Examining Whipple resection specimens

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PathWest
LABORATORY MEDICINE WA

THE UNIVERSITY OF WESTERN AUSTRALIA

Clinipath Pathology

Examination of Whipple resections

Aimed at:

- Confirmation of Pre-operative diagnosis
- Correct identification of the origin
- Assessment of Resection margins (R status)
- Assessment of Response to neoadjuvant therapy

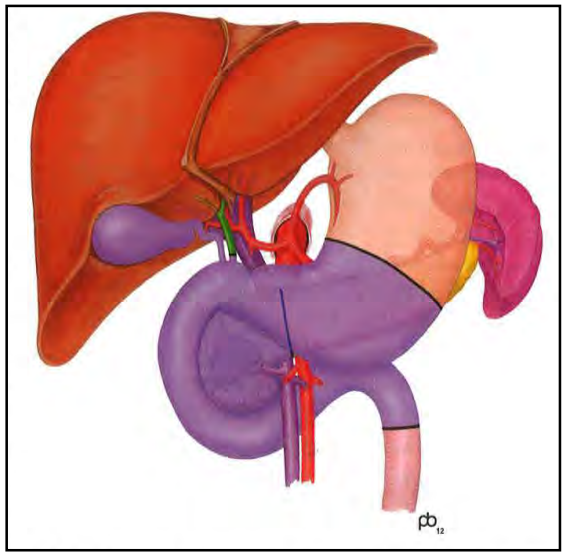
Prognostication and staging (AJCC 8th edition)

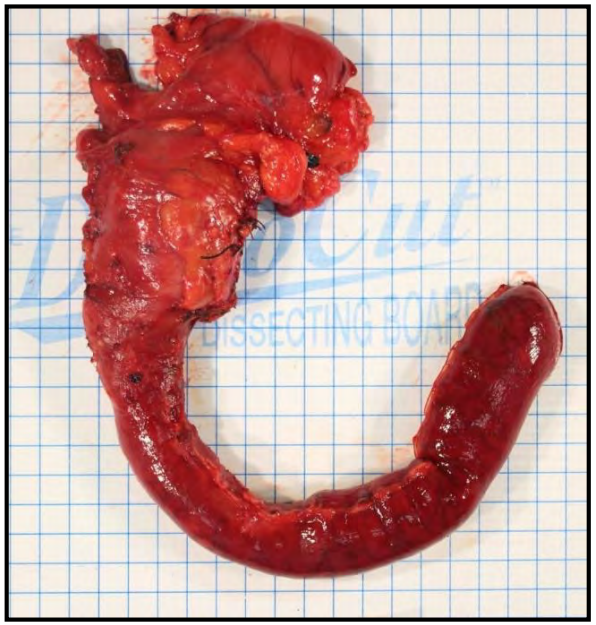
Starts with …

- General orientation of the specimen
- External examination
- Satisfactory orientation of specific margins and surfaces
- Inking the specimen
- Dissection of the specimen
- Appropriate sampling including margins and surfaces

PANCREATICODUODENECTOMY (Whipple resection)

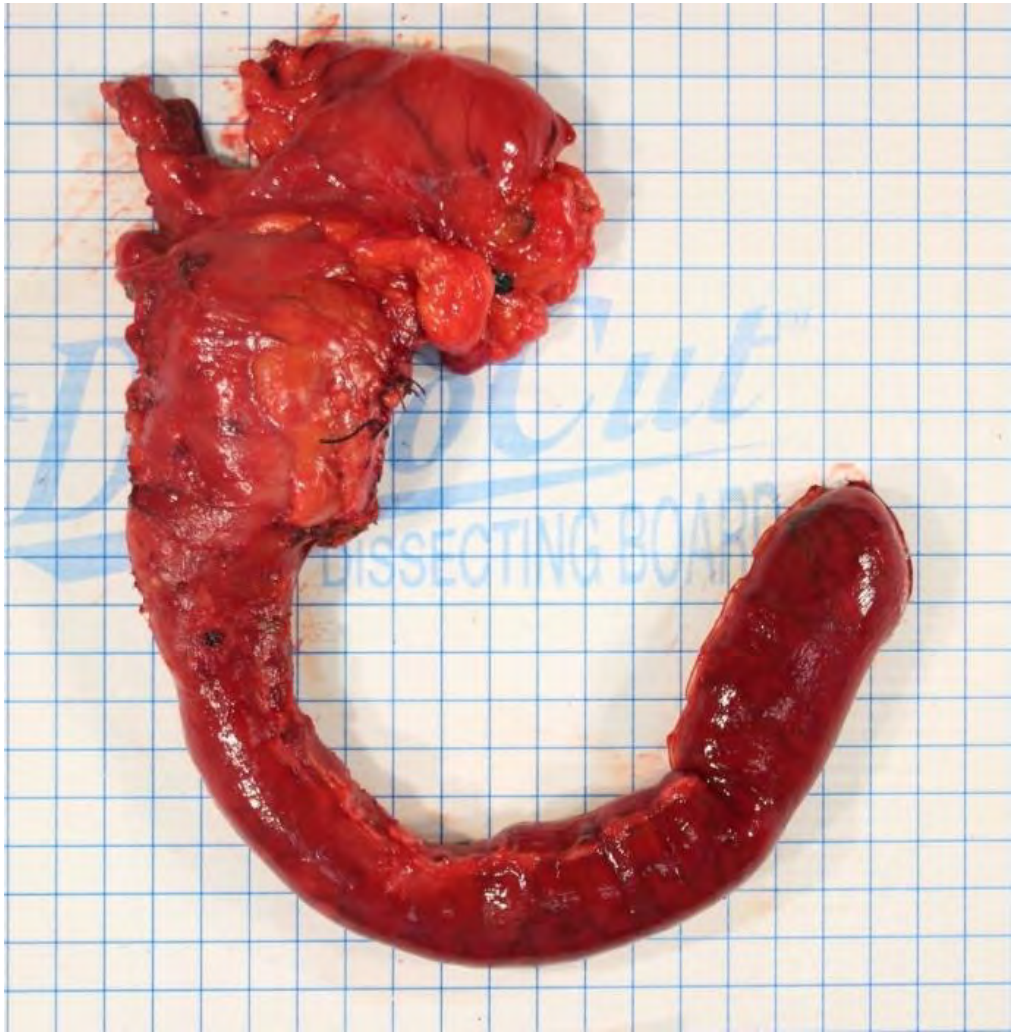
- **Most of the duodenum**
- **Pancreatic head**
- **Distal common bile duct (CBD)**
- Pylorus and a segment of the antrum
- Gallbladder and the cystic duct

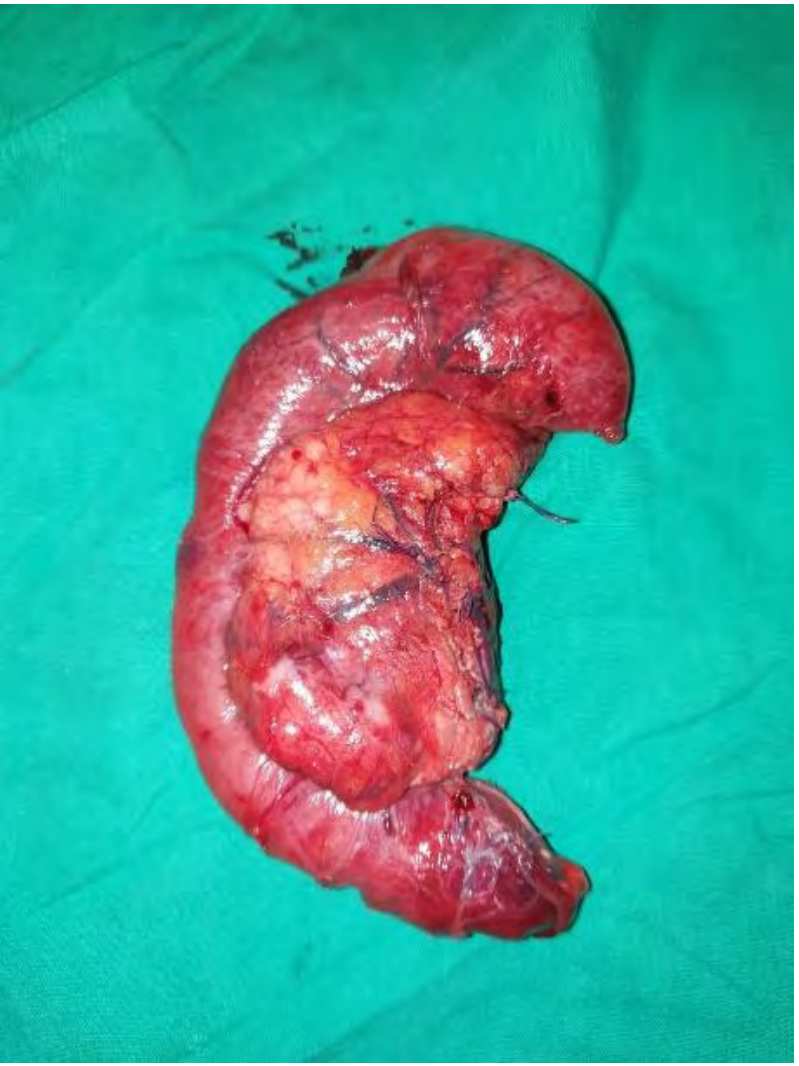


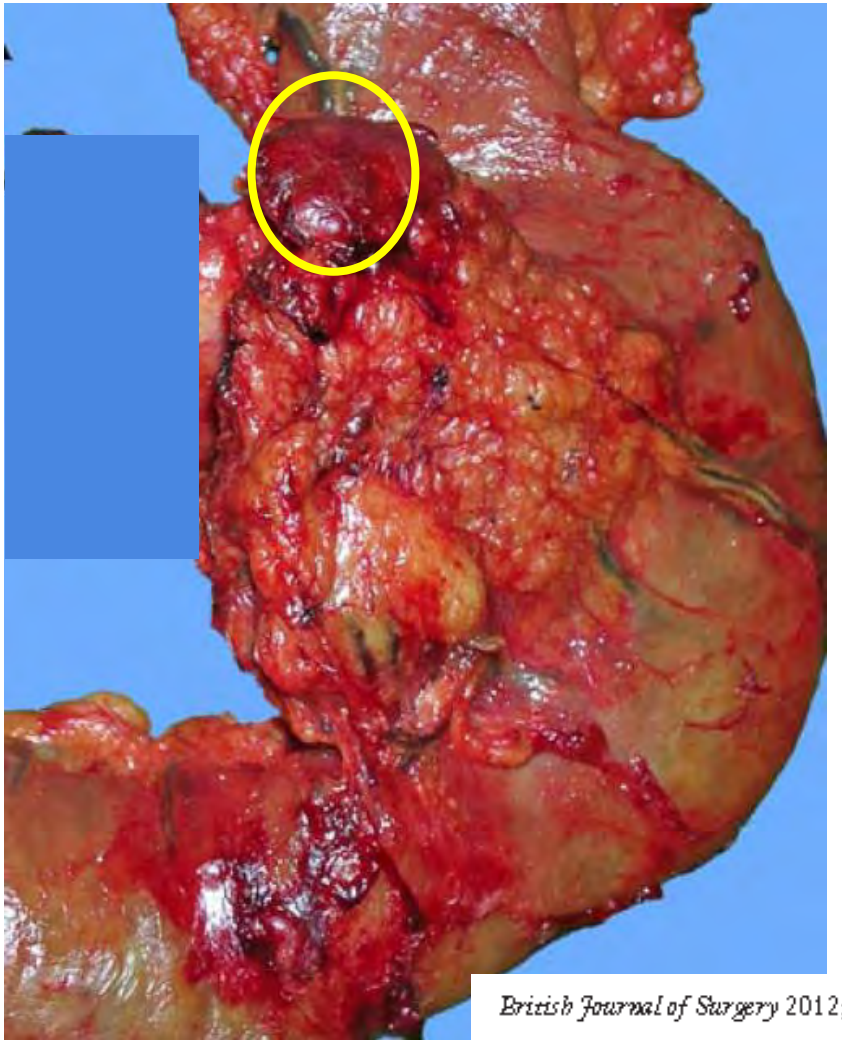


Orientation

- When the specimen is out of the body: challenging
- Sutures marked by surgeons
- Important land marks and clues





