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GROSS ANATOMY

THE JEJUNUM AND ILEUM

By

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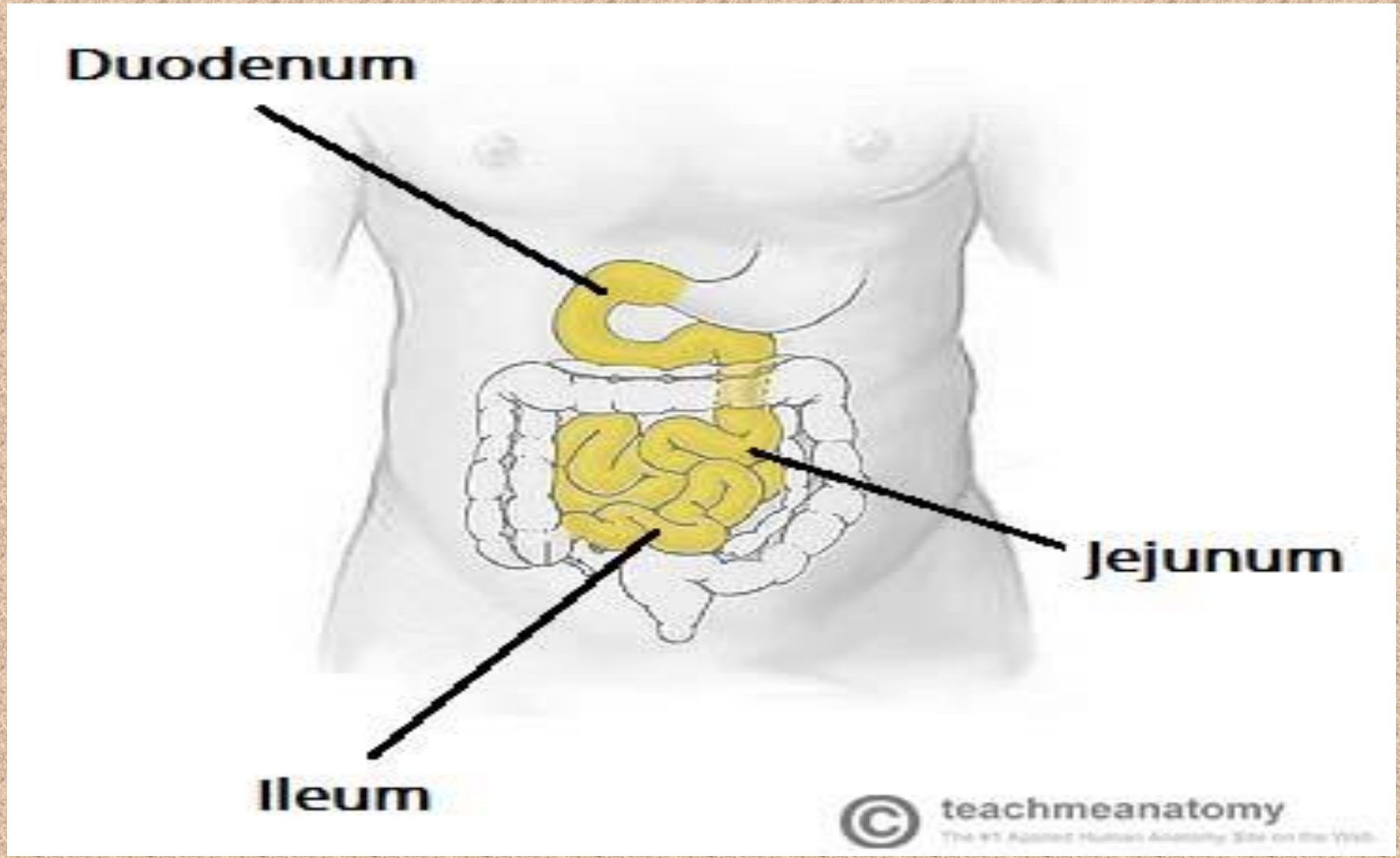
- The **small intestine** is an organ located within the gastrointestinal tract. It is approximately 6.5m in the average person and assists in the digestion and absorption of ingested food.
- It extends from the pylorus of the stomach to the **ileocaecal junction**, where it meets the large intestine at the ileocaecal valve. Anatomically, the small bowel can be divided into three parts: the duodenum, jejunum, and ileum.

Table Derivatives of the developing gut in the abdomen

Part	Derivatives
Foregut	• Esophagus • Stomach • Upper half of the duodenum (up to the opening of common bile duct)
Midgut	• Lower half of the duodenum (distal to the opening of common bile duct) • Jejunum • Ileum • Appendix • Cecum • Ascending colon • Right two-third of transverse colon
Hindgut	• Left one-third of transverse colon • Descending colon • Sigmoid colon • Rectum • Upper part of anal canal



