The small intestine
DOUDENUM
The duodenum is a c-shaped concave tube. About 10” in length. It joins the stomach to the jejunum. It curves around the head of the pancreas to the left and backwards. It is important because it receives the opening of the bile and pancreatic ducts.
Most of the duodenum is retroperitoneal except the 1st inch & last inch.

This short segment (1st inch) has the lesser omentum on its upper border, the greater omentum on its lower border, and the lesser sac posterior to it.

The duodenum extends from the pylorus to the jejunum.

It is divided into 4 parts.
Site of duodenum

- The duodenum is situated in the **epigastric and umbilical regions**
- for purposes of description, is divided into four parts

- Right lobe of liver
- Falciform ligament
- Gallbladder
- Pancreas
- Duodenum
- L-3
Parts of the duodenum & Their relations
Parts of the duodenum & Their relations

- Gallbladder
- Liver
- Common hepatic duct
- Cystic duct
- Common bile duct
- Accessory pancreatic duct
- Hepatic ducts
- Hepatic portal vein
- Spleen
- Pancreatic duct
- Pancreas
- Minor duodenal papilla
- Major duodenal papilla
- Hepatopancreatic ampulla
- Duodenum (cutaway view)
1st part of Duodenum

- The first part is 2 inches long.
- It begins from the pyloduodenal junction
- At the level of the transpyloric line
- Runs upward and backward at the level of the 1st lumbar vertebra 1 inch to the right.
Relations of 1\textsuperscript{st} part of doudenm

Ant.
- The liver (quadratus lobe)
- gall bladder
Relations of 1\textsuperscript{st} part of duodenum......cont

\textbf{Sup.}
- the epiploic foramen
Relations of 1st part duodenum......cont

post.
- The lesser sac
- gastroduodenal Artery
- the Bile duct
- portal vein
- I.V.C

Inf.
• The head of the pancreas.
2nd part of duodenum

- It is 3” (3 inch) long
- runs downward vertically on the right side
- In front of the Rt. kidney
- next to the 3rd and 4th lumbar vertebrae.
- halfway of it, The bile duct and the main pancreatic duct pierce the medial wall, and then form the **ampulla** that opens in the major **duodenal papilla**.
- The accessory pancreatic duct (if present) opens in the **minor duodenal papilla** more superiorly.
Junction of Bile Duct and Duodenum
Dissection

(Common) bile duct
Longitudinal muscle of duodenum
Circular muscle layer of duodenum
Pancreatic duct
Sphincter of (common) bile duct (choledochus)
Longitudinal bundle
Sphincter of pancreatic duct (inconstant)
Reinforcing fibers
Fibers to longitudinal bundle
Sphincter of hepatopancreatic ampulla
Duodenal muscle fibers to longitudinal bundle of ampullary muscle
Hepaticopancreatic ampulla (Ampulla of Vater)
Relations of 2\textsuperscript{nd} part of duodenum

**Ant.**
- The gallbladder (fundus)
- Right lobe of the liver
- Transverse colon
- Coiled of small intestine.

**Post.**
- Hilum of Rt. Kidney
- Rt. Ureter.

**Lateral.**
- Right colic flexure
- Ascending colon
- Right lobe of the liver.

**Medial.**
- Head of pancreas
- Bile and pancreatic ducts.
3\textsuperscript{rd} part of duodenum

- 4” long
- Runs horizontally to the left
- On the subcostal plane.
- Runs in front of the vertebral column
- Under the lower margin of the head of pancreas
- Above the coils of the jejunum.
Relations of 3rd part of duodenum

Anteriorly:
- The root of the mesentery of the small intestine
- the superior mesenteric vessels contained within the mesentry
- coils of jejunum

Posteriorly:
- The right ureter
- the right psoas muscle
- the inferior vena cava
- the aorta

Superiorly:
The head of the pancreas

Inferiorly:
Coils of jejunum
4\textsuperscript{th} part of duodenum.....cont

• 1” long
• Runs upward to the left
• End in the duodejejunal junction at the level of the 2\textsuperscript{nd} lumbar vertebrae 1” to the left.
• The junction (flexure) is held in position by the \textbf{ligament of Treitz}, which is attached to the right crus of the diaphragm (duodenal recess).
Relation of 4\textsuperscript{th} part of duodenum

**Ant.**
- The beginning of the root of the mesentery
- Coils of the jejunum.

**Post.**
- Lt. psoas major
- The sympathetic chain left margin of the aorta.

**Sup.**
- Uncinate process of the pancreas.
Blood supply of duodenum

• **Arteries**

  1- **upper half** (1\(^{st}\) part + upper\(1/2\) of 2\(^{nd}\) part) is supplied by the *superior pancreaticoduodenal artery*, a branch of the gastroduodenal artery.

  2- **The lower half** (lower \(1/2\) of 2\(^{nd}\) part + 3\(^{rd}\)+4\(^{th}\) part) is supplied by the *inferior pancreaticoduodenal artery*, a branch of the superior mesenteric artery.
Arterial supply and venous drainage of the duodenum

- Aorta
- Celiac artery
- Common hepatic artery
- Gastroduodenal artery
- Right gastro-omental artery
- Splenic artery
- Inferior pancreatic-duodenal artery (dividing into anterior and posterior branches)
- Anterior and posterior superior pancreaticoduodenal arteries
- Uncinate process of pancreas (posterior to superior mesenteric artery)
- Superior mesenteric artery
- Short gastric vein
- Portal vein
- Pancreaticoduodenal veins
- Superior mesenteric vein
- Inferior mesenteric vein
Blood supply for duodenum
Veins of duodenum

