

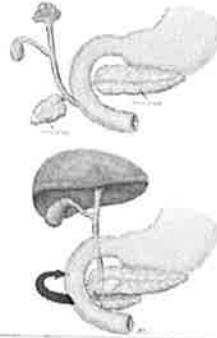
## Pancreas – anatomy, histology and dissection

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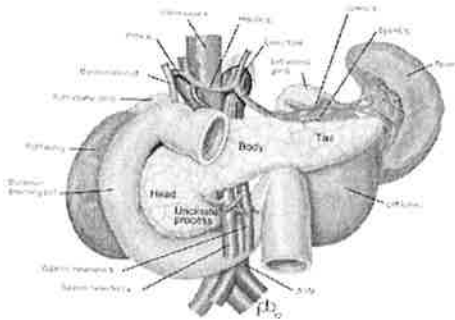
Sarajevo, November 2015

## Embryology

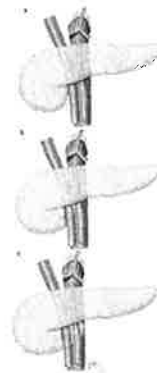


- Pancreas develops during 4<sup>th</sup> to 7<sup>th</sup> weeks of gestation
- Larger dorsal bud appears first, followed by smaller ventral anlage, which develops from the base of the hepatic diverticulum
- By 5<sup>th</sup> week, both buds have a duct system that opens into the developing gut
- In 7<sup>th</sup> week ventral bud rotates clockwise & the two buds fuse to form a single organ

## Head, body and tail of pancreas



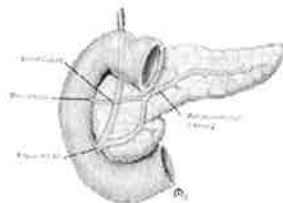
## Uncinate process



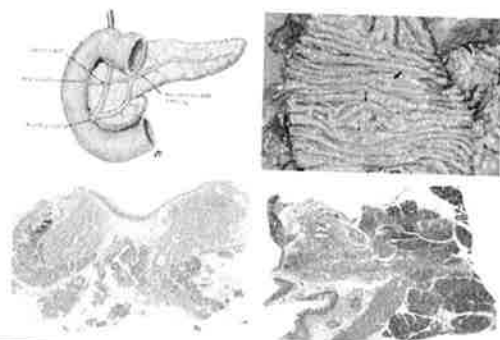
- 'uncus' = hook
- Ventral anlage
- Extension of the head that projects from its left-lateral aspect and hooks behind the superior mesenteric vessels
- Varying degrees of extension up to and/or behind the superior mesenteric vessels

## Pancreatic duct system

- Hierarchical system of collecting ducts of gradually increasing calibre, which drain into the main pancreatic duct (MPD)
- MPD runs centrally, but in the head makes a sharp turn towards the caudal aspect and courses obliquely towards the duodenum and ampulla of Vater
- The accessory (Santorini's) duct drains superior part of the head through the minor ampulla and minor papilla
- Only main duct (1.5-3mm diameter) and occasionally Santorini's duct (<1mm wide) are visible with naked eye

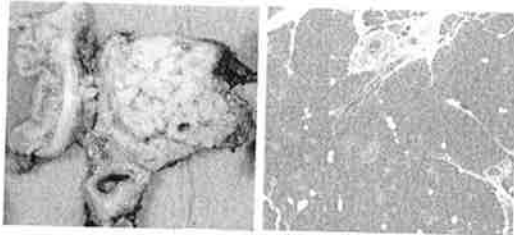


## Ampulla & papilla of Vater



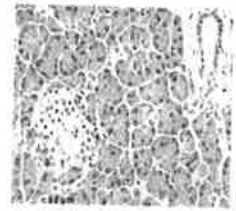
### Cut-surface

- Lobulated architecture
- Separated by thin layer of loose paucicellular stroma containing vessels & nerves



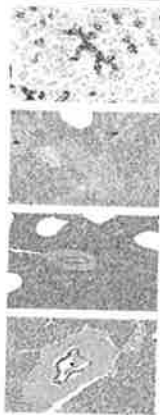
### Histology

- Acinar cells (85% of pancreas)
- Arranged in acini with central lumen that is usually not visible
- Pyramidal shape
- Basal nucleus with single nucleolus
- Basal cytoplasm is basophilic (RER)
- Apical cytoplasm eosinophilic & granular (zymogen granules)