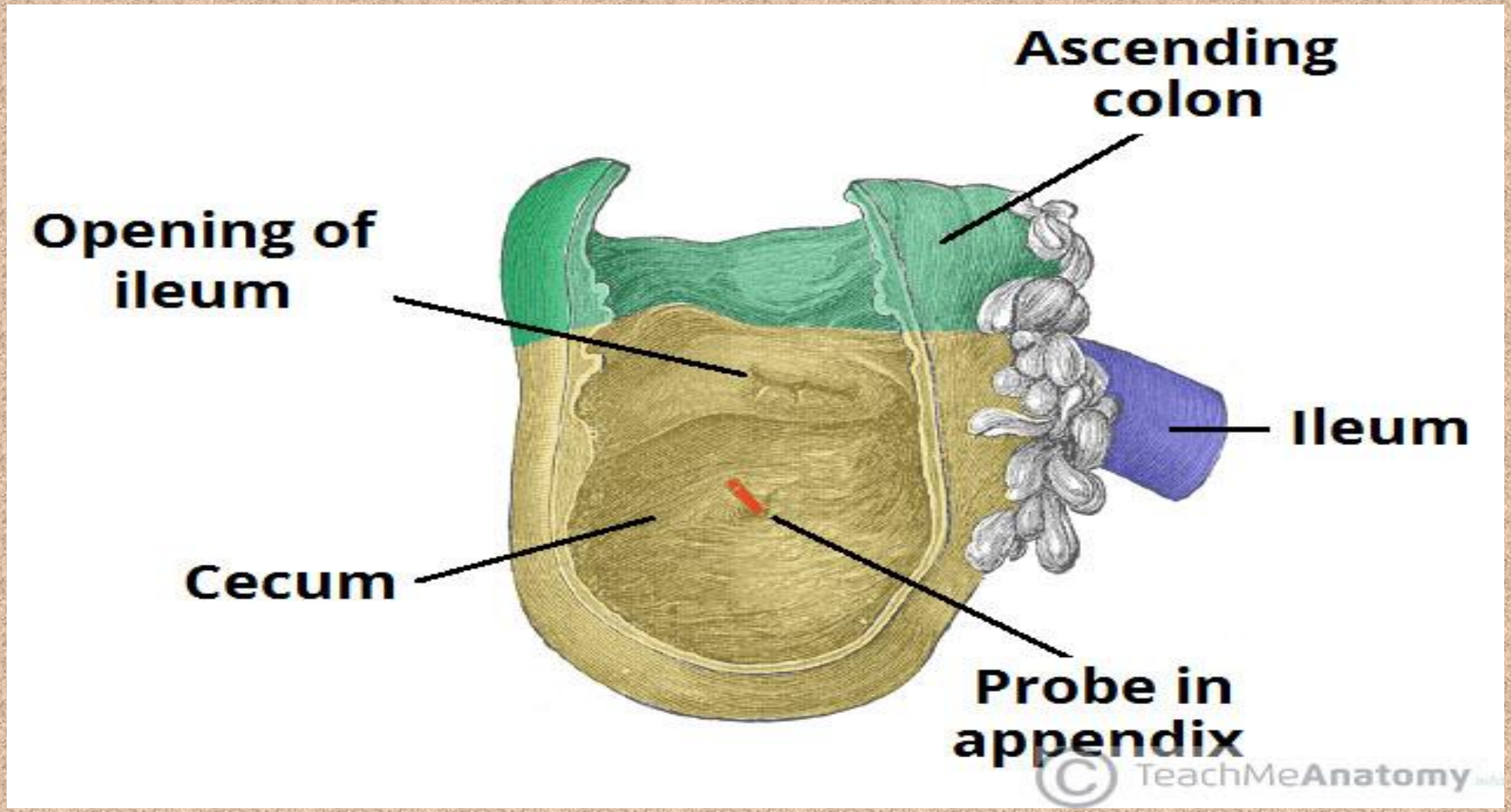
THE ANATOMICAL DIVISIONS OF THE SMALL INTESTINE.

CLINICAL RELEVANCE DUODENAL ULCERS

- A duodenal ulcer is the **erosion** of the mucosa in the duodenum. It may also be described as a peptic ulcer (although this term can also be used to refer to ulcerations in the stomach). Duodenal ulcers are most likely to occur in the **superior portion** of the duodenum.
- The most common causes of duodenal ulcers are *Helicobacter pylori* infection and chronic NSAID therapy.
- An ulcer in itself can be painful, but is not particularly troublesome and can be treated medically. However, if the ulcer progresses to create a complete perforation through the bowel wall, this is a surgical emergency, and usually warrants immediate repair. A perforation may be complicated by:
- **Inflammation of the peritoneum**(peritonitis) – causing damage to the surrounding viscera, such as the liver, pancreas and gall bladder.
- **Erosion of the gastroduodenal artery** – causing haemorrhage and potential hypovolaemia shock.

JEJUNUM AND ILEUM

- The **jejunum** and **ileum** are the distal two parts of the small intestine. In contrast to the duodenum, they are intraperitoneal.
- They are attached to the posterior abdominal wall by **mesentery** (a double layer of peritoneum).
- The jejunum begins at the **duodenojejunal flexure.** There is no clear external demarcation between the jejunum and ileum – although the two parts are macroscopically different. The ileum ends at the **ileocaecal junction**.
- At this junction, the ileum invaginates into the cecum to form the **ileocecal valve**. Although it is not developed enough to control movement of material from the ileum to the cecum, it can prevent reflux of material back into the ileum



THE ILEOCECAL JUNCTION

Clinical Relevance
Characteristic Features of the Jejunum and Ileum

During surgery, it is often necessary to be able to distinguish between the jejunum and ileum of the small intestine:

EJUNUM	ILEUM
LOCATED IN UPPER LEFT QUADRANT	LOCATED IN LOWER RIGHT QUADRANT
THICK INTESTINAL WALL	THIN INTESTINAL WALL
LONGER VASA RECTA (STRAIGHT ARTERIES)	SHORTER VASA RECTA
LESS ARCADES (ARTERIAL LOOPS)	MORE ARCADES
RED IN COLOUR	PINK IN COLOUR

Differences Between The Jejunum And Ileum

Features	Jejunum	Ileum
Location	Umbilical region	Hypogastric region
Walls	Thicker and more vascular	Thinner and less vascular
Lumen	Wider and often found empty (diameter = 4 cm)	Narrower and often found full (diameter = 3.5 cm)
Circular folds/plicae circulares (valves of Kerckring)	Longer and closely set	Smaller and sparsely set
Villi	More, larger, thicker, and leaf-like	Less, shorter, thinner, and finger-like
Aggregated lymph follicles (Peyer's patches)	Small, circular, and few in number, and found only in the distal part of the jejunum	Large oval and more in number and found throughout the extent of ileum being maximum in the distal part
Mesentery	Contains less fat and becomes semitranslucent between the vasa recta called peritoneal windows	Contains more fat and there are no peritoneal windows between the vasa recta

VASCULATURE AND LYMPHATICS

- **Duodenum**
- The arterial supply of the duodenum is derived from two sources:
- **Proximal to the major duodenal papilla** – supplied by the gastroduodenal artery (branch of the common hepatic artery from the coeliac trunk).
- **Distal to the major duodenal papilla** – supplied by the inferior pancreaticoduodenal artery (branch of superior mesenteric artery).
- This transition is important – it marks the change from the embryological **foregut** to **midgut**. The veins of the duodenum follow the major arteries and drain into the hepatic portal vein.
- Lymphatic drainage is to the **pancreatoduodenal** and **superior mesenteric** nodes.