• The superior pancreaticoduodenal vein drains into the portal vein
• The inferior vein joins the superior mesenteric vein.
Lymphatic drainage

- The lymph vessels follow the arteries
- **drain upward** → via pancreaticoduodenal nodes → the gastroduodenal nodes → the celiac nodes
- **drain downward** → via pancreaticoduodenal nodes → the superior mesenteric nodes around the origin of the superior mesenteric artery.
Nerve supply

• Sympathetic nerve
• parasympathetic nerves from:
  1- The celiac plexus
  2- Superior mesenteric plexus.
Jejunum and Ileum
Location and Description

- The jejunum and ileum measure about 20 ft (6 m) long.
- The upper two fifths is the jejunum & the lower 3/5 is the ileum.
- Each has distinctive features.
- There is a gradual change from one to the other.
- The jejunum begins at the duodenojejunal flexure.
- The ileum ends at the ileocecal junction.
- The coils of jejunum and ileum are freely mobile and are attached to the posterior abdominal wall by a fan-shaped fold of peritoneum known as the mesentery of the small intestine.
SMALL INTESTINES ANATOMY

jejunum

ileum
Anatomical position of small intestine
mesentery of the small intestine

- fan-shaped fold of peritoneum
- The long free edge of the fold encloses the mobile intestine.
- The short root of the fold is continuous with the parietal peritoneum on the posterior abdominal wall
- Along a line that extends downward and to the right from the left side of the second lumbar vertebra to the region of the right sacroiliac joint
Root of the mesentery
Contents of the mesentery

- The branches of the superior mesenteric artery and vein
- Lymphatic vessels & lymphatic nodes
- nerves
## Difference between Jejunum & Ileum

<table>
<thead>
<tr>
<th></th>
<th>Jejunum</th>
<th>Ileum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td>Proximal 2/5</td>
<td>Distal 3/5</td>
</tr>
<tr>
<td><strong>Site</strong></td>
<td>in the upper part of the peritoneal cavity</td>
<td>in the lower part of the cavity and in the</td>
</tr>
<tr>
<td></td>
<td>below the left side of the transverse</td>
<td>pelvis</td>
</tr>
<tr>
<td></td>
<td>mesocolon</td>
<td></td>
</tr>
<tr>
<td><strong>Wall</strong></td>
<td>Thicker wall &amp; redder</td>
<td>Thinner &amp; less redder</td>
</tr>
<tr>
<td><strong>Arcades in Mesentery</strong></td>
<td>- Simple, only one or two arcades</td>
<td>Numerous short terminal vessels arise from</td>
</tr>
<tr>
<td></td>
<td>- With long infrequent branches</td>
<td>a series of three or four or even more</td>
</tr>
<tr>
<td></td>
<td>- Long vase recta</td>
<td>Arcade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Short vase recta</td>
</tr>
<tr>
<td><strong>Fat in Mesentery</strong></td>
<td>- The fat is deposited near the root</td>
<td>- The fat is deposited throughout mesentery</td>
</tr>
<tr>
<td></td>
<td>- It is scanty near the intestinal wall</td>
<td>- Big amount</td>
</tr>
<tr>
<td></td>
<td>- Less in amount → appear window</td>
<td>- No window appear</td>
</tr>
</tbody>
</table>
## Difference between Jejunum & Ileum

<table>
<thead>
<tr>
<th></th>
<th>Jejunum</th>
<th>Ileum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diameter</strong></td>
<td>Wider</td>
<td>Smaller</td>
</tr>
<tr>
<td><strong>Villi</strong></td>
<td>Numerous</td>
<td>Less numerous</td>
</tr>
<tr>
<td><strong>Plicae circularis</strong></td>
<td>They are:</td>
<td>They are:</td>
</tr>
<tr>
<td><strong>(the permanent enfolding of the mucous membrane &amp; submucosa)</strong></td>
<td>1- larger</td>
<td>1- smaller</td>
</tr>
<tr>
<td></td>
<td>2- more numerous</td>
<td>2- more widely separated</td>
</tr>
<tr>
<td></td>
<td>3- closely set</td>
<td>3- in the lower part they are absent</td>
</tr>
<tr>
<td><strong>Lymphatic follicles</strong></td>
<td>No or few</td>
<td>Aggregations of lymphoid tissue (Peyer's patches) are present in the mucous membrane</td>
</tr>
</tbody>
</table>
Blood supply of Jejunum & Ileum

**Arteries:**

- The arterial supply is from branches of the **superior mesenteric artery**.
- The intestinal branches arise from **the left side** of the artery and run in the mesentery to reach the gut.
- They anastomosis with one another to form a series of **arcades**.
- The lowest part of the ileum is also supplied by **the ileocolic artery**.
Blood supply for jejunum & Ileum
Veins:

• The veins correspond to the branches of the superior mesenteric artery
• Drain into the superior mesenteric vein.
Lymphatic Drainage of jejunum & ileum

• The lymph vessels pass through many intermediate mesenteric nodes
• Finally reach the superior mesenteric nodes ➔ around the origin of the superior mesenteric artery.
Lymph Drainage of jejunum & ileum
Nerve Supply of jejunum & Ileum

• The nerves are derived from the sympathetic and parasympathetic (vagus)
• Nerves from the superior mesenteric plexus.
Nerve supply for small intestine
Congenital anomaly of small intestine

**Meckel's Diverticulum:**

- a congenital anomaly of the ileum
- Present in 2% of people
- 2 feet from iliocecal junction
- 2 inch long
- contains gastric or pancreatic tissue
- Remains of vitelline duct of embryo