

Small Intestine

1. From pyloric end of stomach to ileo-caecaljunction
2. 6-7 meter
3. Large intestine- > 1.5 meter

Duodenum

1. Fixed part
2. Devoid of mesentery
3. C shaped curve

First Part
<ul style="list-style-type: none">• From pylorus to superior duodenal flexure• 5 cm• First 2 cm is intraperitoneal, 3 cm is retroperitoneal
Anteriorly
<ul style="list-style-type: none">• Greater sac• Quadrate lobe, Neck and body of gall bladder
Posteriorly
<ul style="list-style-type: none">• Portal vein, bile duct and gastroduodenal artery• Inferior vena cava
Above
<ul style="list-style-type: none">• Attaches free margin of lesser omentum• Forms the floor of epiploic foramen• Prepyloric vein
Below: Attaches anterior layers of greater omentum
Blood supply
<ul style="list-style-type: none">• Supra duodenal branch of gastroduodenal artery• Retro duodenal branch of gastro duodenal artery• Infra duodenal branch of right gastro epiploic artery
Peculiarities
<ul style="list-style-type: none">• Movable part• Supplied by end arteries• Devoid of circular mucous fold• Triangular radio opaque- Duodenal cap or duodenal bulb
Second Part
<ul style="list-style-type: none">• Superior duodenal flexure (L1 vertebra)• Inferior duodenal flexure (L3 vertebra)• In front of hilum of right kidney
Anteriorly
<ul style="list-style-type: none">• Non peritoneal• Crossed by transverse colon• Downwards: Duodenal impression of right lobe of liver, Transverse colon, Coils of jejunum
Posteriorly: Anterior surface of right kidney → renal vessels, pelvis of ureter → right psoas major → right edge of inferior vena cava → part

of right supra renal gland

Laterally: Right colic flexure

Medially: Head of pancreas, arterial anastomosis, bile duct and main pancreatic duct

Interior of the second part

- Circular folds-permanent mucous folds
- Major duodenal papilla
- Minor duodenal papilla
- Plica semicircularis
- Plica longitudinalis

Third Part

- Horizontal part
- Retroperitoneal
- Across L3
- 10 cm
- Inferior duodenal flexure to front of aorta

Anteriorly

- Covered by peritoneum
- Crossed by superior mesenteric vessels and root of mesentery

Posteriorly: Right psoas major muscle, right ureter, inferior vena cava, right gonadal vessels, abdominal aorta, origin of inferior mesenteric artery

Above: Head of pancreas

Below: Few coils of jejunum

Fourth Part

- 2.5 cm
- Ascending part
- Front of aorta to duodeno jejunal flexure
- Opposite L2
- Held by suspensory muscle of the duodenum

Anteriorly: Transverse colon and mesocolon, stomach

Posteriorly

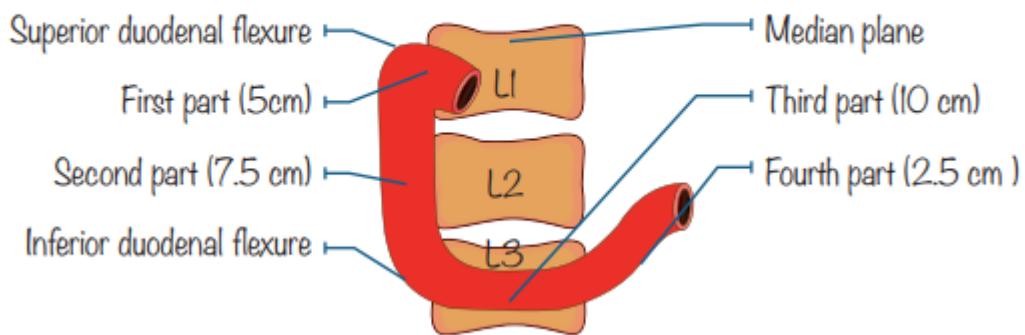
- Left crus of diaphragm
- Left psoas major & sympathetic trunk
- Left renal vessels
- Left gonadal vessels
- Inferior mesenteric vein