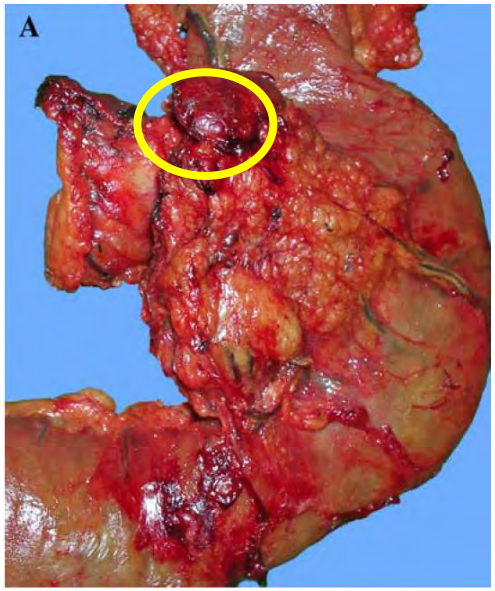


British Journal of Surgery 2012; 99: 1036–1049

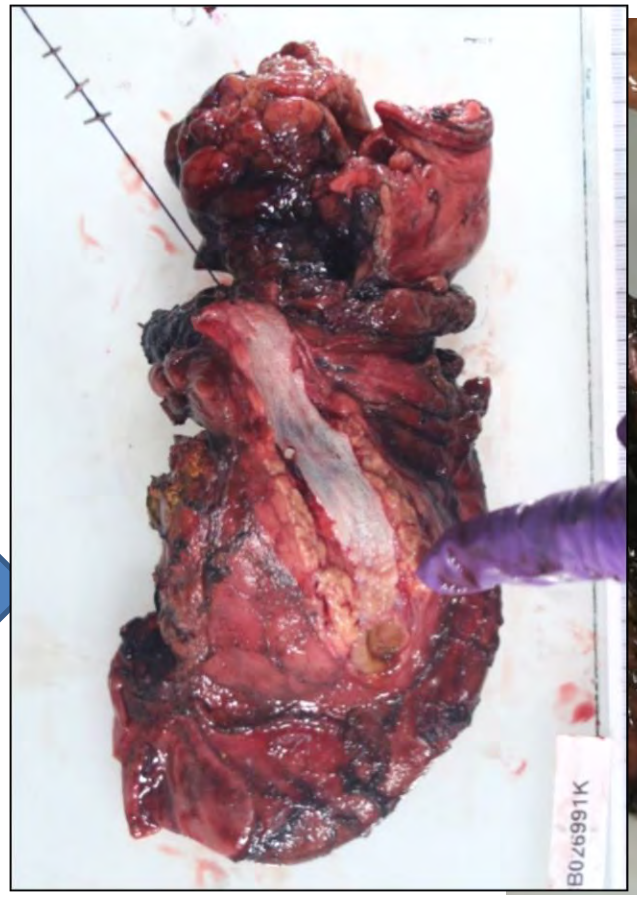
Anterior free surface:
Anterior pancreaticoduodenal junction: abundant adipose tissue; convex; abrupt transition with the duodenal surface

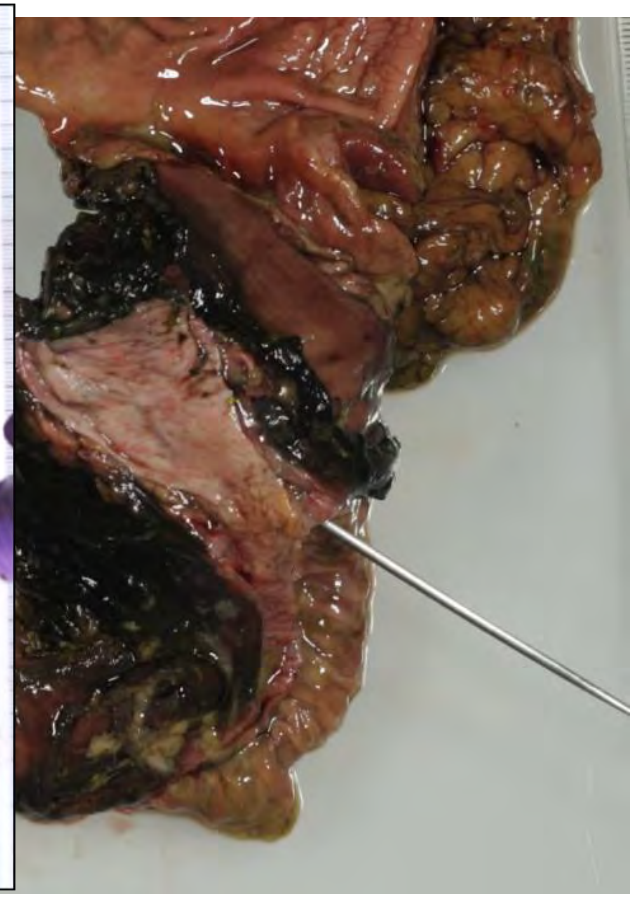
Posterior margin/surface
Posterior pancreaticoduodenal junction: relatively flat, shiny region; smooth transition; pancreatic head adjoins the duodenum

Posterior surface/margin and CBD



CBD enters pancreas superior-posteriorly

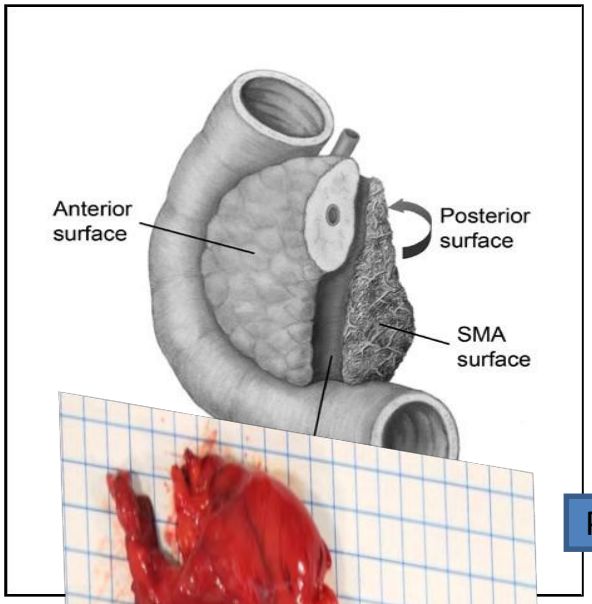




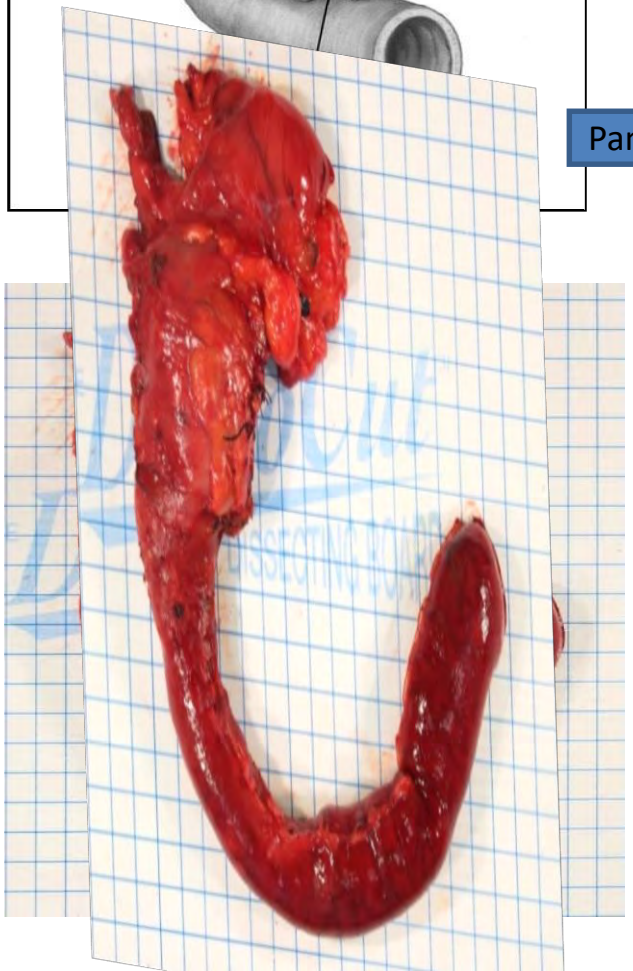
PANCREATODUODENECTOMY: MARGINS AND SURFACES