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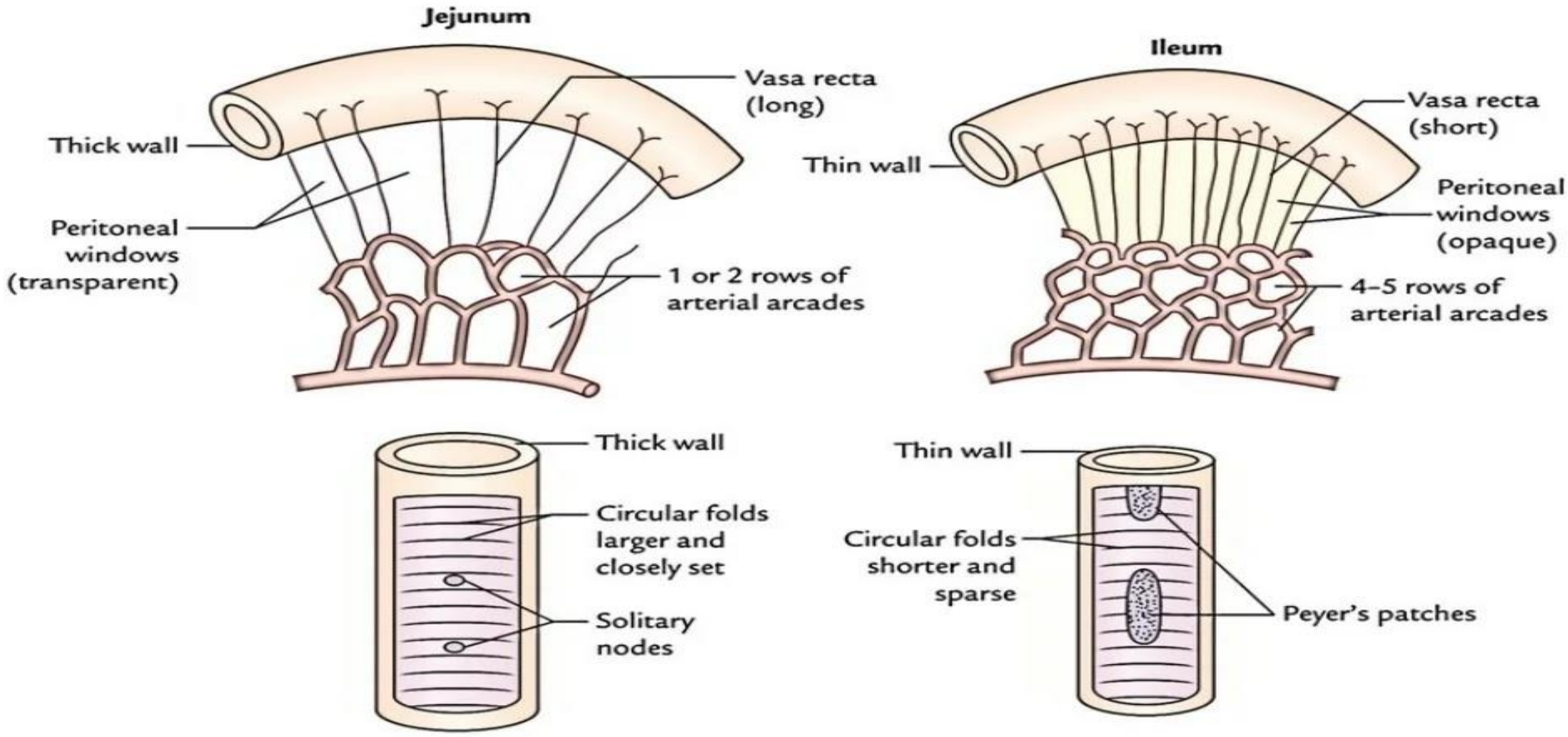