Right side: Uncinate process of pancreas

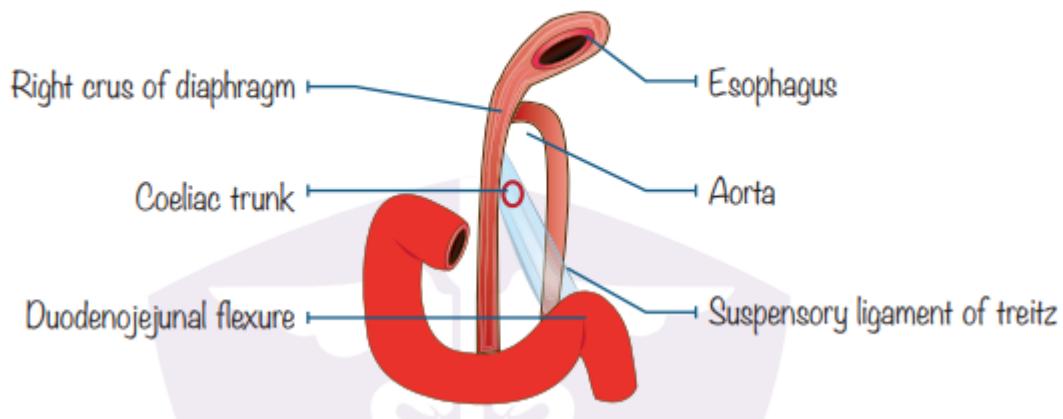
Left side: Left kidney and ureter

Superiorly: Pancreas

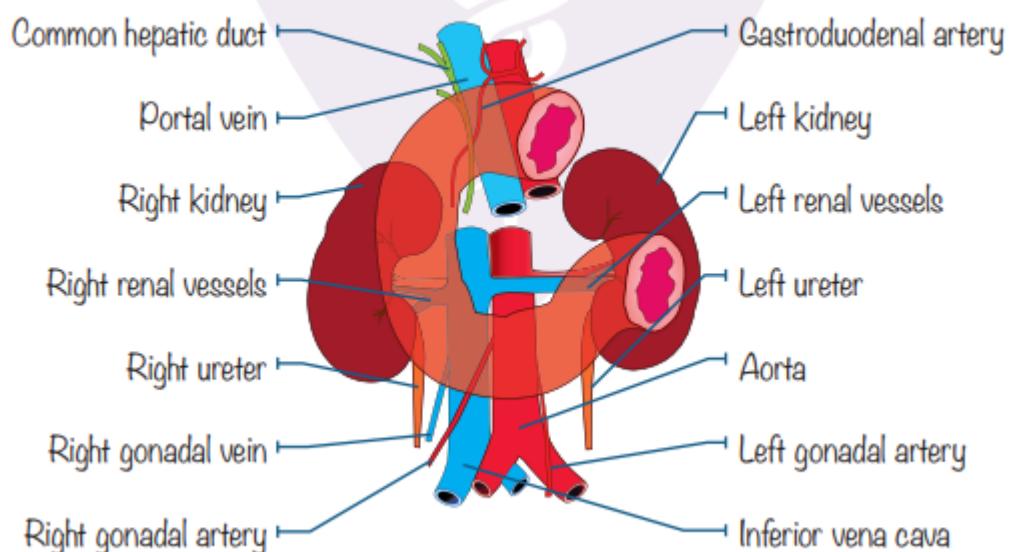
Parts of the duodenum



Suspensory ligament of treitz



The four parts of the duodenum. Anterior and posterior



Suspensory Ligament of Duodenum

1. Ligament of Treitz
2. From right crus of diaphragm → pass by the side of coeliac artery → attached to postero superior surface of duodeno jejunal flexure
3. Striated muscle in upper third, elastic tissue in middle, lower third by unstriped muscle

Structure

1. Serous coat
2. Muscular: Outer longitudinal, inner circular separated by myenteric plexus
3. Submucous layer:
 1. Blood vessels, lymphatics, Meissner's plexus, duodenal glands of Brunner
1. Mucous layer:
 1. Epithelium, lamina propria and muscularis mucosa

Arterial Supply

1. Ventral and dorsal anastomoses of superior and inferior pancreatico duodenal arteries
2. Supraduodenal artery: Branch of gastroduodenal artery supplies first part of duodenum
3. Vasa recta
4. Between the two rows of vasa recta, head of pancreas

Hepatic artery
Gastroduodenal artery
Superior pancreatico duodenal artery
Anterior and posterior branches