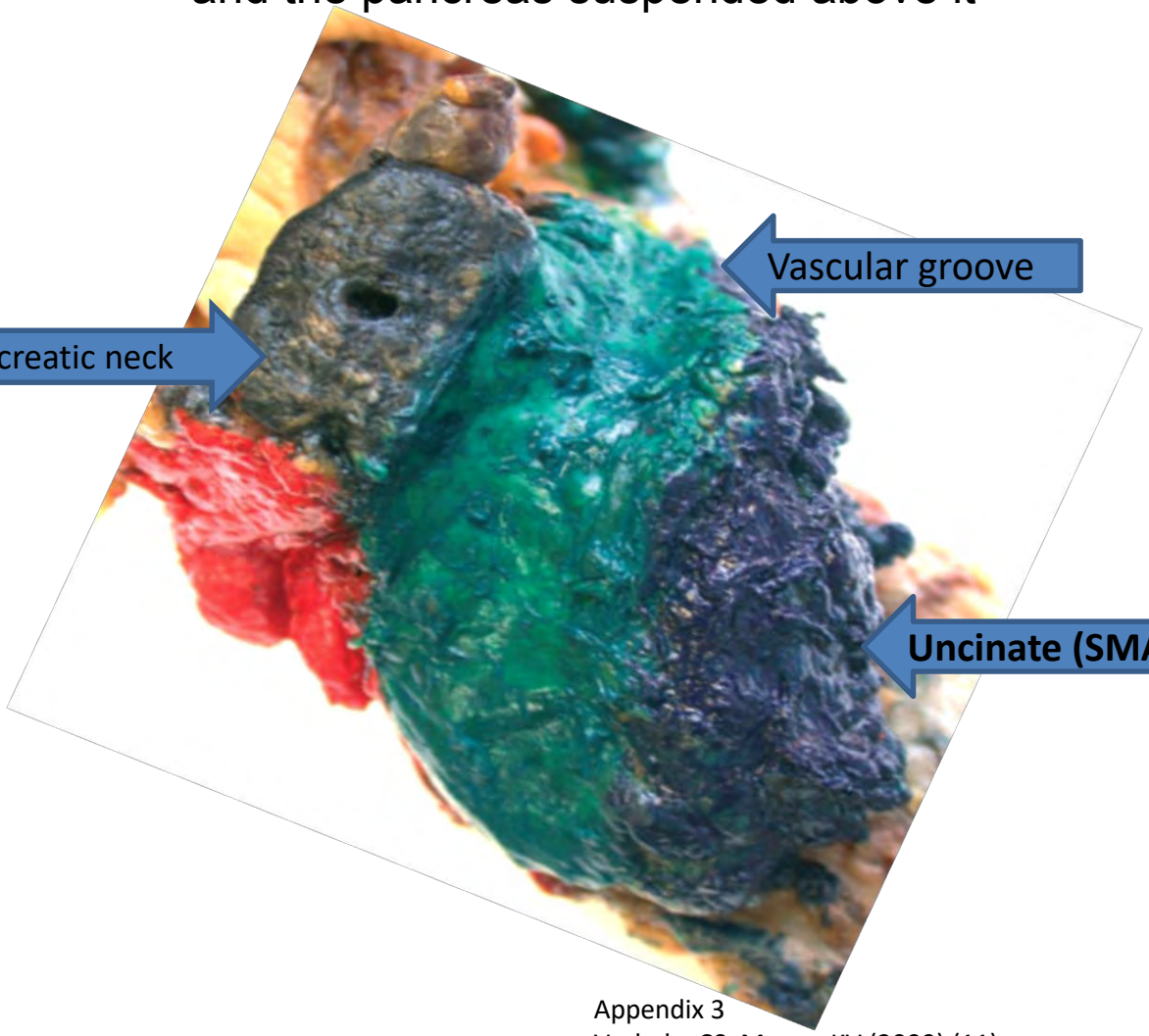
- Anterior surface
- Posterior pancreatic margin/surface
- **Pancreatic transection margin (neck or body)**
- **Uncinate margin (Superior mesenteric artery)**
- **Bile duct margin**
- **Vascular groove/bed**
- *Proximal gastric or duodenal margin*
- *Distal duodenal or jejunal margin*

Uncinate (SMA) & Pancreatic neck margin, & Vascular groove



When the duodenum is laid on the table and the pancreas suspended above it





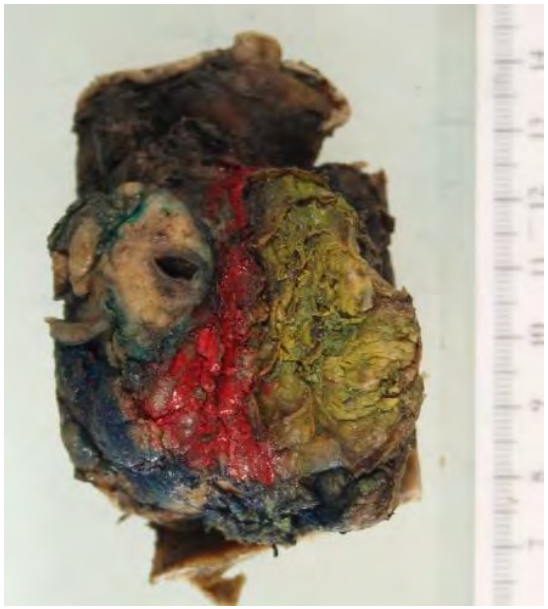
Appendix 3
Verbeke CS, Menon KV (2009) (11)
The Royal College of Pathologist (UK) May 2010 (12)

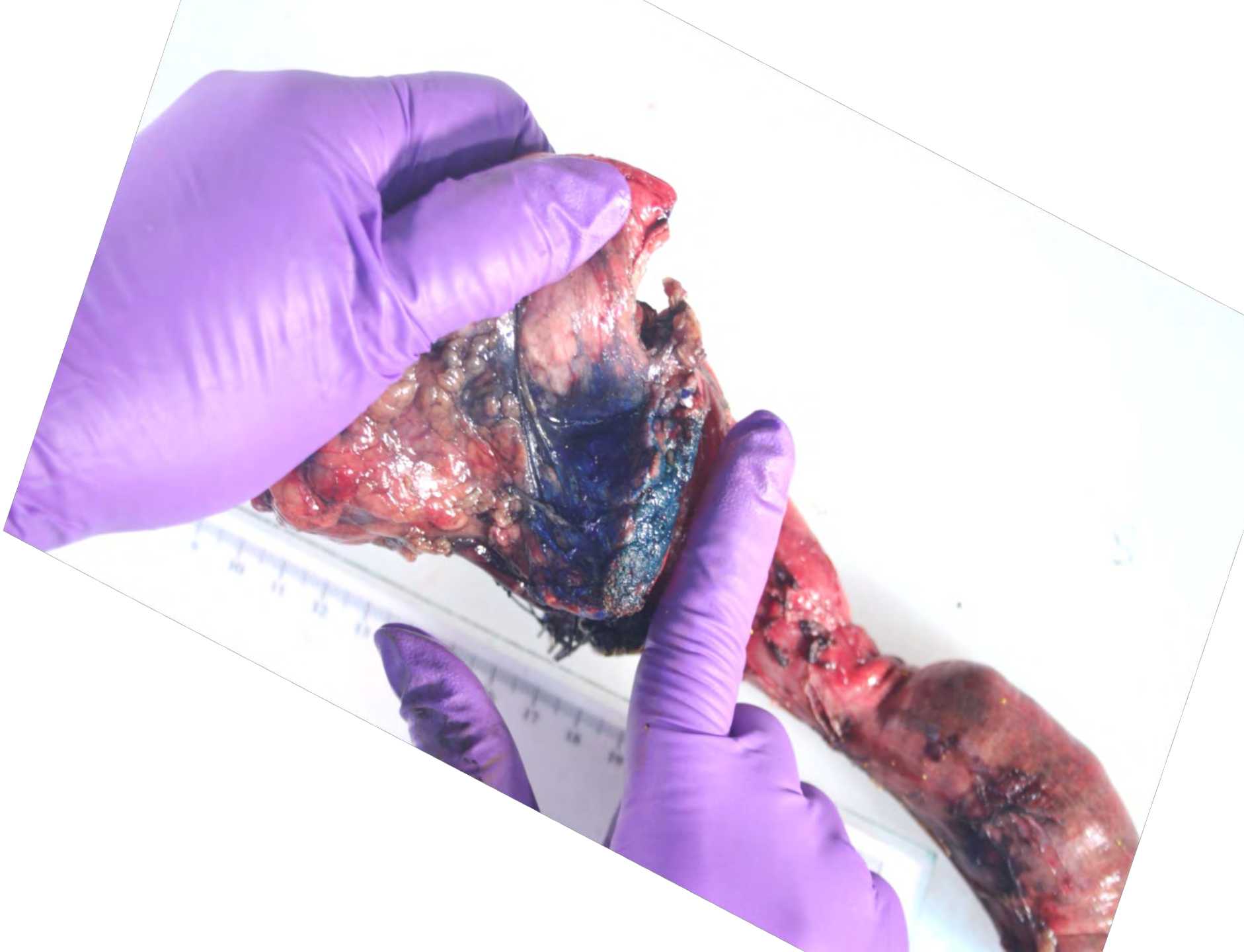
3 important LANDMARKS: “Trapezoid”

Am J Surg Pathol. 2014 April ; 38(4): 480–493

- Uncinate (SMA)
- Pancreatic neck
- Vascular groove

FIGURE 1.
Laying the duodenum with the pancreas on top allows readily the identification of the “trapezoid,” located in the postero-median aspect of the pancreatic head. The left vertical edge of the trapezoid is formed by the pancreatic neck margin* (often cauterized, relatively flat and reveals fine granularities) and the right vertical edge by the uncinate margin** (elongated, relatively soft and convex with highly irregular/nodular appearance). A concave-shaped, smooth-surfaced, relatively firm area in between these 2 margins is the vascular bed, where the superior mesenteric vein/portal vein and superior mesenteric artery lie originally.





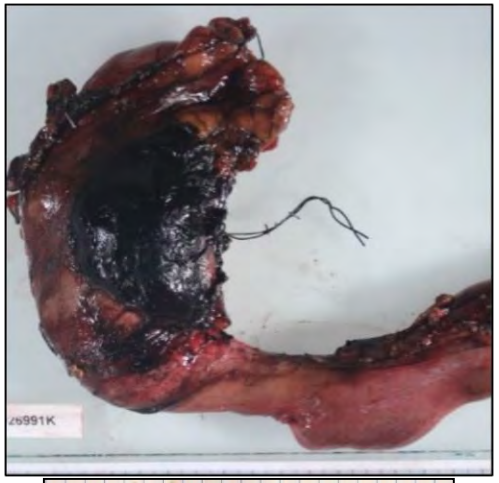
External examination

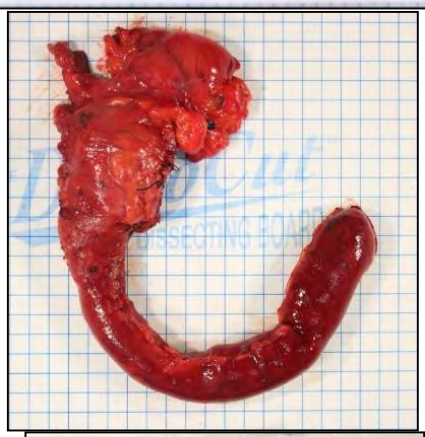
- **Be familiar with the clinical and radiologic findings and pre-operative diagnosis**
- PNETs/SPNs: palpable, bulging
- PDAC: palpate the pancreas to locate the tumour (no neoplasm visible)
- Proximal CBD Ca: Focus on the radial soft tissue surfaces (radial margins) surrounding the CBD at the superior
- Ampullary: Focus on the area; examine and open the CBD gently
- Cystic tumours:

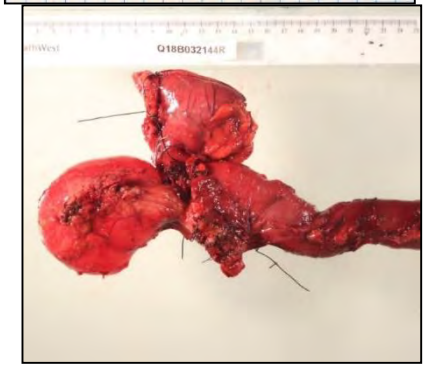
- May be identified externally; Measurements may need to be taken before cysts are ruptured

- Injection of formalin into the cyst may be helpful

- Tumour size - may not be accurate in specimens resected after neoadjuvant therapy.