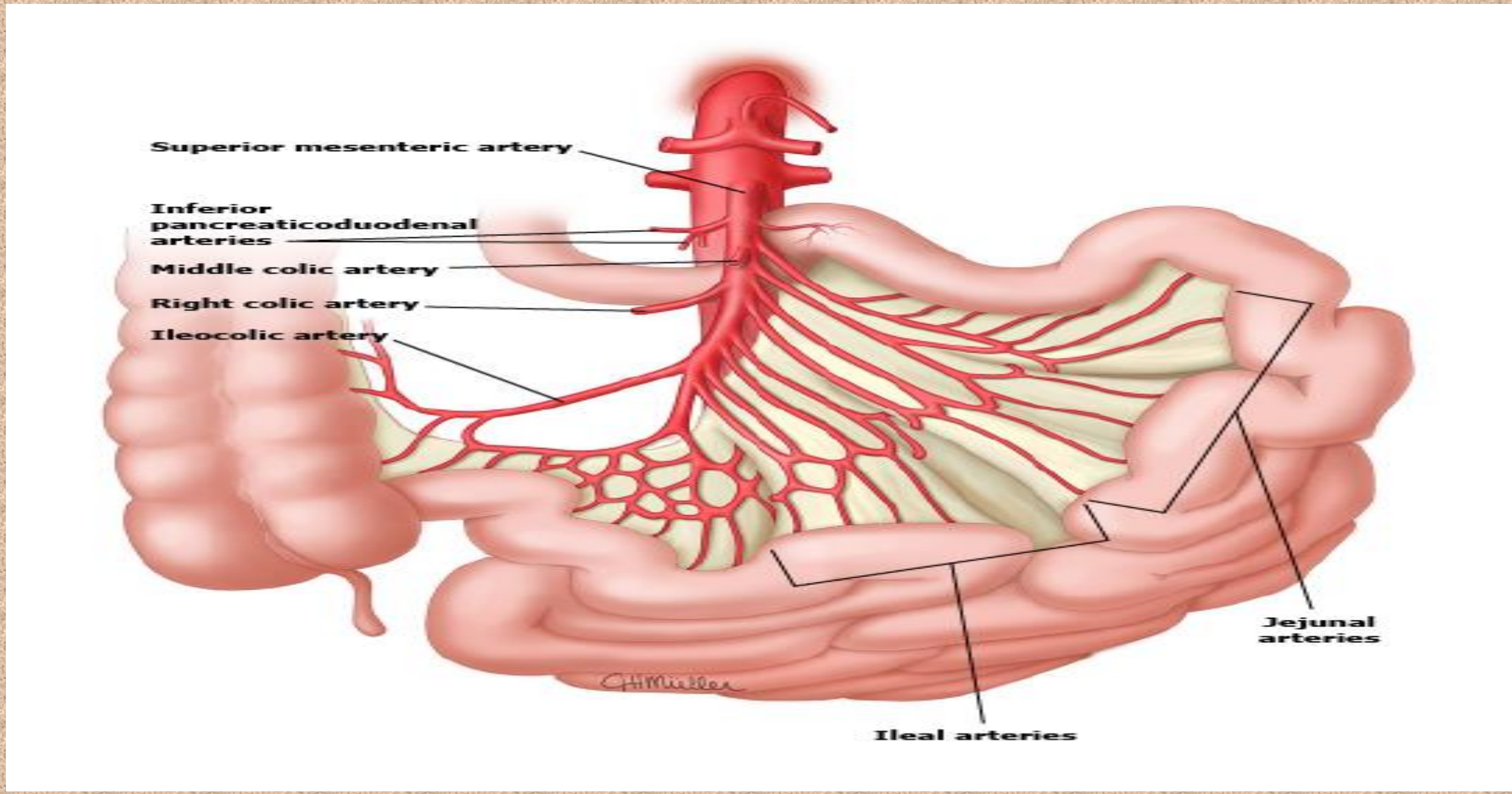
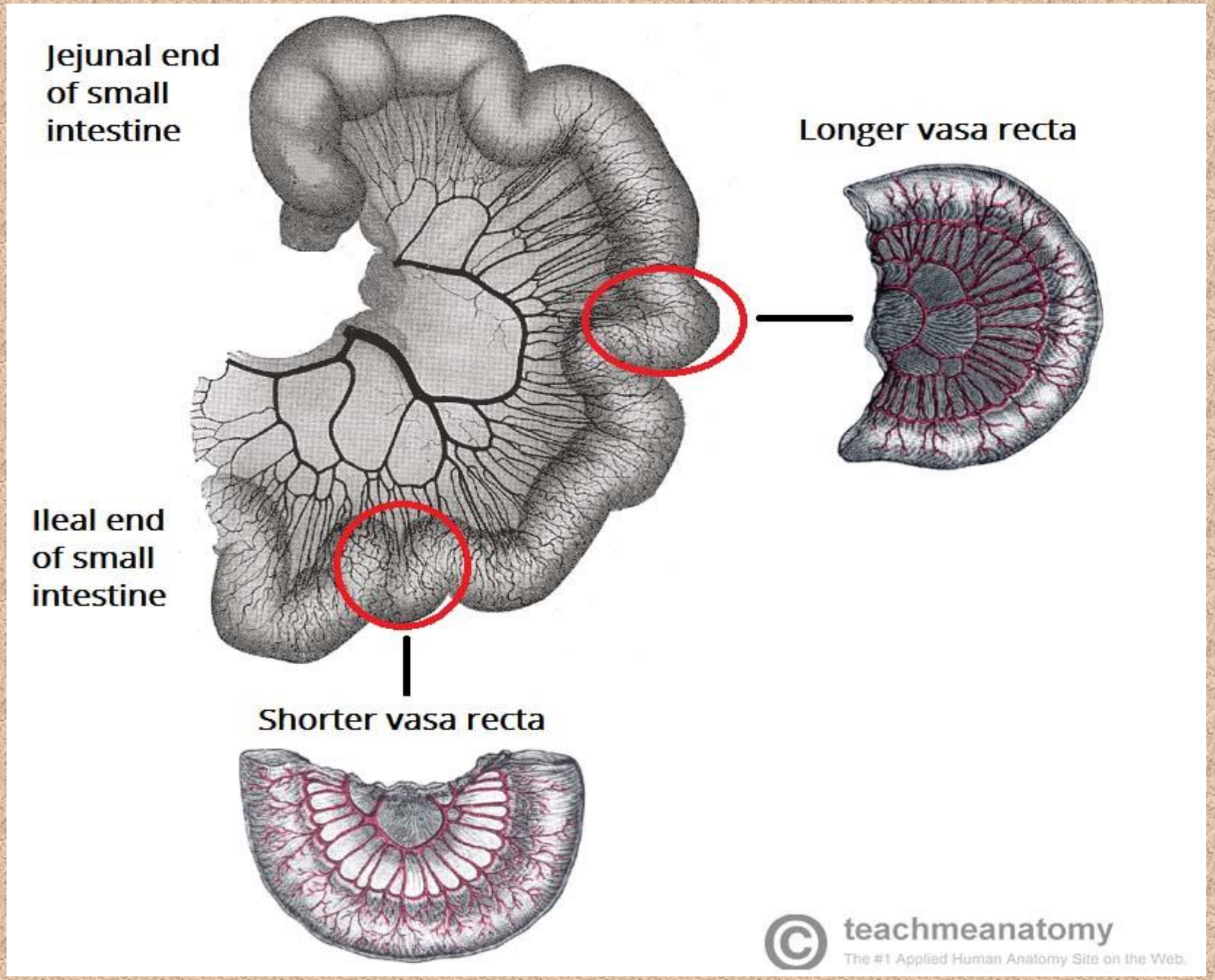