### Pancreatic ducts

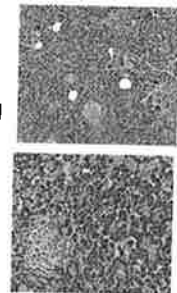
- Centroacinar (clear) cells partially cover the apical surface of the acinar cells
- Intercalated ducts (low cuboidal epithelium) outside the acini
- Intralobular ducts (low columnar epithelium) of varying sizes
- Interlobular ducts (columnar epithelium)
- Main pancreatic duct



### Islets

Compact islets (90%) – round and smooth

- Cells arranged in loose complex of anastomosing loops with capillary-type blood vessels
- Cells are ovoid in shape with pale eosinophilic cytoplasm and ovoid nucleus
- Variation in nucleus size is normal



### Islets

Compact islets

- alpha-cells (glucagon) = 15-20% of islet population
- beta-cells (insulin) = 60-80%
- delta-cells (somatostatin) = 5-10%
- PP-cells (pancreatic polypeptide) = <2%
- {grehlin-secreting epsilon-cells}



### Diffuse islets

Diffuse islets (10%) – irregular in shape, less well demarcated

- Found in uncinate process/inferior head
- Larger size (up to 450 microns) than compact islets (150-300 microns)
- Cells arranged in trabeculae
- Rich in PP cells (70-80%) and few insulin cells (<2%)



### Extrainsular endocrine cells

- <10% of endocrine cells are found outside the islets
- Located within or close to ducts
- PP cells
- Rarely alpha-, beta-, or delta-cells
- In large ducts may produce serotonin



### Interstitium

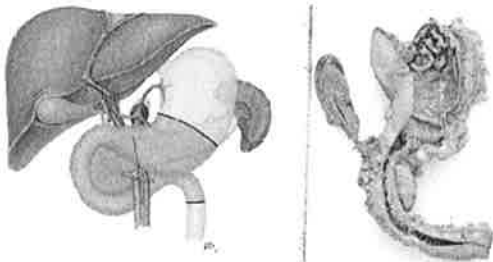
- Within the lobules, it consists of delicate network of capillaries
- Interlobular septa have small amount of loose fibrous stroma, which supports interlobular ducts, peripheral nerves, lymphatics and blood vessels