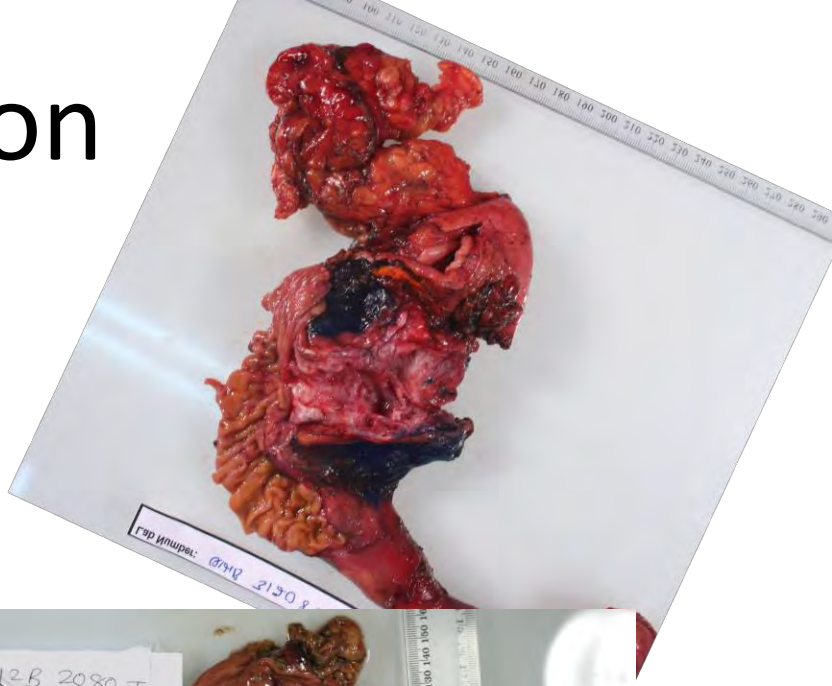


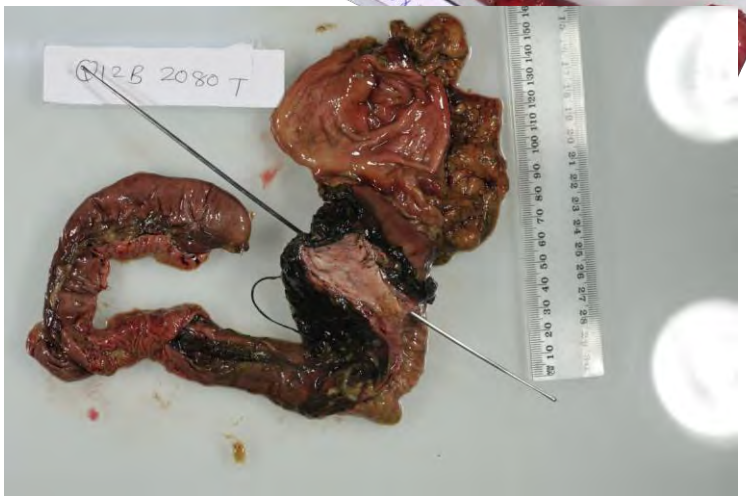


Dissection

- *Open the duodenum along the lateral antimesenteric border*

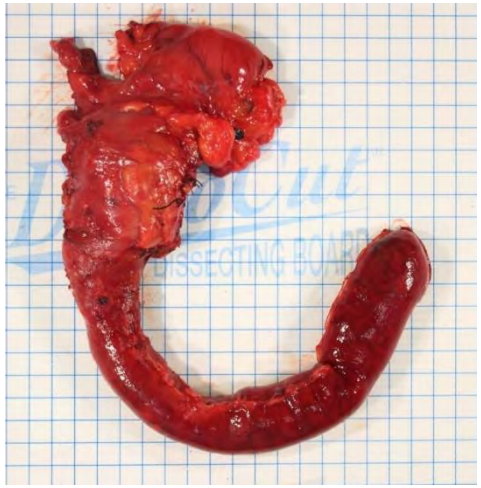
- -allows preservation and identification of the ampulla





- *Allow to fix*
- *Probe CBD and MPD*
- *Probe and open CBD*
- *Fix, sample margins before dissection*

Describe and measure the anatomical components present.

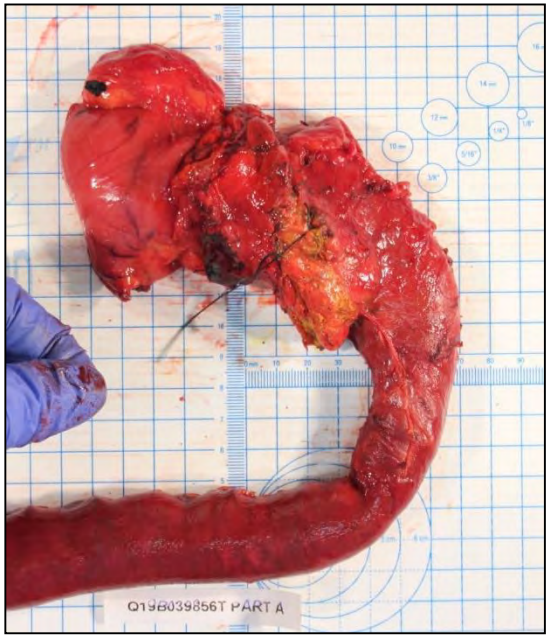


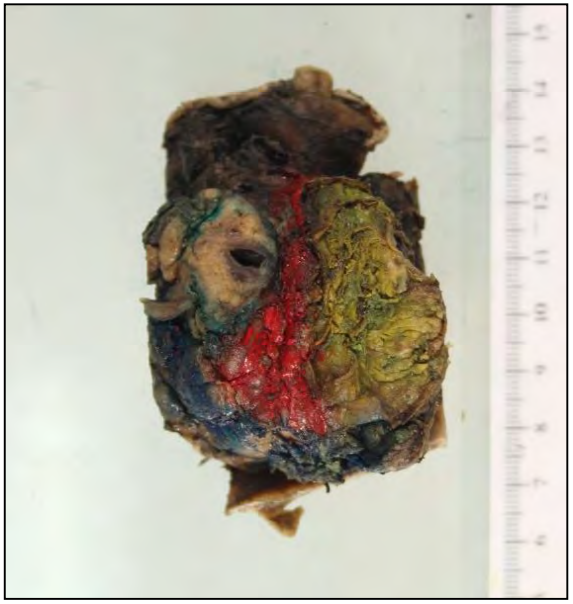
- Pancreas, in three dimensions, *inclusive of:*
  - Head
  - Uncinate process
- Bile duct, length and diameter
- Stents
- Mesenteric vessels/portion of vessel, length and diameter.

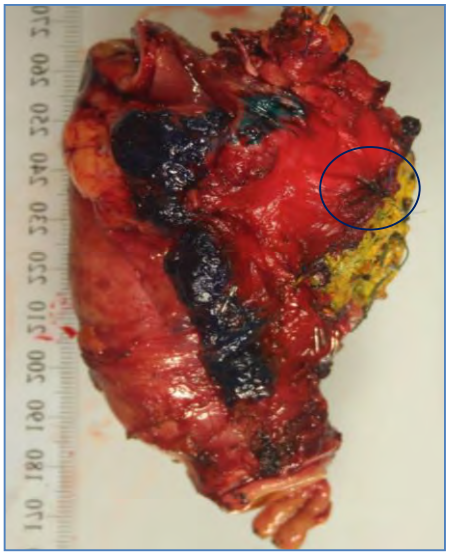
(Large vessels should be measured in three dimensions if a tangential resection has been performed or length x diameter if the whole circumference is present).

- Spleen, in three dimensions and weight
- Omentum, in three dimensions
- Stomach, length along lesser and greater curves
- Duodenum, length
- Gallbladder, in two dimensions
- Other, describe

Inking: Before and after fixation

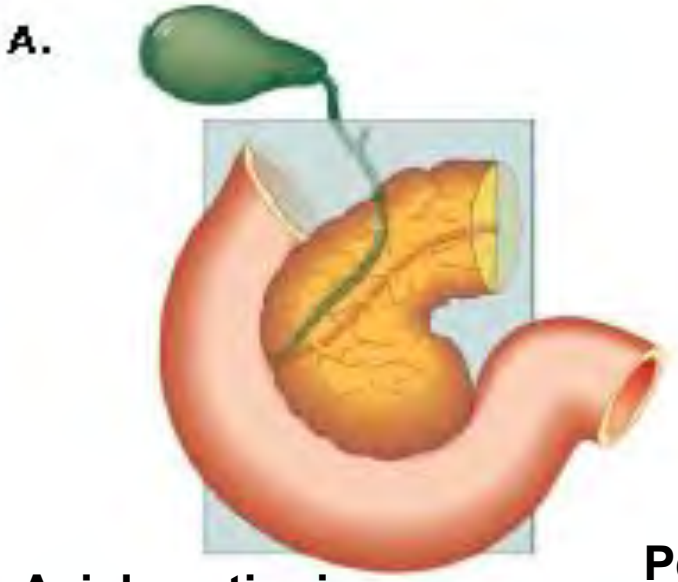




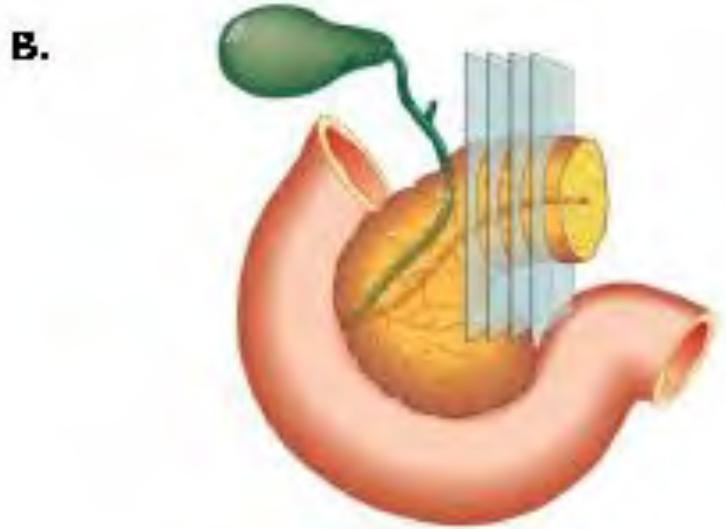


Dissection: technique

Bivalving method:

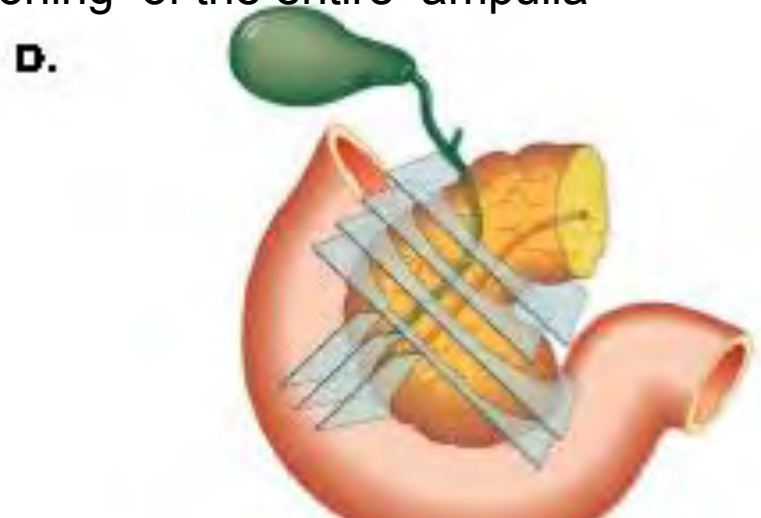


‘Bre**ad-loaf’ slicing:**



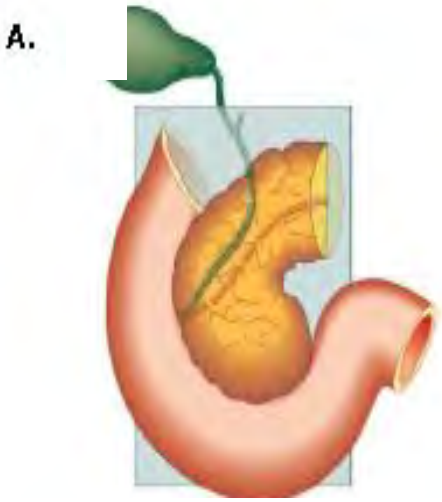
. **Axial sectioning:**

Perpendicular to the CBD (opened) followed by systematic sectioning of the entire ampulla

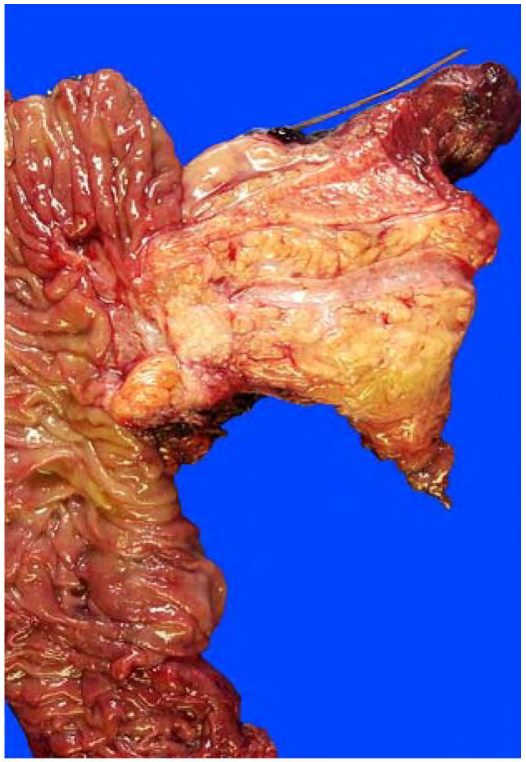


BIVALVING

Sectioning along the plane of the pancreatic and common bile ducts (bi-valving method).



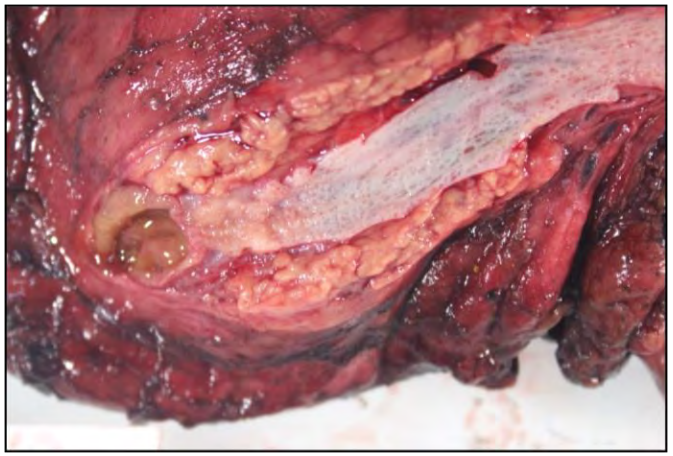
Allows examination and proper classification and staging of ampullary cancers



Probing of CBD and MPD

CBD: unlike the pancreatic duct, is virtually always probe-patent even in the presence of constrictive tumours.

MPD: difficult, kinked and may be obstructed.

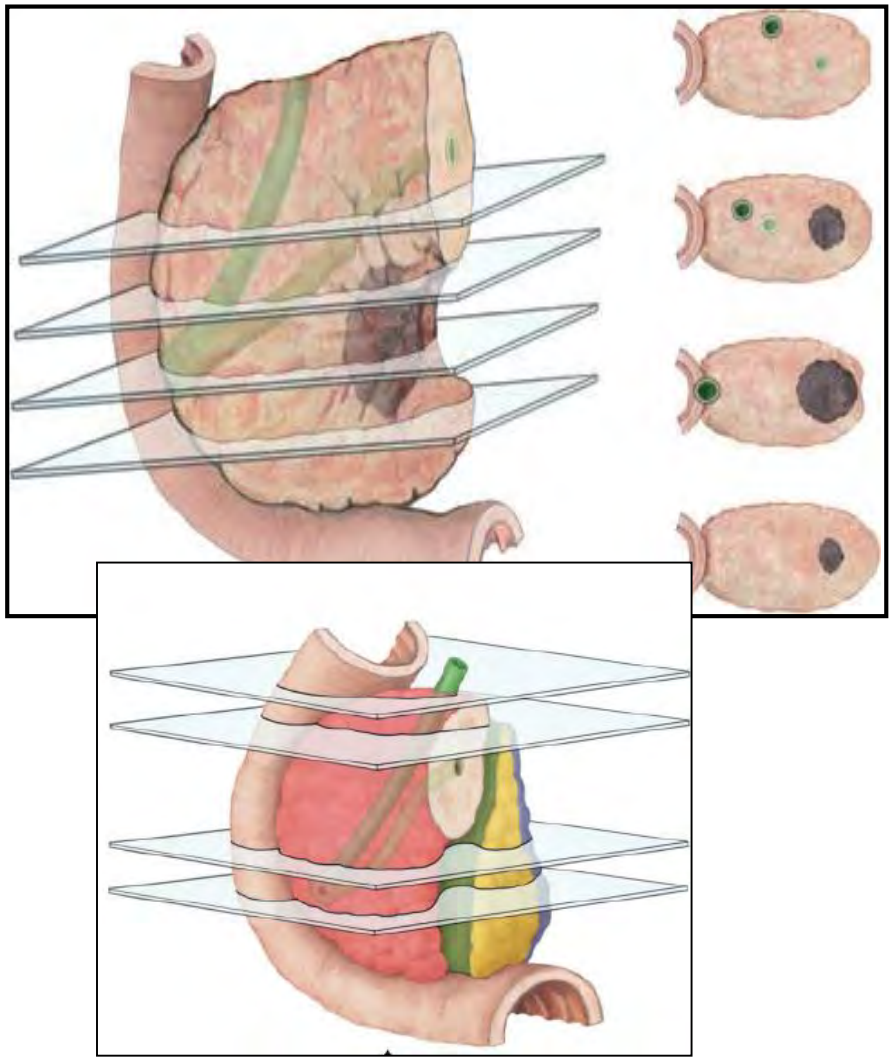


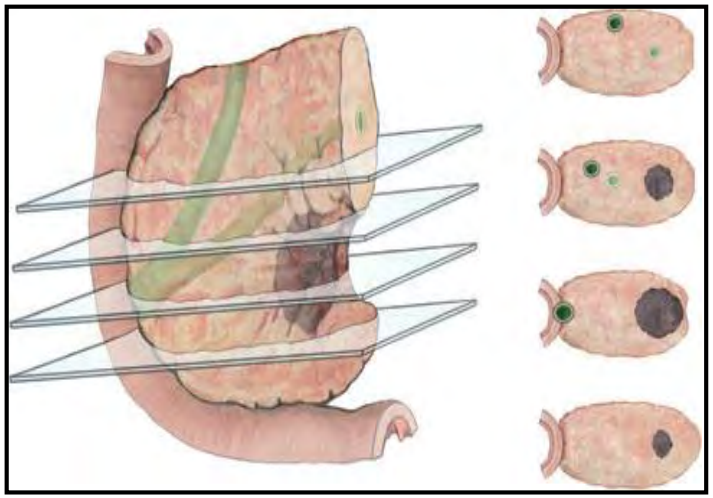
Axial sectioning

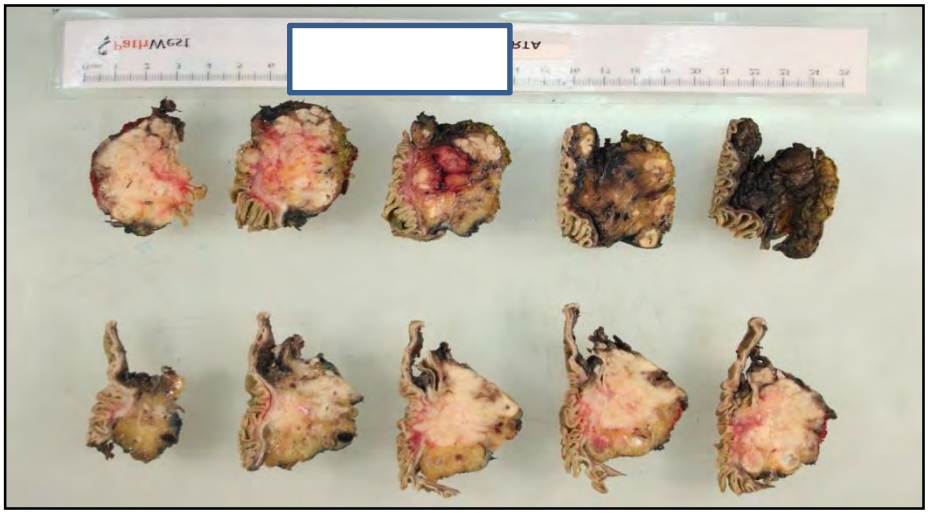
- Serially section the whole pancreatic head in the axial plane at 5mm intervals, i.e. perpendicular to the longitudinal axis of the duodenum to produce 10-13 slices.

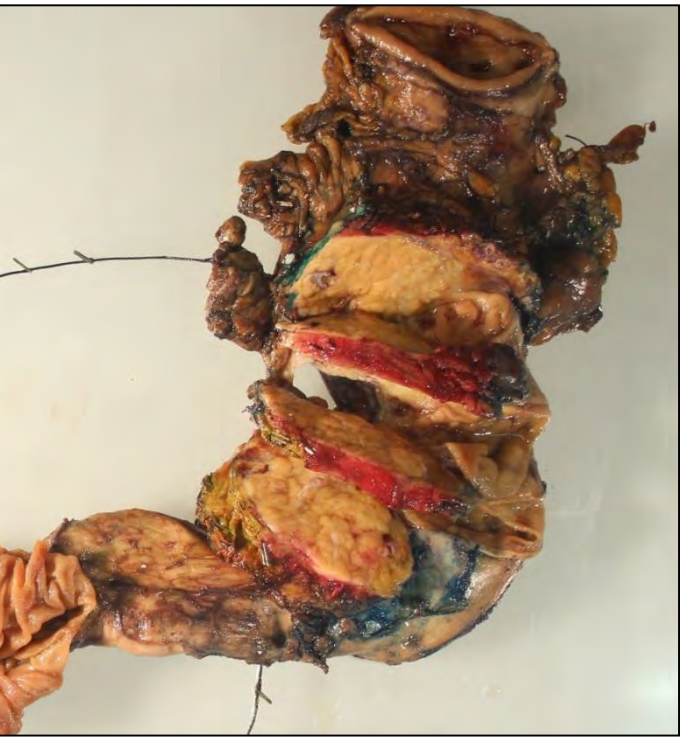
- Optimally one slice should be through the ampulla.