Jejunum
Vasa recta (long)
Thick wall
Peritoneal windows (transparent)
1 or 2 rows of arterial arcades
Ileum
Vasa recta (short)
Thin wall
Peritoneal windows (opaque)
4–5 rows of arterial arcades
Thick wall
Circular folds larger and closely set
Solitary nodes
Thin wall
Circular folds shorter and sparse
Peyer's patches


Superior mesenteric artery
Inferior pancreaticoduodenal arteries
Middle colic artery
Right colic artery
Ileocolic artery
Jejunal arteries
Ileal arteries


Jejunal end of small intestine
Longer vasa recta
Ileal end of small intestine
Shorter vasa recta
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The #1 Applied Human Anatomy Site on the Web.

CLINICAL RELEVANCE: ILEOCAECAL VALVE

- The **ileocaecal valve** represents the separation between the small and large intestine. Its main function is to prevent the reflux of enteric fluid from the colon into the small intestine. It is also used as an landmark during colonoscopy, indicating that the limit of the colon has been reached and that a complete colonoscopy has been performed.
- The ileocaecal valve is also important in the setting of large bowel obstruction. Should the ileocaecal valve be competent, a **closed loop obstruction** can occur and cause bowel perforation. Should the ileocaecal valve be incompetent (i.e. allow backflow of enteric contents into the small bowel) then the situation is less emergent and the trajectory of the obstruction less rapid.

Blood Supply of the Jejunum and Ileum

- The arterial supply to the jejunoileum is from the **superior mesenteric artery**.
- The superior mesenteric artery arises from the aorta at the level of the L1 vertebrae, immediately inferior to the **coeliac trunk**.
- It moves in between layers of mesentery, splitting into approximately 20 branches.
- These branches anastomose to form loops, called **arcades**. From the arcades, long and straight arteries arise, called **vasa recta**.

Venous Drainage of the Jejunum and Ileum

- The **superior mesenteric vein** drains the jejunum and ileum.
- This accompanies the **superior mesenteric artery**, lying **anterior and to its right** in the root of the mesentery.
- This vein unites with the **splenic vein** to form the **portal vein**

Lymphatic Drainage of the Jejunum and Ileum

- The **lacteals** in the intestinal villi empty their milk-like fluid (L. *lactis*, milk) into a plexus of lymph vessels in the walls of the jejunum and ileum.
- These lymph vessels pass between the two layers of mesentery to the **mesenteric lymph nodes**.
- From here, the lymph drains ultimately to the **thoracic duct**.

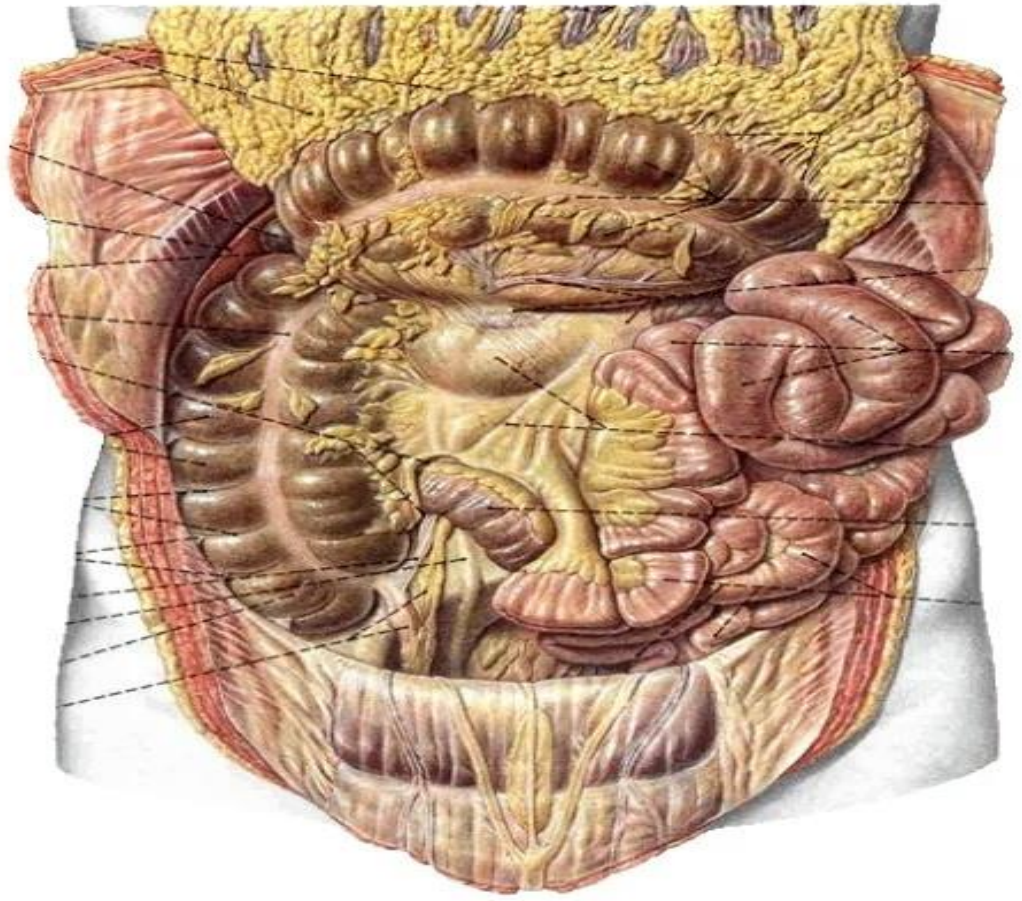
Innervation of the Jejunum and Ileum

- The innervation is through the **superior mesenteric plexus** extensions along the arteries.
- The **sympathetic supply** is from the **greater splanchnic** and **lesser splanchnic nerves**.
- The **parasympathetic supply** is from the **posterior vagal trunk via the coeliac plexus**.

