Anatomy of Pancreas

Greek πᾶν (pân, “all”) & κρέας (kréas, “flesh”)

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Learning Objectives:

By the end of this teaching session the MBBS 1st year students should be able to:

- Identify the location of pancreas
- Enumerate & describe the parts of pancreas
- Describe the relations of pancreas
- Write a note on exocrine and endocrine parts of pancreas
- Name the pancreatic ducts
- Describe the ducts and their openings
- Describe the arterial supply, venous drainage, lymphatic drainage of pancreas
- Write a short note on nerve supply of exocrine pancreas
- Write a short note on applied anatomy of pancreas
• Retroperitoneal organ
• Lies on the posterior abdominal wall
• Extent T12-L2
• Obliquely placed behind the stomach (behind the lesser sac)
Size & shape

- J shaped/ Retort shaped

- Measurements:
  - Length - 12-15 cm
  - Width - 3-4 cm
  - Thickness - 1.5 – 2cm
  - Weight - 80-90 gm
Parts

Subdivided into:
- Head with uncinate process
- Neck
- Body with tuber omentale
- Tail

- Head within curvature of duodenum
- Tail reaches hilum of spleen
Description of Head

- Enlarged, right extremity, within curvature of duodenum, opposite L1 & L2
- 2 surfaces, 4 borders, 1 process

**ANTERIOR RELATIONS:**
- peritoneum in lower part
- Uncinate process related anteriorly to Superior mesenteric vessels

**POSTERIOR RELATIONS:**
- IVC & both renal veins, Bile duct, right celiac ganglion, right suprarenal
Description of Neck

- Constricted part between head & body
- 2 cm long
- Projects anterior
- 2 surfaces, 2 borders

RELATIONS:

**Anterior:**
- Lesser sac, pyloric part of stomach
- Uncinate process- Superior mesenteric vessels

**Posterior:**
- Lower part - SMV
- Upper part-portal vein
Description of Body

• between neck & tail
• passes obliquely upwards, backwards, towards left
• At / just below transpyloric plane
• Triangular : 3 borders, 3 surfaces, 1 process – tuber omentale

RELATIONS:
Anterosuperior surface: peritoneum of lesser sac, Stomach
Anteroinferior surface: peritoneum of greater sac, coils of jejunum
Posterior surface: aorta, left psoas major, left suprarenal, left kidney, left renal vessels
Description of Tail

- Narrow, left end, reaches T 12
- Hilum of spleen, within lienorenal ligament
- Most mobile
- CONTAINS largest number of ISLETS OF LANGERHANS per unit of tissue

RELATIONS:
Anterior: lesser sac, stomach
Posterior: splenic vessels
Below: splenic flexure of colon
Structure/Function of Pancreas

**Exocrine part**
- Compound racemose gland
- Lobules, acini – duct system
- 2 secretory products critical to proper digestion:
  - Digestive enzymes (proteases, lipase and amylase)
  - Bicarbonate.
- Enzymes are synthesized and secreted from the exocrine acinar cells
- Bicarbonate is secreted from the epithelial cells lining small pancreatic ducts.

**Endocrine part**
- Isolated colonies of ovoid cellular masses
- Islets of Langerhans
- 1 million islets
- Within islet cell mass – Alpha (20%), Beta (68%), (Delta 10%), PP cell (2%)
- Minor cell types - D 1 cell, Enterochromaffin cell
Pancreatic ducts

- Usually 2 ducts
  A. Main Duct (Duct of Wirsung)
    - Begins in tail, Passes from left to right
    - Receives smaller ducts at regular angles (herringbone pattern)
    - At neck- main duct passes downwards, backwards to right
    - Unites with bile duct----Opens in 2\textsuperscript{nd} part of duodenum---at major duodenal papilla
  B. Accessory duct (Duct of Santorini)
    - Receives secretion from uncinate process
    - Passes upwards to right, in front of main duct
    - Opens in 2nd part of duodenum---at minor duodenal papilla
Arterial supply

Supplied by branches from:

- Artery of foregut (celiac trunk)
- Artery of midgut (superior mesenteric artery)

They include:

1. Superior pancreaticoduodenal artery (SPDA)
2. Inferior pancreaticoduodenal artery (IPDA)
3. Pancreatic branches from splenic artery

Head and neck supplied by SPDA & IPDA

Body & Tail supplied by pancreatic branches from splenic artery

- one large branch arteria pancreatica magna accompanies duct

Outflow of blood from islets drains into acinar capillary network---Insular acinar portal system
Venous drainage

Veins from Body & Tail:
- Splenic vein
- Superior mesenteric vein

Veins from Head and Neck:
- Trunk of Portal vein
Lymphatics of Pancreas

Head & neck - Anterior and posterior pancreaticoduodenal nodes

Body & Tail – Pancreaticosplenic nodes

Efferents pass to:

Celiac
&
Superior mesenteric nodes

Figure 3: Lymphatics of pancreas.
Applied anatomy of Pancreas
To EXOCRINE PANCREAS:

- **Partly Nerves and Partly Hormones**
  - **Nerves**
    - Sympathetic – Celiac and superior mesenteric plexus
    - Parasympathetic – Right & left vagus nerves
  - **Hormones (from duodenal mucosa)**
    - Secretin (bicarbonate secretion) &
    - Pancreozymin (digestive enzymes)
Pancreatitis

It occurs due to obstruction of pancreatic duct, ingestion of alcohol, viral infections (mumps), or trauma.

It is serious condition because activated pancreatic enzymes leak into the substance of pancreas and initiates the autodigestion of the gland.

Clinically, it presents as very severe pain in the epigastric region radiating to the back, fever, nausea, and vomiting.
When the pancreas gets inflamed, it may leak digestive enzymes.
This damages the pancreas and causes collections of fluid to form.
These are called pancreatic pseudocysts.

Pancreatic pseudocysts may start after
- an episode of sudden (acute) pancreatitis.
- In people with chronic pancreatitis
Carcinoma of Pancreas

If in and around - Head of pancreas

- May obstruct bile duct ------ jaundice
- May obstruct portal vein ------ ascites
  (accumulation of fluid in abdomen)
- May compress pylorus ------ pyloric obstruction
Diabetes mellitus

What is Diabetes?

1. When pancreas doesn’t produce insulin (Type 1)

2. When pancreas doesn’t produce enough insulin or the insulin cannot be processed (Type 2)
Annular Pancreas

May result in Duodenal obstruction

Figure 9-7. The ventral pancreas may consist of two lobes. If the lobes migrate around the duodenum in opposite directions to fuse with the dorsal pancreatic bud, an annular pancreas is formed.