- Slices will include cross sections of the duodenum

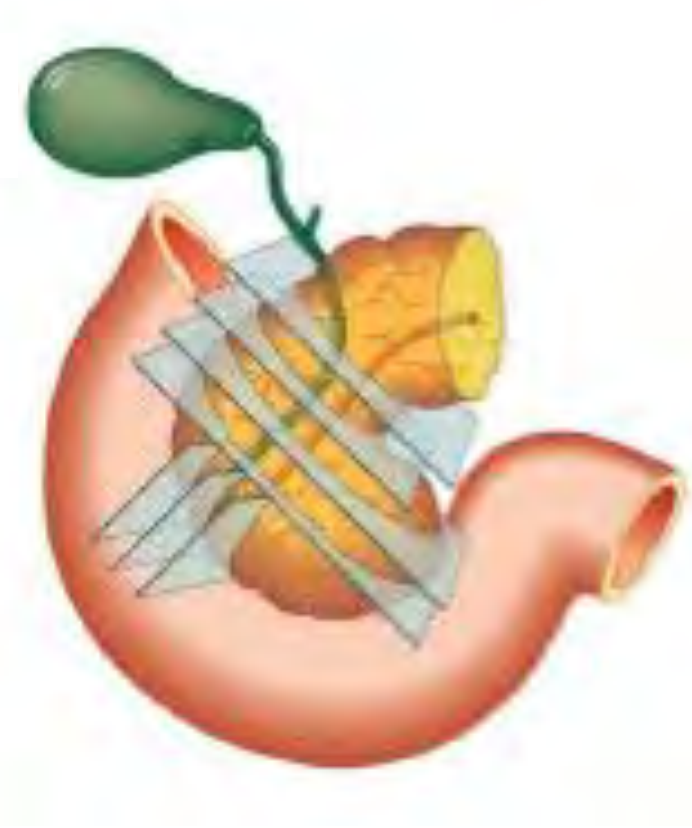


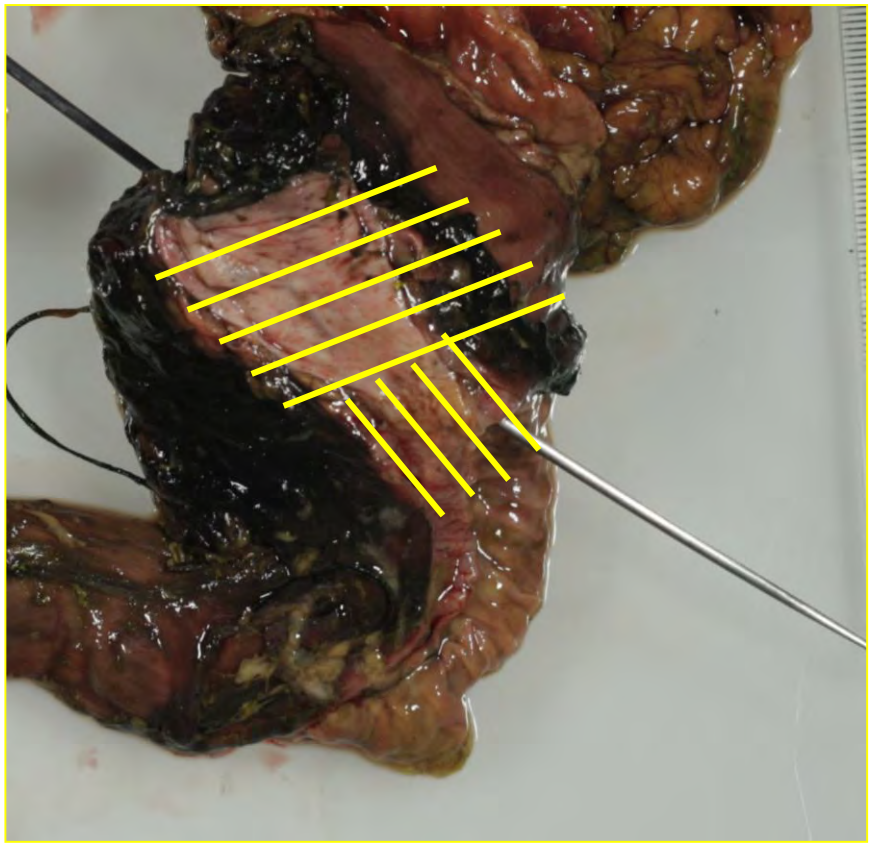






_ . **Sectioning perpendicular to the opened common bile duct** up to the periampullary region, followed by sectioning along the plane of the ampullary duct in the immediate periampullary region.





CBD: Virtually always probe-patent even in the presence of constrictive tumours total obstruction is incompatible with life/operability (vs. unlike the pancreatic duct)

Dissection technique

- Advantages and disadvantages exist for all
- Standardisation of dissection method and subsequent blocking of specimens in institutions: desirable
- Selected technique:

- Observe the gross abnormality (‘a peak!’),
- Observe the tumour relationship to key anatomical structures
- Assess tumour origin: PDAC, CBD, Ampulla (subtypes), margins and surfaces
- Special attention to relevant areas
- Targeted sampling

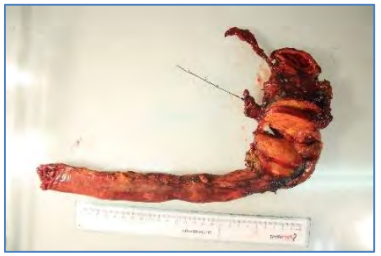
Depends on the pre-op diagnosis, ‘enthusiasm’… !!

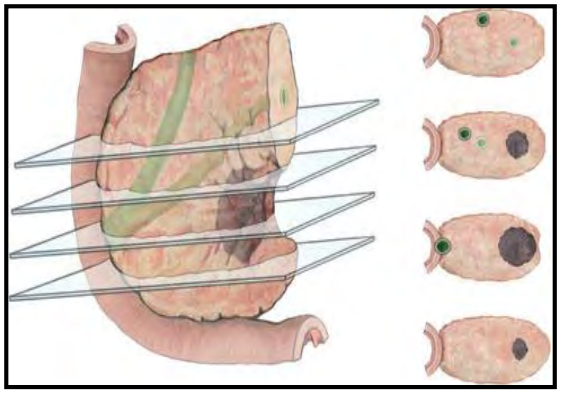
PDACS and other solid tumours

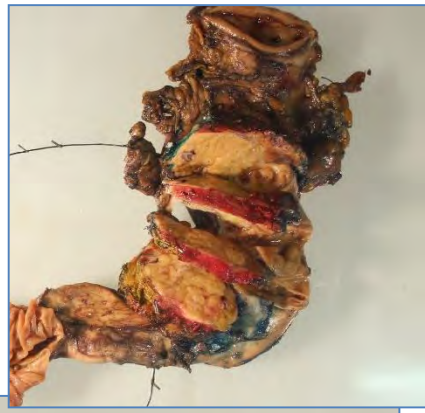
PDACS

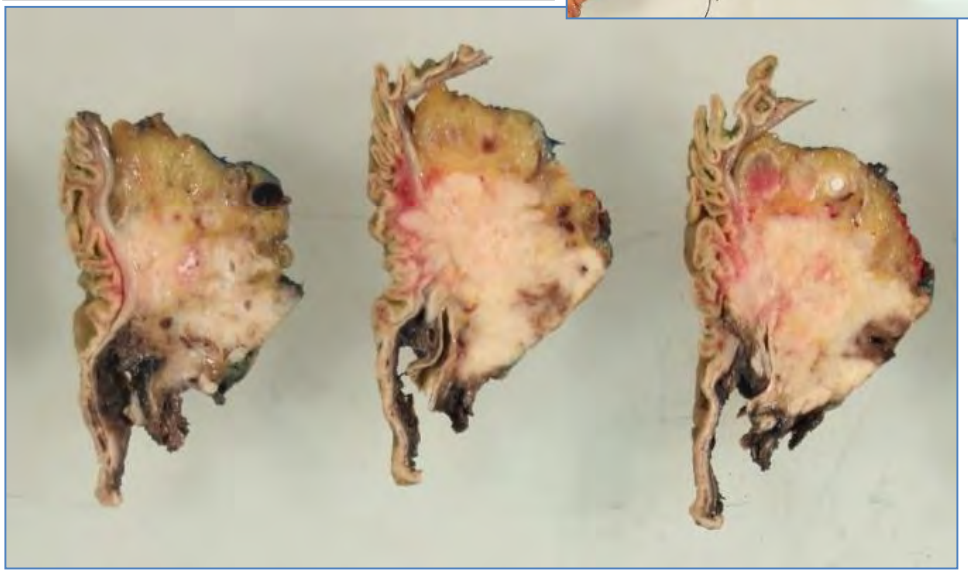
- Many are post CRT: not visible grossly
- Scirrhous, ill-defined; typically grey-green ; firm-white
- Infiltrate surrounding soft tissue with puckering of the adipose tissue

NETs and SPNs



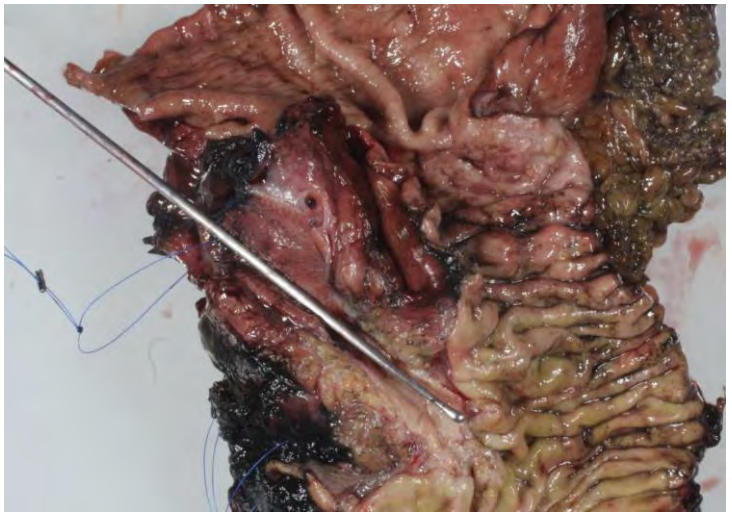






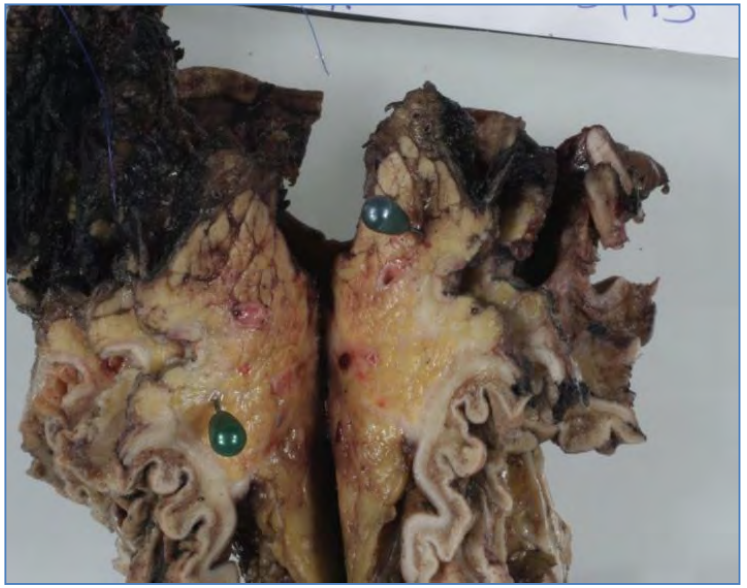
CBD carcinoma

Bulk of the lesion circumferentially around the CBD - documented grossly- **strictures**