The Mesentery

Fold of peritoneum that suspends the small intestine from the posterior abdominal wall

- Broad and a fan-shaped
- Consists of two peritoneal layers



The mesentery

- The jejunum and ileum are attached to the posterior abdominal wall by the **root of the mesentery** (about 15 cm long) is directed obliquely.
- **It extends from the duodenojejunal junction on the left side of vertebra L2 to the ileocolic junction and the right sacroiliac joint.**
- Between these two points, the root of the mesentery crosses:
  1) ***The horizontal (3rd & 4rh) parts of the duodenum***
  2) ***Aorta***
  3) ***Inferior vena cava***
  4) ***Psoas major muscle***
  5) ***Right ureter***
  6) ***Right testicular (or ovarian) vessels***

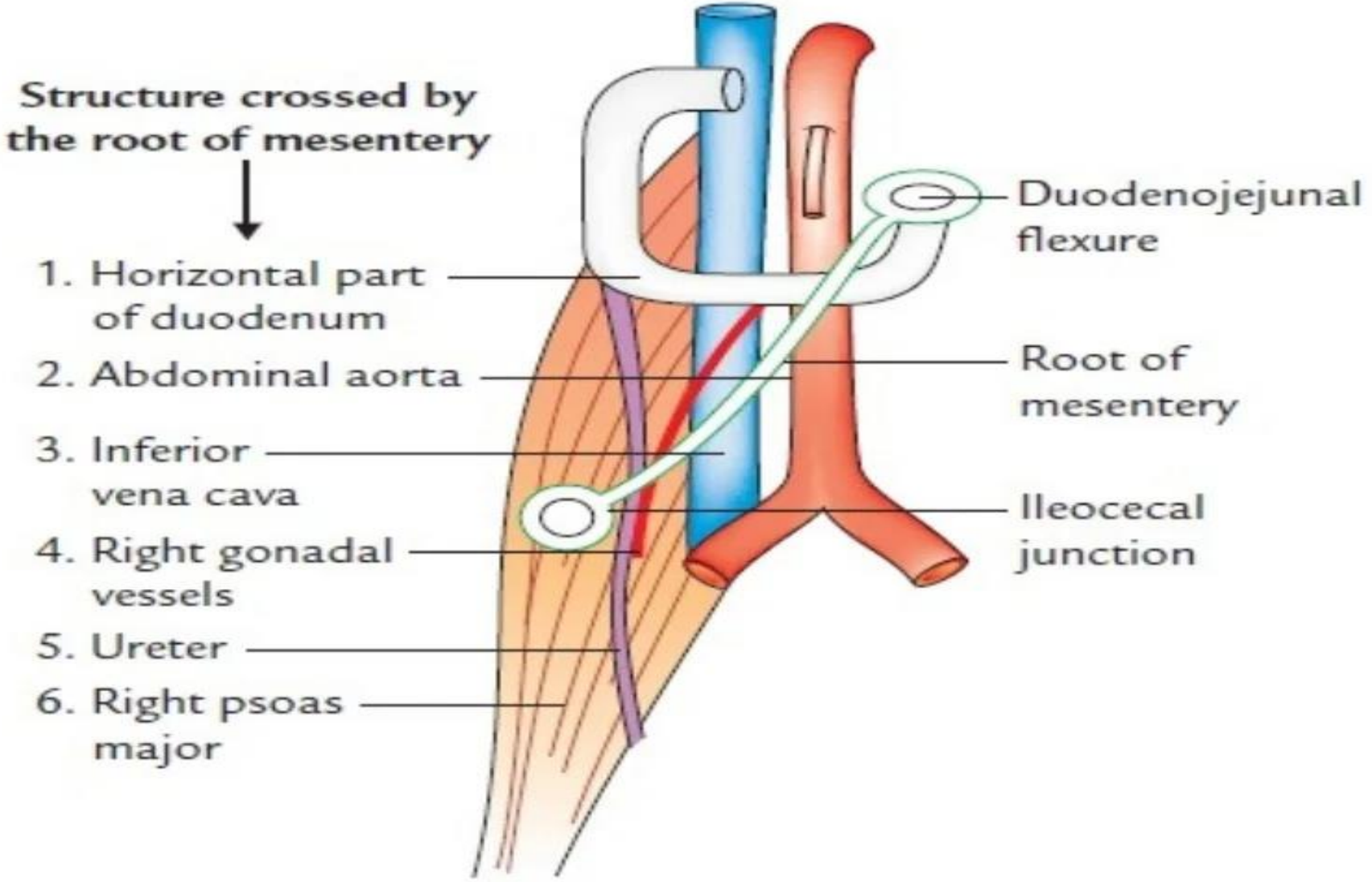
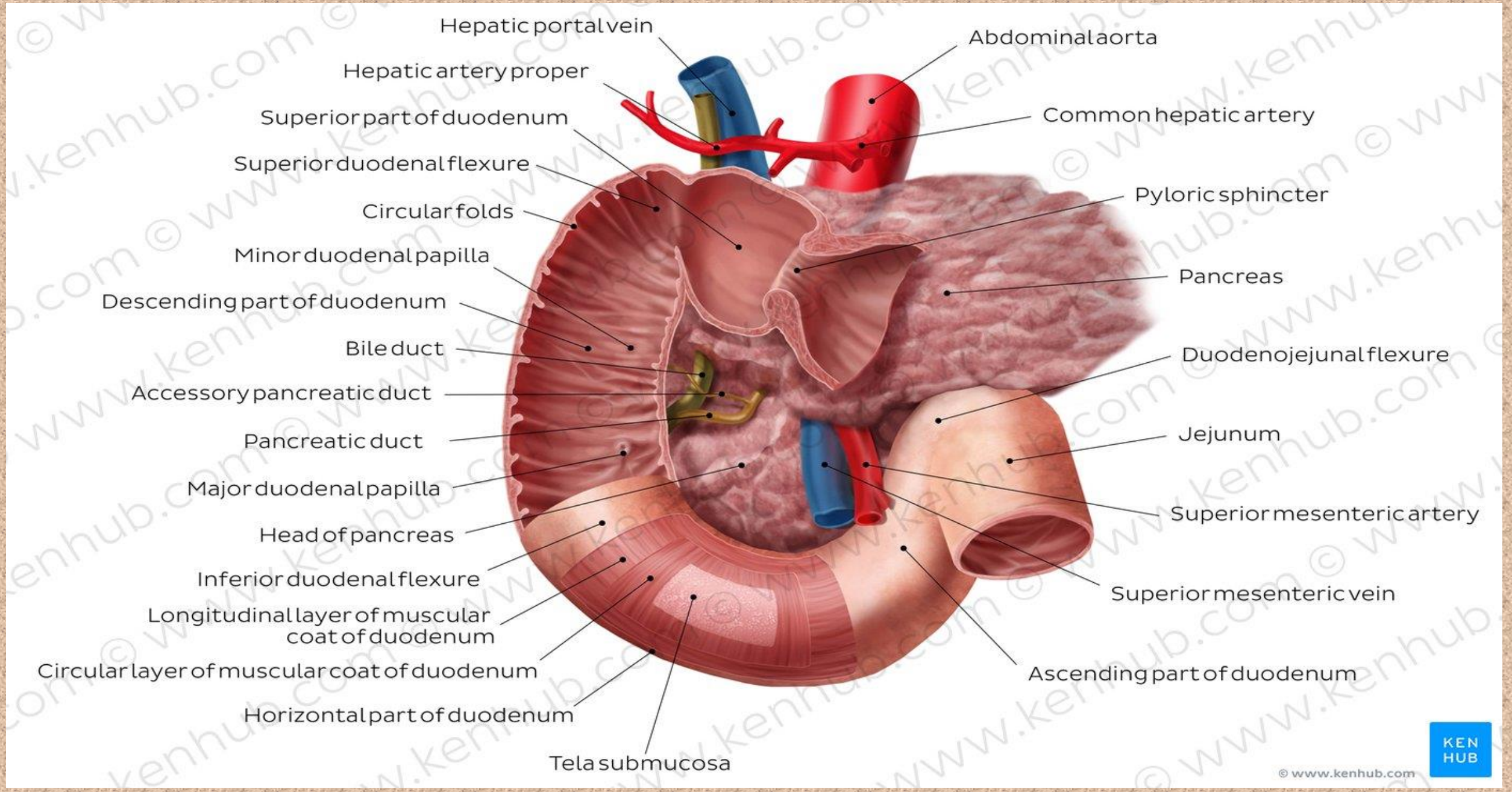


