Overview:

The primitive gut tube is formed from the incorporation of the dorsal part of the yolk sac into the embryo as a result of the craniocaudal folding and lateral folding of the embryo. The primitive gut tube is divided into the foregut, midgut, and hindgut. Histologically, the general plan of the adult gastrointestinal tract consists of a mucosa (epithelial lining and glands, lamina propria, and muscularis mucosae), submucosa, muscularis externa, and adventitia or serosa. Embryologically, the epithelial lining and glands of the mucosa are derived from endoderm, whereas the other components are derived from visceral mesoderm. Early in development, the epithelial lining the gut tube proliferates rapidly and obliterates the lumen. Later, recanalization occurs.

Foregut Derivatives:

A. Esophagus

Formation: The tracheoesophageal septum divides the foregut into the esophagus and trachea.

B. Stomach

Formation. The primitive stomach develops from a fusiform dilatation that forms in the foregut during week 4- The stomach rotates 90 degrees clockwise during its formation, causing the formation of the lesser peritoneal sac.

C-Liver

Formation. The hepatic diverticulum sends hepatic cell cords into the surrounding mesoderm called the septum transversum. As the liver bulges into the abdominal cavity, the septum transversum is stretched to form the ventral mesentery. The septum transversum also plays a role in the formation of the diaphragm,which explains the close adult anatomic relationship of the liver and diaphragm.

D-Gallbladder and bile ducts

Formation: The connection between the hepatic diverticulum and foregut narrows to form the bile duct. Later, an outgrowth from the bile duct gives rise to the gallbladder and cystic duct.

E. Pancreas

Formation. The ventral pancreatic bud forms the uncinate process and part of the head of the pancreas. The dorsal pancreatic bud forms the remaining part of the head, body, and rail of the pancreas. Acinar cells, duct epithelium, and islet cells are derived from endoderm.

F- Upper duodenum.

Formation: The upper duodenum develops from the caudal portion of the foregut. The junction of the foregut and midgut is just distal to the opening of the common bile duct.

Midgut Derivatives: are supplied by the superior mesenteric artery.

A- Lower duodenum

Formation:The lower duodenum develops from the cranial portion of the midgut.

B- Jejunum, ileum, cecum, appendix, ascending colon, and proximal two thirds of the transverse colon

Formation: At week 6, the midgut loop herniates through the primitive umbilical ring and causes a physiologic umbilical herniation. At week 11, the midgut loop rotates 270 degrees counterclockwise around the superior mesenteric artery as it returns to the abdominal cavity, thus reducing the physiologic umbilical herniation.

Hindgut Derivatives: are supplied by the inferior mesenteric artery.

A- Distal third of the transverse colon, descending colon, and sigmoid colon

Formation: The cranial end of the hindgur forms the distal third of the transverse colon, descending colon, and sigmoid colon.

B. Rectum and upper anal canal.

Formation: The terminal end of the hindgut is a pouch called the cloaca. The cloaca is partitioned by the urorectal septum into the rectum, upper anal canal, and urogenital sinus.

C-Anal Canal

Formation: The upper anal canal is a hindgut derivative, whereas the lower anal canal develops from an envagination of surface ectoderm called the proctodeum. The junction between the upper and lower anal canal forms the anal membrane and is marked in the adult by the pectinate line.

Mesenteries

The primitive gut tube is suspended within the peritoneal cavity of the embryo by the ventral mesentery and dorsal mesentery, from which all adult mesenteries are derived.