### Specimen dissection

### Specimen types

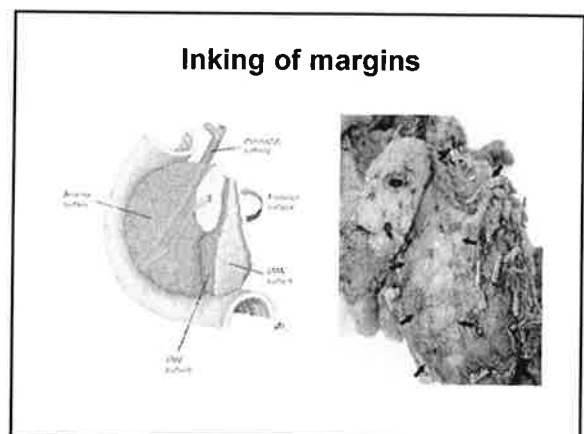
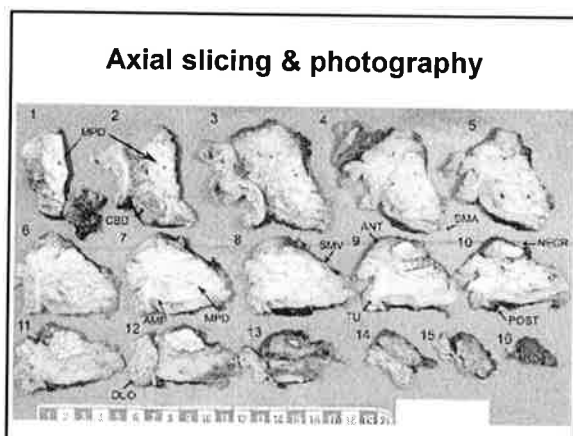
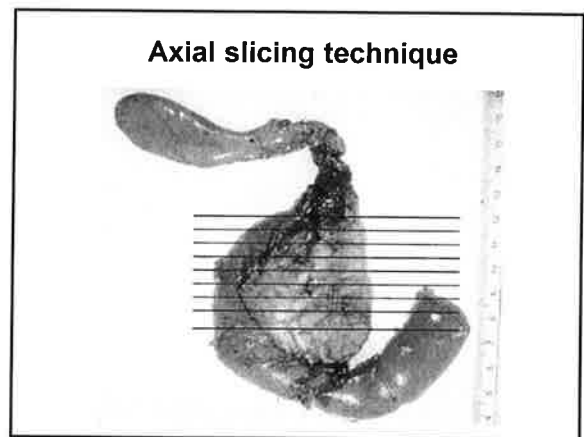
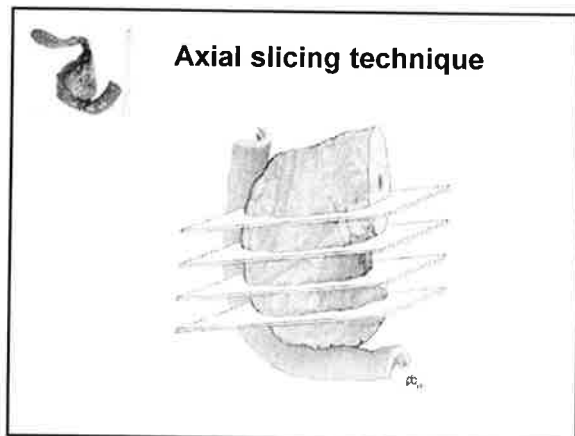
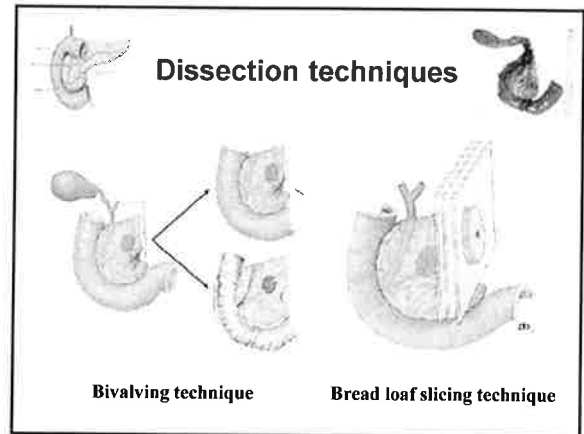
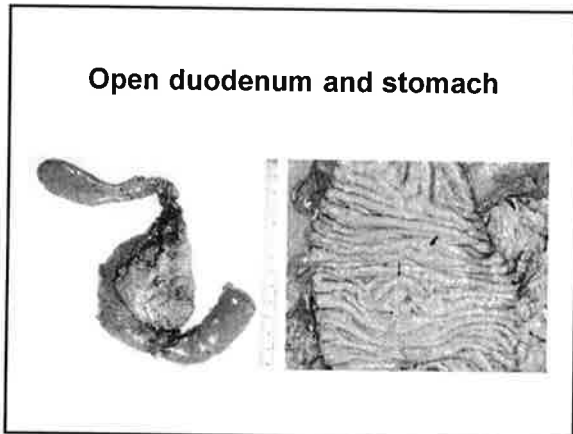
- Pancreatoduodenectomy
- Distal pancreatectomy
- Total pancreatectomy
- Duodenum-preserving pancreatic resection
- Complex multi-visceral en-bloc resection
- Central pancreatectomy
- Enucleation
- Specimens following Frey, Beger or Puestow procedures (chronic pancreatitis)

### Pancreatoduodenectomy



### Pylorus-preserving PD

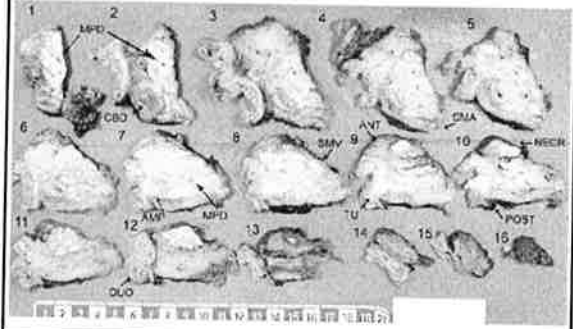




**Axial slicing**



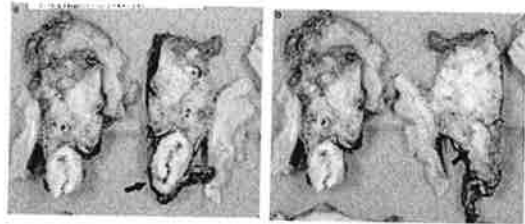
**Axial specimen slicing**



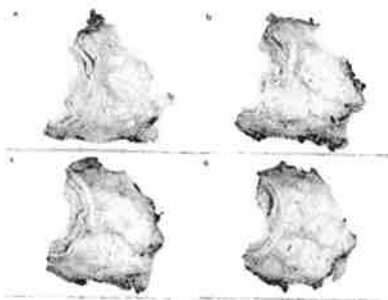
**Main pancreatic duct vs  
common bile duct**