Fig. Structures crossed by the root of the mesentery.

Contents of mesentery

Between the two layers of the mesentery are

1) Coils of intestine
2) The superior mesenteric artery
3) The superior mesenteric vein
4) Lymph nodes,
    i. Small nodes in free border of the mesentery
    ii. Medium sized in middle
    iii. Large sized at root of the mastery
5) A variable amount of fat, and
6) Autonomic nerves.


Hepatic portal vein
Hepatic artery proper
Superior part of duodenum
Superior duodenal flexure
Circular folds
Minor duodenal papilla
Descending part of duodenum
Bile duct
Accessory pancreatic duct
Pancreatic duct
Major duodenal papilla
Head of pancreas
Inferior duodenal flexure
Longitudinal layer of muscular coat of duodenum
Circular layer of muscular coat of duodenum
Horizontal part of duodenum
Tela submucosa
Abdominal aorta
Common hepatic artery
Pyloric sphincter
Pancreas
Duodenojejunal flexure
Jejunum
Superior mesenteric artery
Superior mesenteric vein
Ascending part of duodenum
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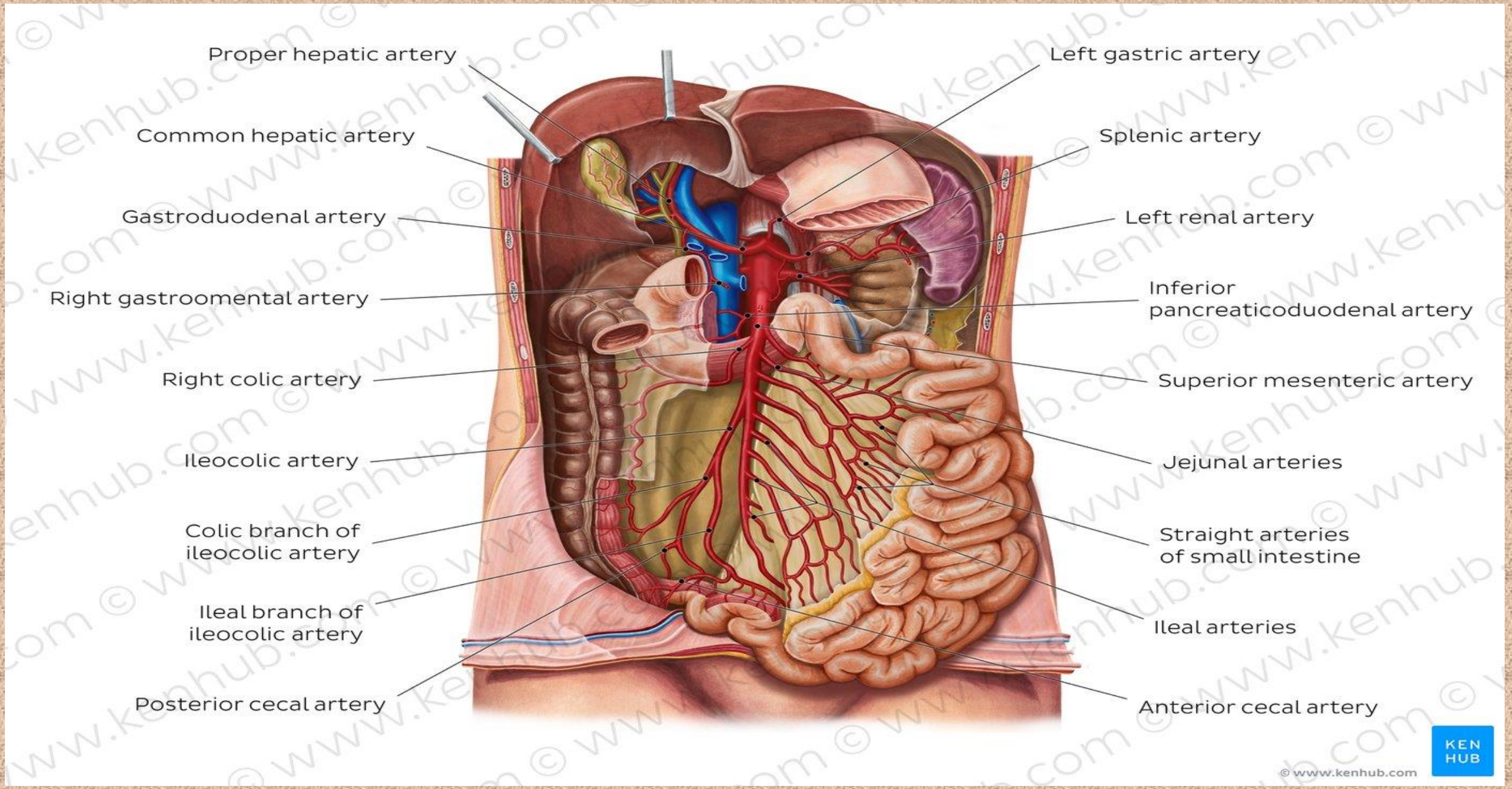
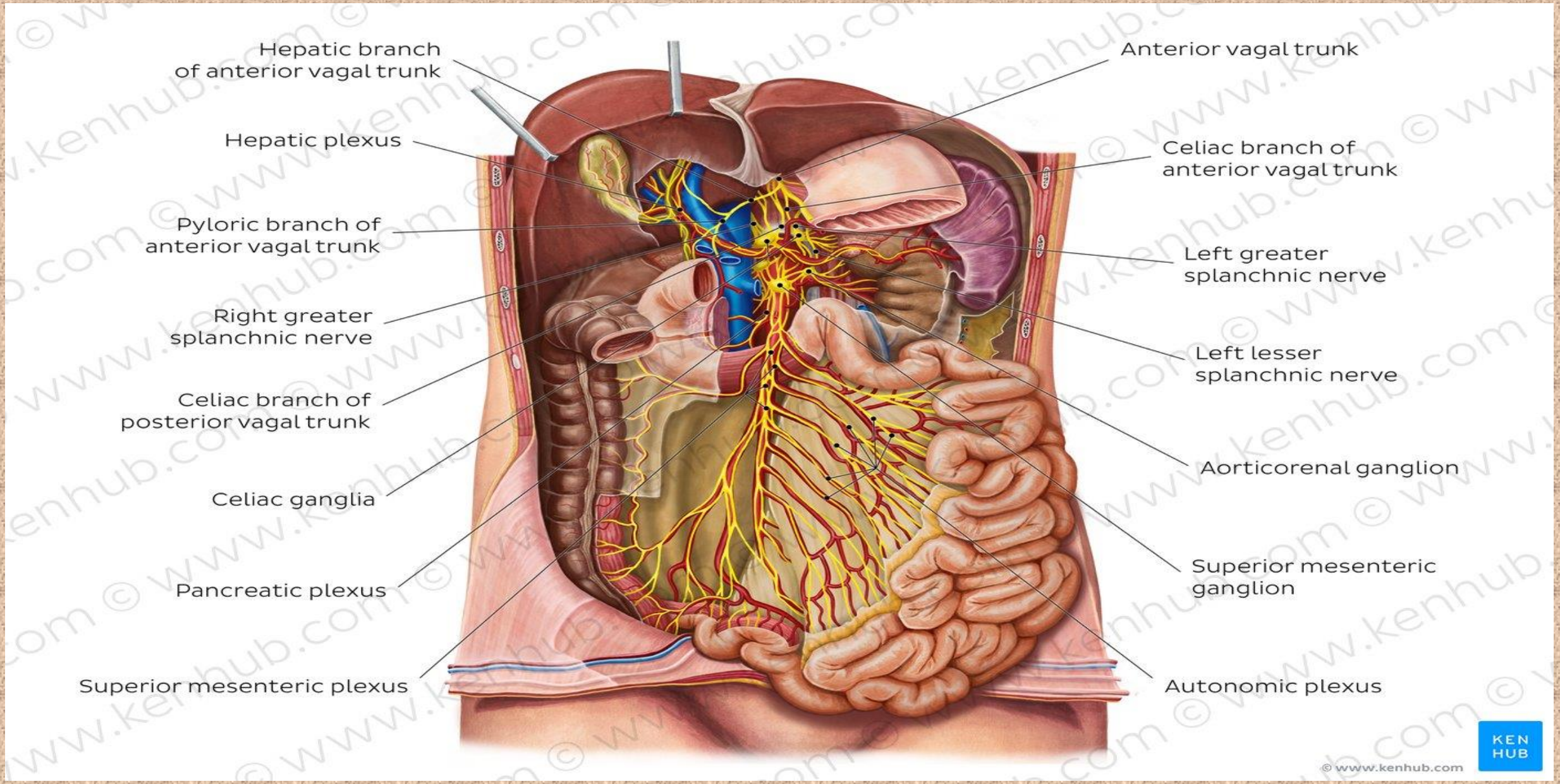
DUODENUM



ARTERIES OF THE SMALL INTESTINE



INNERVATION OF THE SMALL INTESTINE

CLINICAL RELATIONS

DUODENAL ULCER

- An ulcer is a defect of intestinal mucosa. Ulcers can appear in the stomach and/or duodenum, usually due to a bacterial infection of the pylorus of the stomach with *Helicobacter pylori* combined with the corrosive effect of gastric acid and pepsin.
- Duodenal peptic ulcers are usually found in the ampulla of duodenum. They appear more often within the younger population, contrasting with gastric ulcers which are more prevalent in the older population. The most common symptom of duodenal ulcers is the presence of burning pain in the epigastric region of the abdomen around 2-3 hours after a meal. Depending on the severity of ulceration, pain can be followed by nausea and vomiting.