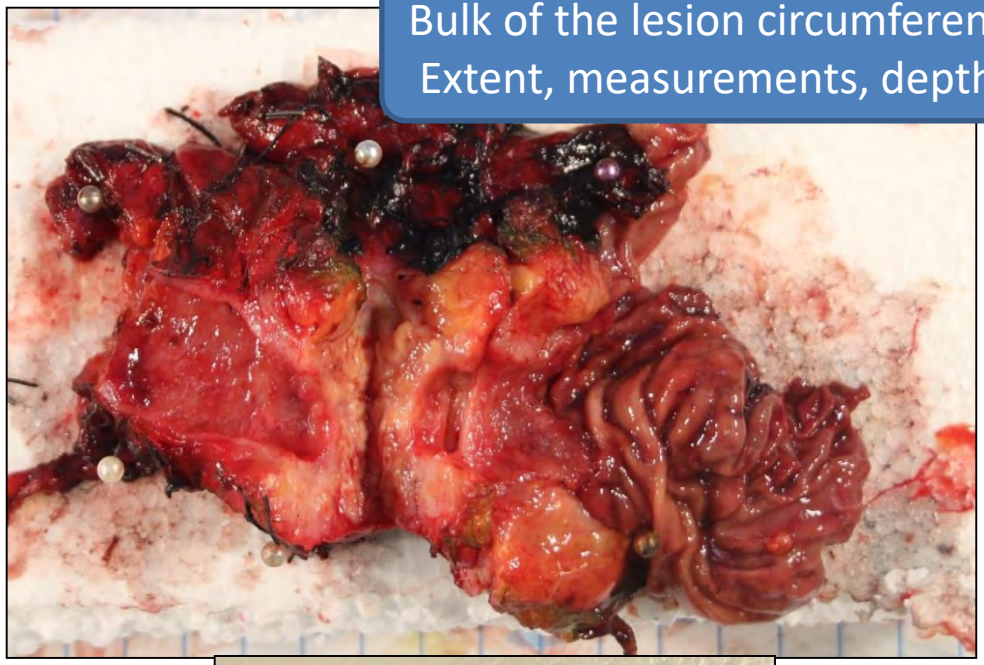


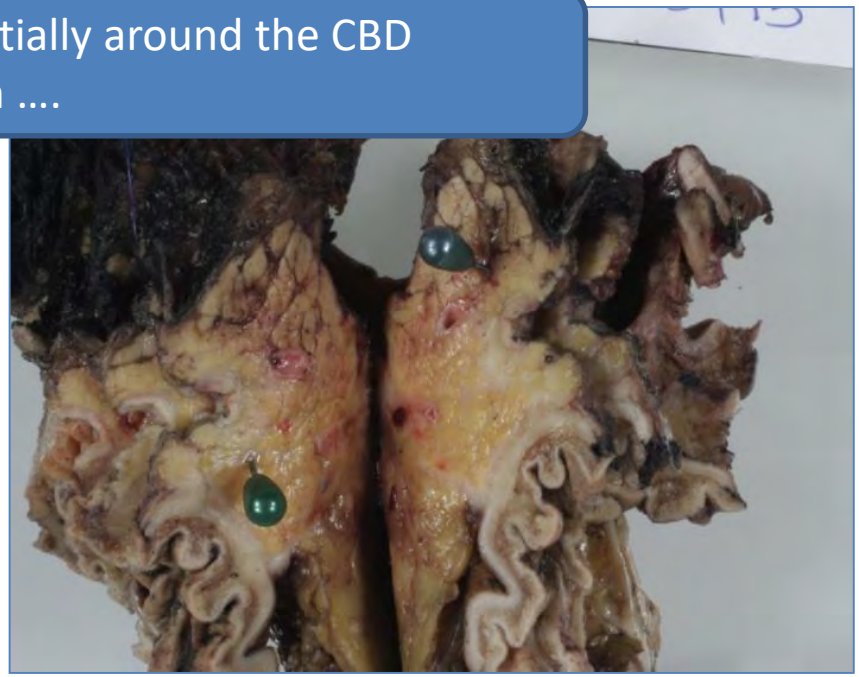
- Gross appearance: Essential

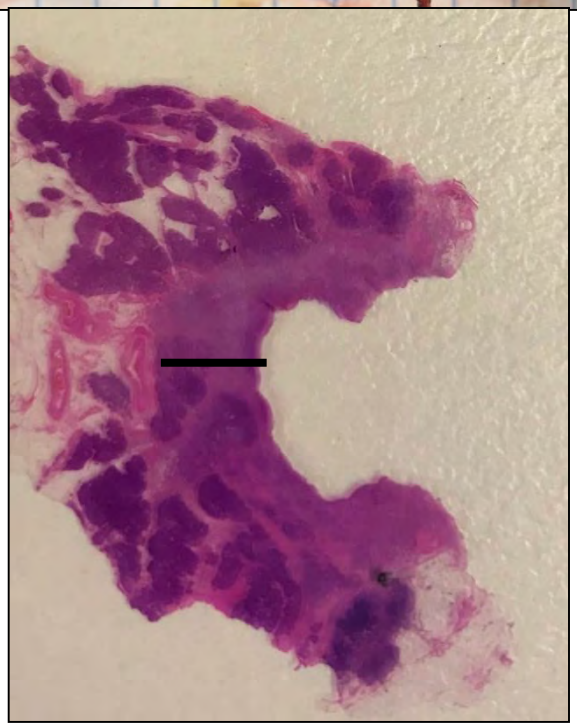
- Microscopic alone: Difficult; CBD vs MPD
- CBD: Generally thicker, wider, more peribiliary mucous glands, smooth muscle.

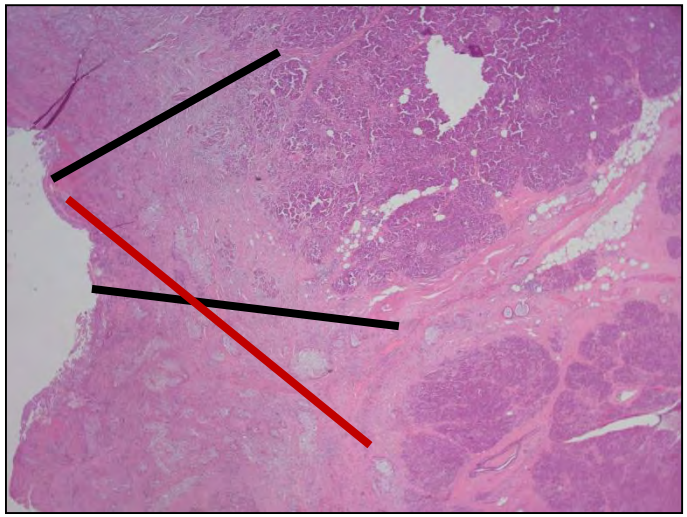


Bulk of the lesion circumferentially around the CBD
Extent, measurements, depth ….