Superior mesenteric artery
Inferior pancreaticoduodenal artery
Anterior and posterior branches

1. Supraduodenal artery of Wilkie-Branch of gastroduodenal artery- Supplies first part
2. Retroduodenal branches of gastroduodenal artery
3. Branches of hepatic artery
4. Branches from right gastroepiploic artery
5. Artery from the first jejunal branch of superior mesenteric artery - Supplies fourth part

Venous Drainage

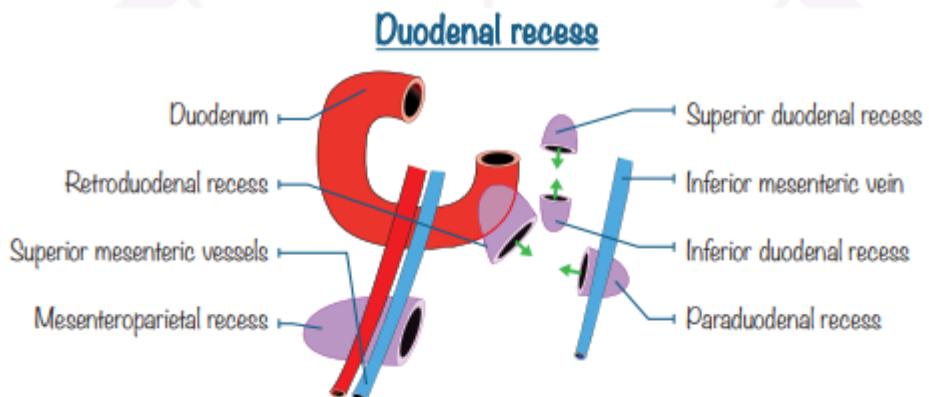
1. Anterior and posterior superior pancreaticoduodenal veins → Portal vein
2. Anterior and posterior inferior pancreaticoduodenal veins → Superior mesenteric vein → Portal vein.

Lymphatic Drainage:

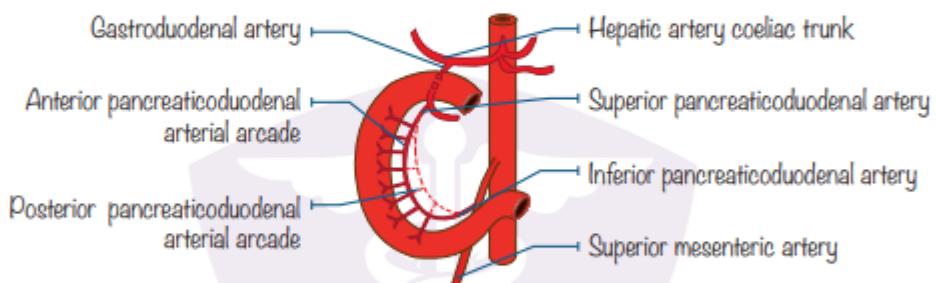
Pancreatico duodenal lymph nodes → coeliac and superior mesenteric group

Nerve Supply

1. T6-T9 → preganglionic fibres → coeliac and superior mesenteric plexus (sympathetic)
2. Vagus → Auerbach's and Meissner's plexus (parasympathetic)

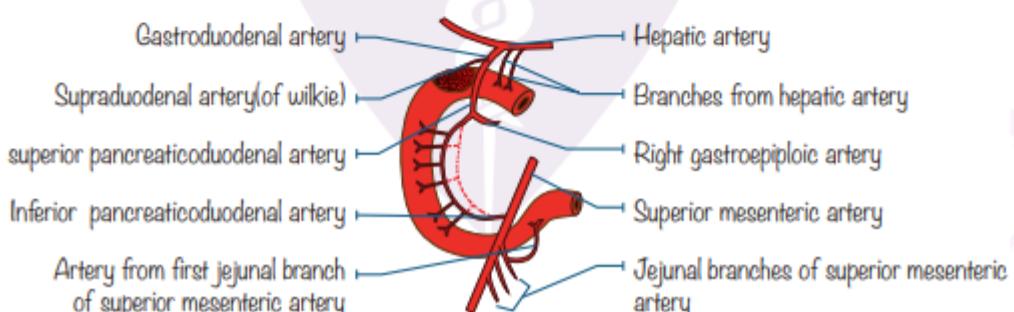


A



Various arteries supplying the duodenum

B



Jejunum And Ileum

1. From duodeno-jejunal flexure to ileo caecal junction
2. Suspended by mesentery
3. Proximal 2/5th- Jejunum, Distal 3/5th- Ileum