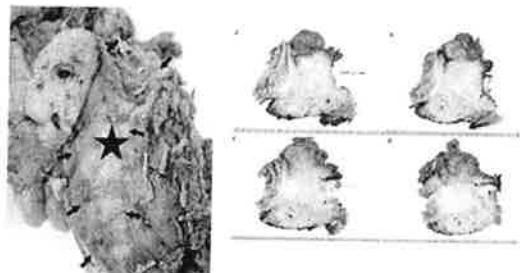
**Inspect tissue slices on both  
sides**



**Ampulla of Vater**



**Venous resections**

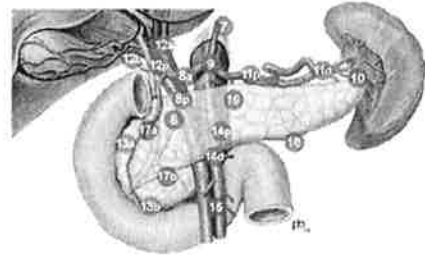


## Stents and coils

- CBD is stented to relieve obstructive jaundice
- Record presence and nature (plastic for short-term use, or metal for longer period of time)
- Plastic can be left in-situ, since they can be sliced easily
- Metal stents require removal before slicing



## Peripancreatic LN stations (JPS)



## UICC TNM lymph node classification

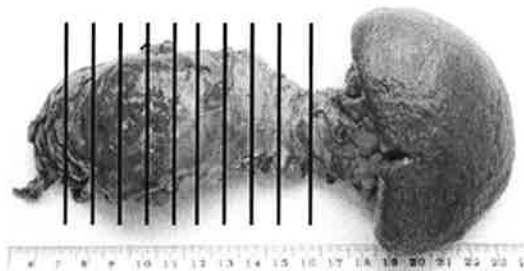
Station	Anatomical localization	For tumors of
Superior	Superior to head and body/tail	Head and body/tail of pancreas
Inferior	Inferior to head and body/tail	Head and body/tail of pancreas
Anterior	Anterior pancreatoduodenal	Head and body/tail of pancreas
	Pylicic	Head of pancreas
	Proximal mesenteric	Head and body/tail of pancreas
Posterior	Posterior pancreatoduodenal, common bile duct, proximal mesenteric	Head and body/tail of pancreas
Splenic	Behind of spleen, tail of pancreas	Body/tail of pancreas
Celiac	Around celiac trunk	Head of pancreas

## Tissue sampling

- Transection margins (neck & BD & duodenum/stomach) sampled en face
- Follow the sequential order of the specimen slices
- Tumour/lesion with adjacent anatomical structures, lymph nodes or margins/surfaces allowing nature of tumour/lesion and its extension to be assessed
- Whole-mount of specimen slice or entire slice embedded as 4-5 parts
- All lymph nodes should be sampled (12-15 for pancreatoduodenectomy)
- Background (pancreas, ampulla, bile duct)

## Distal pancreatectomy

- Serial slicing at 3-4mm intervals in the sagittal plane (perpendicular to the long axis of the pancreas)
- Orientation – splenic artery/vein runs along cranial (superior) aspect of body and tail
- Margins: transection margin & the anterior and posterior surfaces of the body and tail



## What is a PD resection margin?

- **Transection margin** (where tissue has been surgically divided): bile duct, pancreatic neck, duodenum or stomach, and superior mesenteric artery-facing (SMA, uncinata, mesopancreatic, medial) margins
- **Dissection/mobilization planes/margins** (where surgeon bluntly dissects tissue along an anatomical plane): posterior margin, superior mesenteric vein (SMV) margin and around extrapancreatic bile duct
- **Anterior surface:** is a true anatomical surface and not a surgical resection
- **28 different names for margins of the Whipples resection specimens**  
Gill et al. Pathology 2009; 41: 161-7

## Standardisation

- **Standardisation: dissection protocols and reporting protocols/synoptic reporting**

Verbeke et al. Br J Surg 2008; 93: 1232-7  
Esposito I et al. Ann Surg Oncol 2008; 15: 1651-60  
Gill A et al. Pathology 2009; 41: 161-7  
2<sup>nd</sup> edition RCPATH dataset, 2010



- **Major efforts should be made to reach 'an internationally accepted and standardised, but technically and financially feasible pathologic reporting'**

Rau BM et al. Surgery 2012; 152: S103-11

## Guidelines

- Royal College of Pathologists. Dataset for the reporting of carcinomas of the pancreas, ampulla of Vater and common bile duct. 2<sup>nd</sup> edition. London: Royal College of Pathologists, 2010
- Washington K et al. Protocol for the examination of specimens from patients with carcinoma of the exocrine pancreas. College of American Pathologists. Available at [www.cap.org](http://www.cap.org), web posting date June 2012