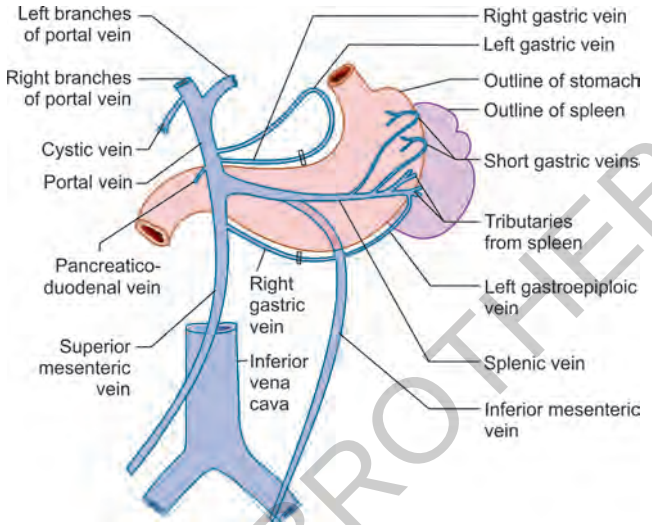


Fig. 4.8: Scheme to show the tributaries of the portal vein

- *Lower end of esophagus:* Communication between esophageal branch of left gastric (portal system) and esophageal branch of azygos system
- *In the distal part of analcanal:* The superior rectal vein (portal system) anastomoses between the middle and inferior rectal vein (systemic)
- *In umbilical region:* Paraumbilical vein connects left branch of portal vein with the superficial vein of abdomen (systemic).

Clinical Anatomy

The anastomotic channels may be distended and ruptures and produces severe hemorrhage. It may be treated with sclerotherapy.

PEYER'S PATCHES

These are the aggregations of lymphatic tissue within the ileum of small gut. Previously, in the enteric fever (typhoid) the Peyer's patches were infected. Previously, it produced perforation of gut and peritonitis. Nowadays, this perforation is prevented by the drug chloramphenicol.

ESOPHAGEAL VARICES

Normal pressure of portal vein is 5–15 mm Hg. When the pressure rises above 40 mm Hg is known as portal hypertension. It is due to cirrhosis of liver, Banti's disease and portal vein thrombosis. In this case, the venous blood can reach the heart via important portacaval anastomosis (Fig. 4.9) described below:

This communication exists at:

- *Lower end of esophagus:* Communication of esophageal branch of left gastric (portal system) with esophageal veins of azygos system (systemic). An abnormally large amount of blood passes through these channels and forms esophageal varices. Channels may rupture and produce severe hemorrhage. It may be corrected by giving sclerosing agent
- *In the distal part of analcanal:* The superior rectal vein (portal system) anastomoses with the middle and inferior rectal vein (systemic). In portal hypertension, these veins dilated and protruded through mucosa and form internal piles (hemorrhoids), which may rupture during passage of stool. It may be corrected by sclerosing agent

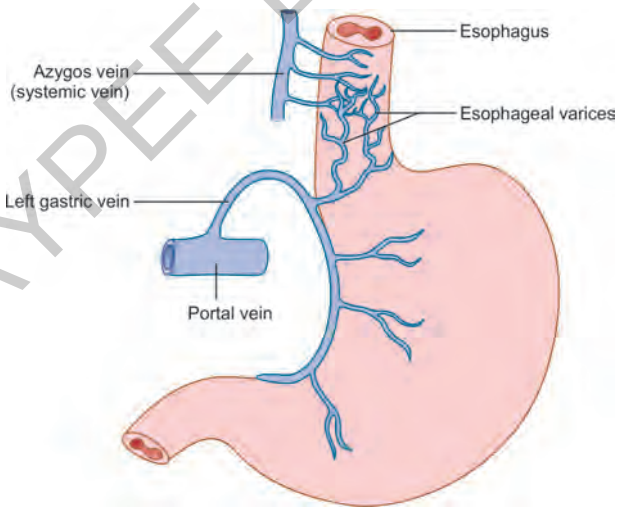


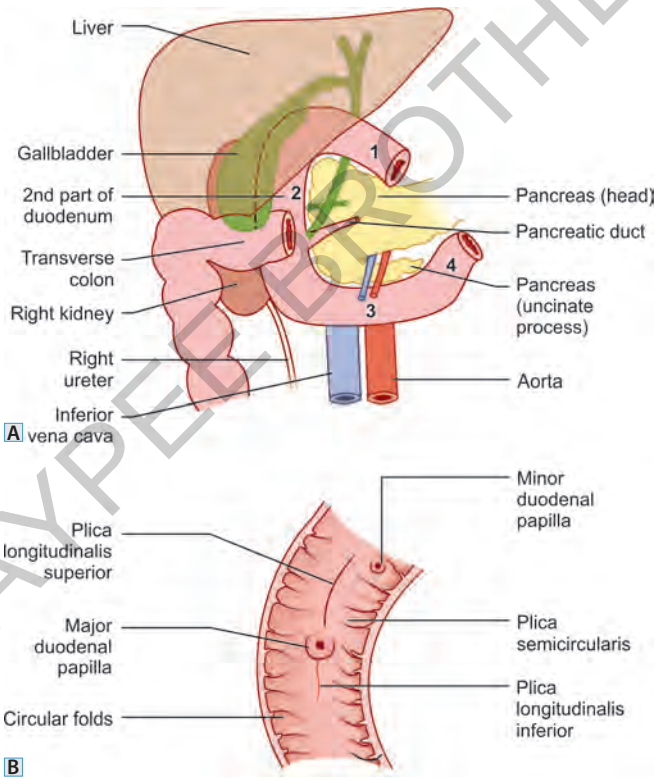
Fig. 4.9: Communication of blood via different veins

- *In umbilical region:* The paraumbilical vein connects with left branch of portal vein with the superficial vein of abdomen (systemic circulation). In portal hypertension, these veins are enlarged and radiates around the umbilicus and form caput medusa.

SECOND PART OF DUODENUM (FIGS 4.10A AND B)

Beginning

From superior duodenal flexure at the level of the neck of gallbladder.



Figs 4.10A and B: (A) Relations of the second and third parts of the duodenum; (B) Interior of the second part of the duodenum

SURGICAL ANATOMY

A Student's Manual

Salient Features

- This book bridges the gap between preclinics and clinics
- Short notes and explanatory notes on surgical and medical topics are given in lucid language for almost every anatomical part of the body in separate chapters
- Must-know areas are highlighted and at the end of every chapter there is a special note as 'points to remember'
- Salient points about surface anatomy are given with each chapter, so that student can learn how to examine a patient
- Easy reproducible diagrams are the strong points of the short notes and explanatory answers of surgical anatomy
- Imaging anatomy details both in points and writing are the specialty of this book.

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Shelving Recommendation
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