Structure

Serous Coat:

Invests entire tube except area of attachment of mesentery

Muscular Coat:

1. Outer longitudinal and inner circular
2. Separated by myenteric plexus of nerves
3. Nerve cells: Post ganglionic neurons for parasympathetic fibres

Submucous Coat

1. Blood vessels plexus, lymphatics and nerves
2. Meissner's plexus: Post ganglionic neurons for parasympathetic fibres

Mucous Membrane

1. Epithelium, lamina propria and muscularis mucosae
2. Outer longitudinal and inner circular
3. Lamina propria: Meshwork of reticular fibres
4. 70% T helper cells, 30% T suppressor cells
5. Plasma cells are IgA producers, bound to secretory protein
6. Lamina provides nutrition to the surface epithelium

Features In The Mucous Membrane

Circular Folds

1. Permanent mucous folds
2. Thickly set in duodenum and jejunum
3. Absent in proximal one inch of duodenum, distal 6 inches of ileum
4. Increase surface area

Villi

1. Leaf like in jejunum, finger like in ileum
2. Seen in entire gut except solitary follicles and Peyer's patches
3. Increase the absorptive surface
4. VILLI 10 FOLD, microvilli 20 fold, total increase of 600 fold

Central lacteal	<ul style="list-style-type: none"> • Dilated lymph capillary, blind towards tip of villus • Communicates with submucous plexus • Layer of muscularis mucosae surround the lacteals • Exerts milking action of villi
Lamina propria	<ul style="list-style-type: none"> • Contains reticular fibres, macrophages, lymphocytes, plasma cells, vascular plexus and nerves • Plasma cells secrete IgA
Basement membrane	<ul style="list-style-type: none"> • Columnar cells rest on this • New cells migrate along sides • Surface cells replaced every 3-4 days
Crypts of Lieberkuhn	<ul style="list-style-type: none"> • Extend perpendicularly in the lamina propria upto muscularis mucosae • Cells at Paneth cells and undifferentiated columnar cells • Paneth cells are rich in zinc • There are eosinophilic granules, secrete lysozyme
Solitary follicles and Peyer's patches	
Entero chromaffin or argentaffin cells	<ul style="list-style-type: none"> • Belong to APUD cell system • Between the basement membrane and columnar

	<p>cells</p> <ul style="list-style-type: none"> Contain granules stained black with silver, brown with chromium salts Serotonin is formed
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Meckel's Diverticulum

1. Blind pouch from antimesenteric border of ileum
2. 2 ft proximal to the ileocaecal junction
3. Seen in 2%
4. 2 inches long
5. Remnant of the proximal part of vitello intestinal duct
6. Connects midgut with the extra embryonic part of the yolk sac

Structure

1. 4 coats
2. Serous, muscular, submucous, mucous
3. Muscular coat: Outer longitudinal and inner circular
4. Mucous membrane: Simple columnar epithelium

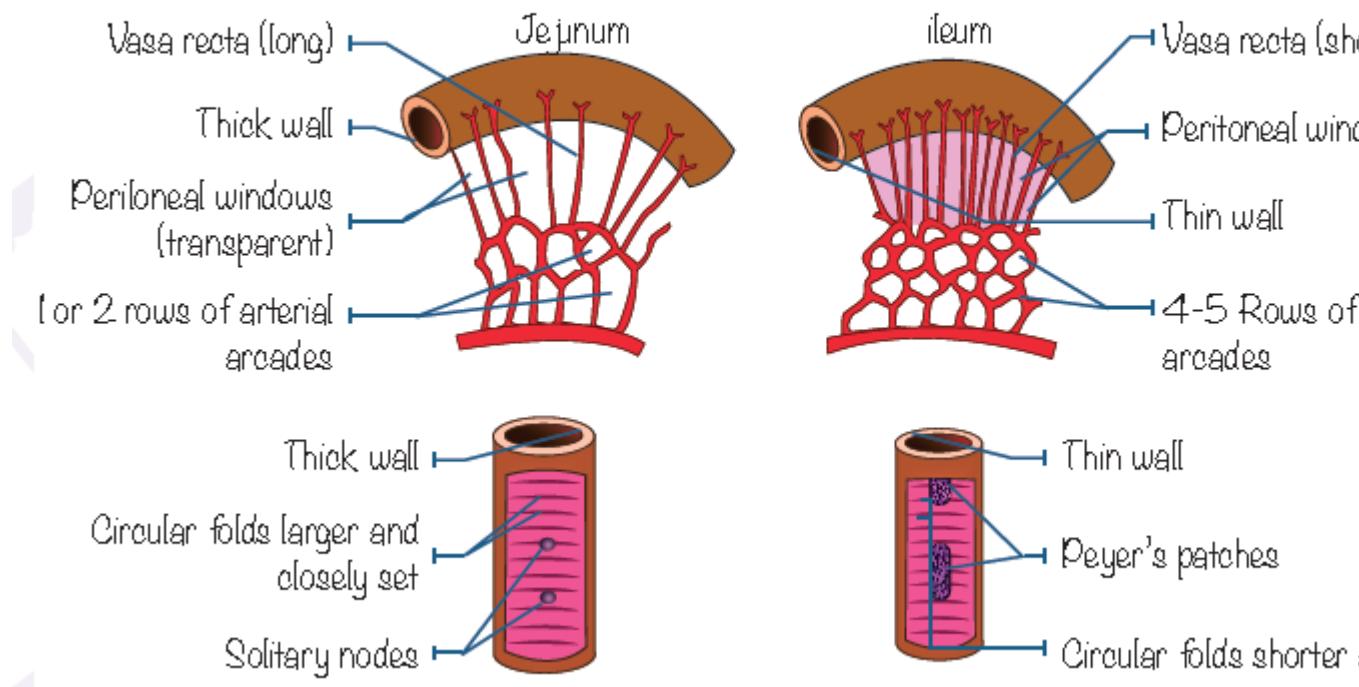
Differences Between Duodenum And Remaining Small Intestine

Duodenum	Remaining Small Gut
<ul style="list-style-type: none"> • Fixed and devoid of mesentery • Supplied by two rows of vasa recta • Brunner's glands in submucous coat 	<ul style="list-style-type: none"> • Mobile and suspended by mesentery • Single row of vasa recta • No glands in the submucous coat

Difference Between Jejunum And Ileum

Jejunum	Ileum
<ul style="list-style-type: none"> • Wider, thicker, vascular • Proximal 2/5th of small gut 	<ul style="list-style-type: none"> • Narrower, thinner and less vascular • Distal 3/5th
<ul style="list-style-type: none"> • 1 or 2 arterial arcades • Jejunal vasa recta - 4 cm long 	<ul style="list-style-type: none"> • 3 or more arcades • Vasa recta are shorter 1.25 cm
Fat is confined along root of mesentery "translucent windows" found between vasa recta	Fat is uniformly distributed along whole breadth
Permanent circular folds in mucosa, thickly set	<ul style="list-style-type: none"> • Smaller widely separated folds • Absent folds in terminal 6 inches
<ul style="list-style-type: none"> • More numerous villi • Except solitary follicles and Peyer's patches 	<ul style="list-style-type: none"> • Shorter villi • Absent over Peyer's patches
• Scanty Peyer's patches, M cells covering Peyer's patches	More numerous Peyer's patches in the ileum

Differences between jejunum and ileum



Notes

- First 2 cm of duodenum- Duodenal cap or bulb
- Duodenal ulcers- Mostly on anterior wall of first part
- Perforations most often occurs on anterior wall
- Posterior wall perforations erode gastroduodenal artery
- Brunner's gland- Seen in proximal duodenum
- Valvulae conniventes in jejunum

Part Of Gut And Histological Features	
Part Of Gut	Histological Features
Stomach	<ul style="list-style-type: none"> • Gastric pits and glands • Gastric glands contain mucus neck, parietal cells and chief cells
Duodenum	Brunner's glands in the submucosa
Jejunum	Solitary lymphoid nodules
Ileum	Submucosal aggregated lymphoid tissue
Large intestine	<ul style="list-style-type: none"> • Crypts of lieberkuhn and goblet cells • Paneth cells lie at deepest part of crypts

Minor duodenal papillae- Opening of accessory pancreatic duct