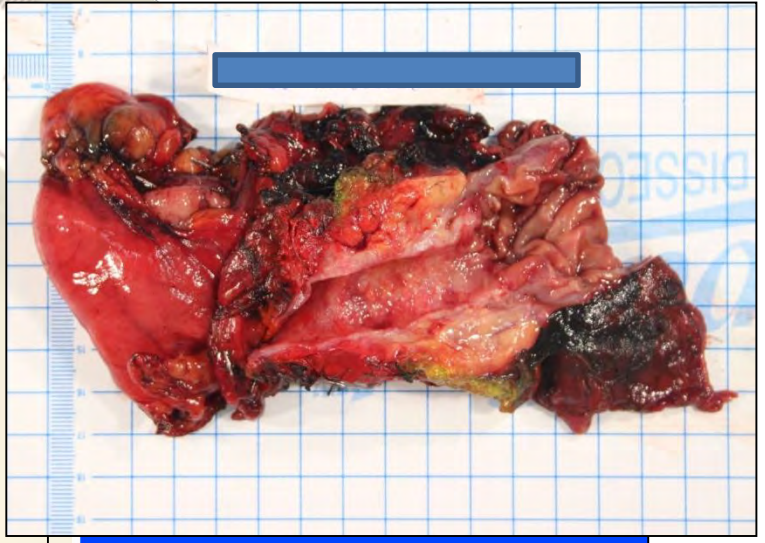




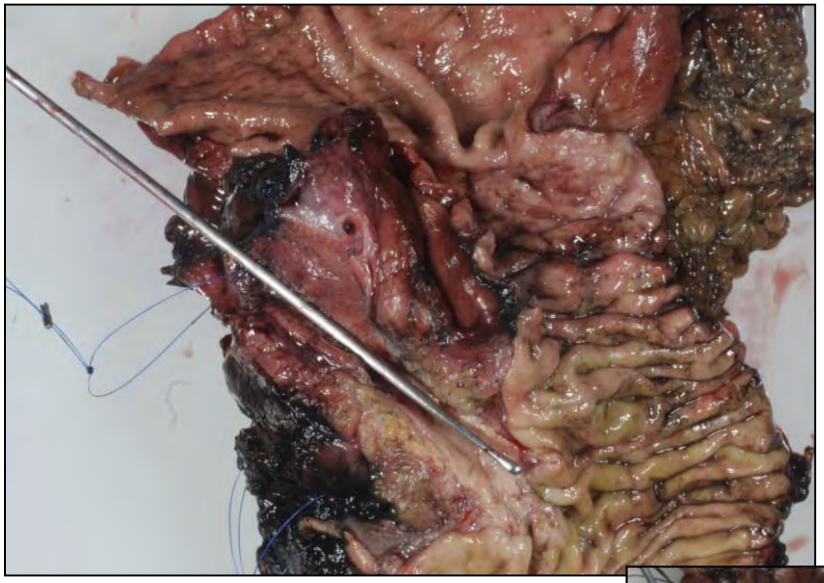


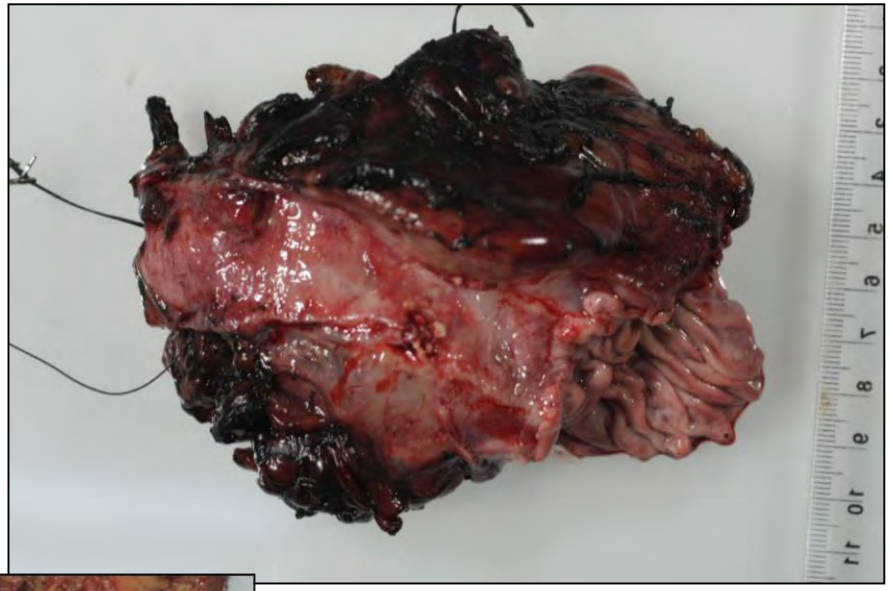
Staging (AJCC 8th edition)

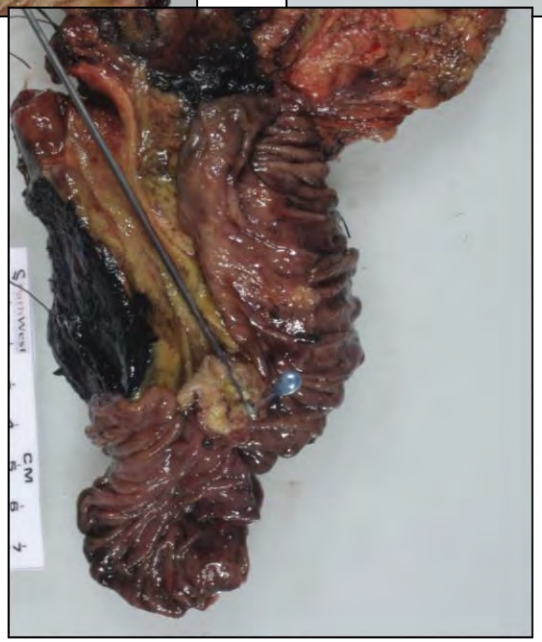
Look into the pancreas!!



Pre-op diagnosis - Distal Common Bile duct stricture







Cytology : adenocarcinoma

Correlate with brush cytology and issues

Ampullary carcinomas

- Bulk (> 75%) of the tumour in the ampulla (main definition of ampullary carcinoma)
- Findings in the duodenal surface of the ampulla is crucial
- **Look into the pancreas!!**
- **Tumours of the small intestine and ampulla (WHO 2018)**

- Carcinoma of the ampullary duodenum: "intestinal type".

- Intra-ampullary papillary tubular neoplasms (IATPN): lesion filling the ampullary channel .

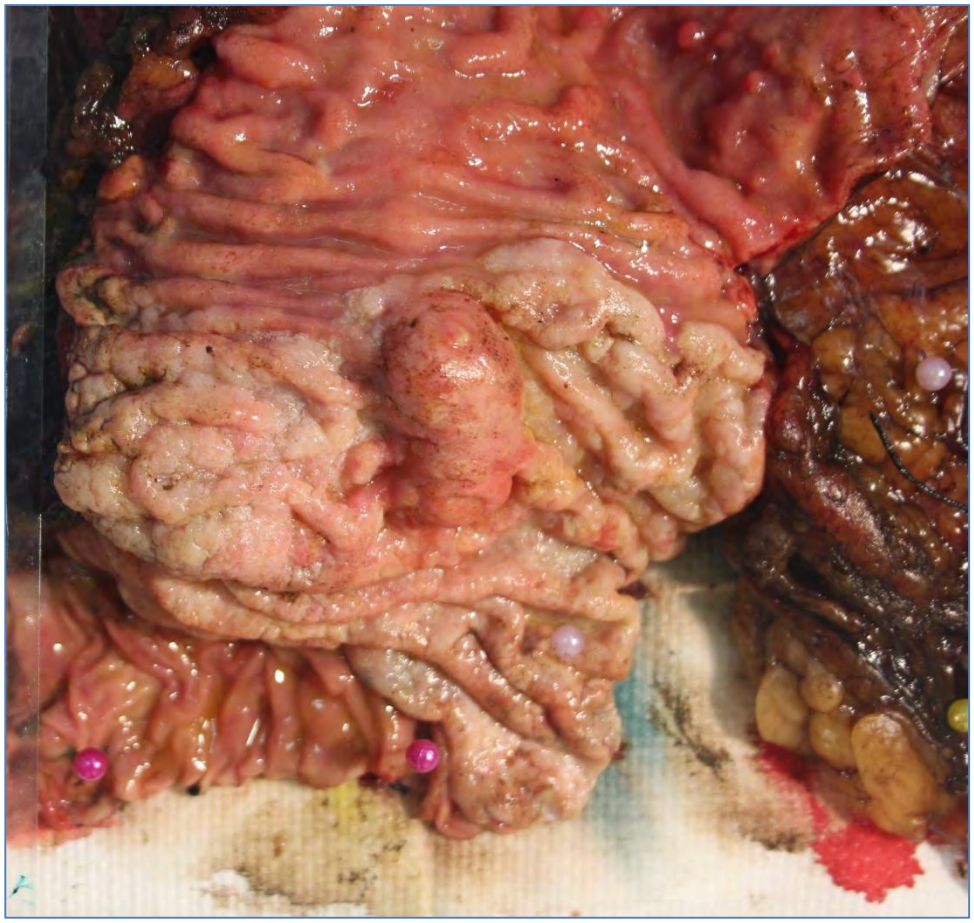
- Carcinomas of ampullary ducts: are usually subtle from the duodenal side, circumferential scarring of the distal end of opened CBD ("PB type").

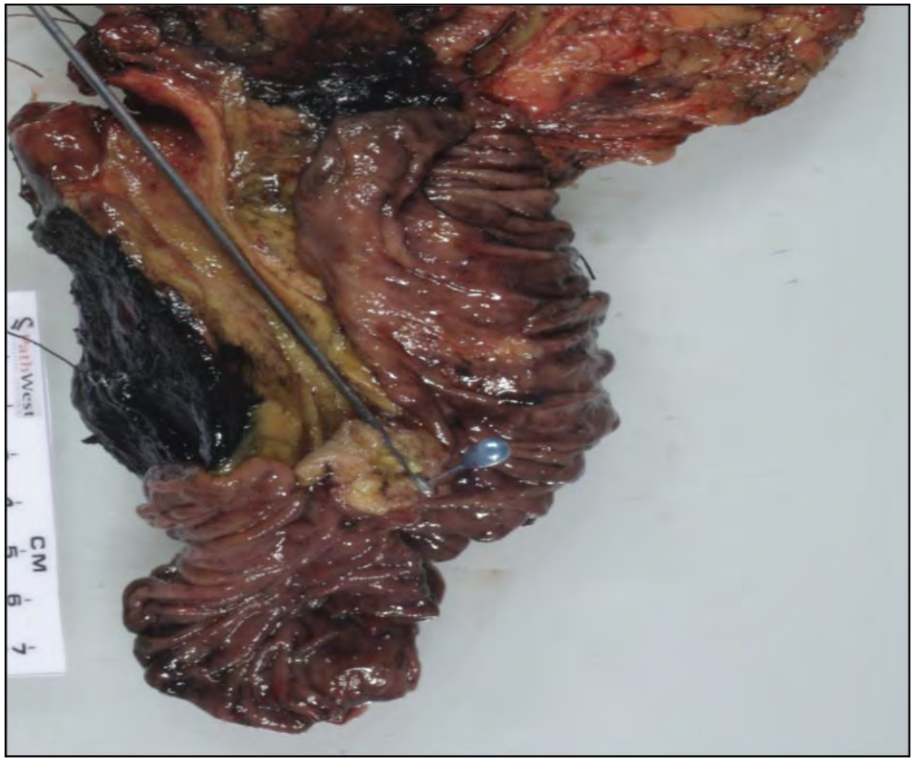
- Mixed (ill defined)

Gross examination and detailed assessment of the ampulla is crucial

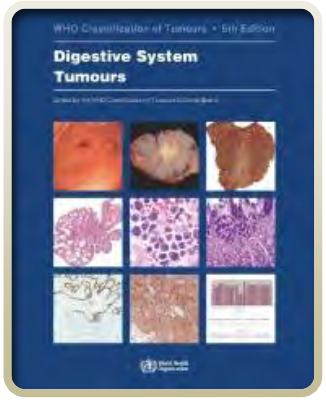
Ampullary carcinoma

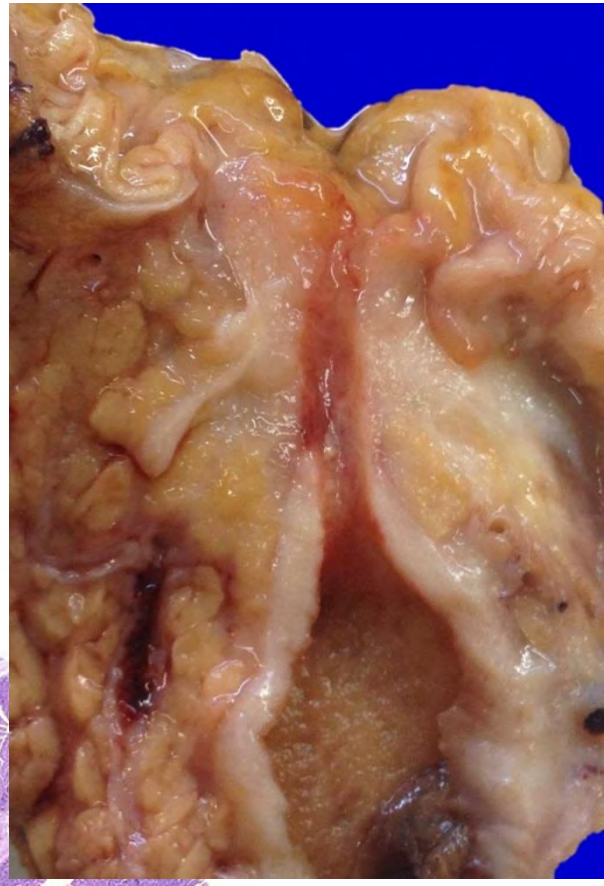
Florid vegetating/ulcerating mass on the duodenal surface ; ampullary orifice is eccentrically located

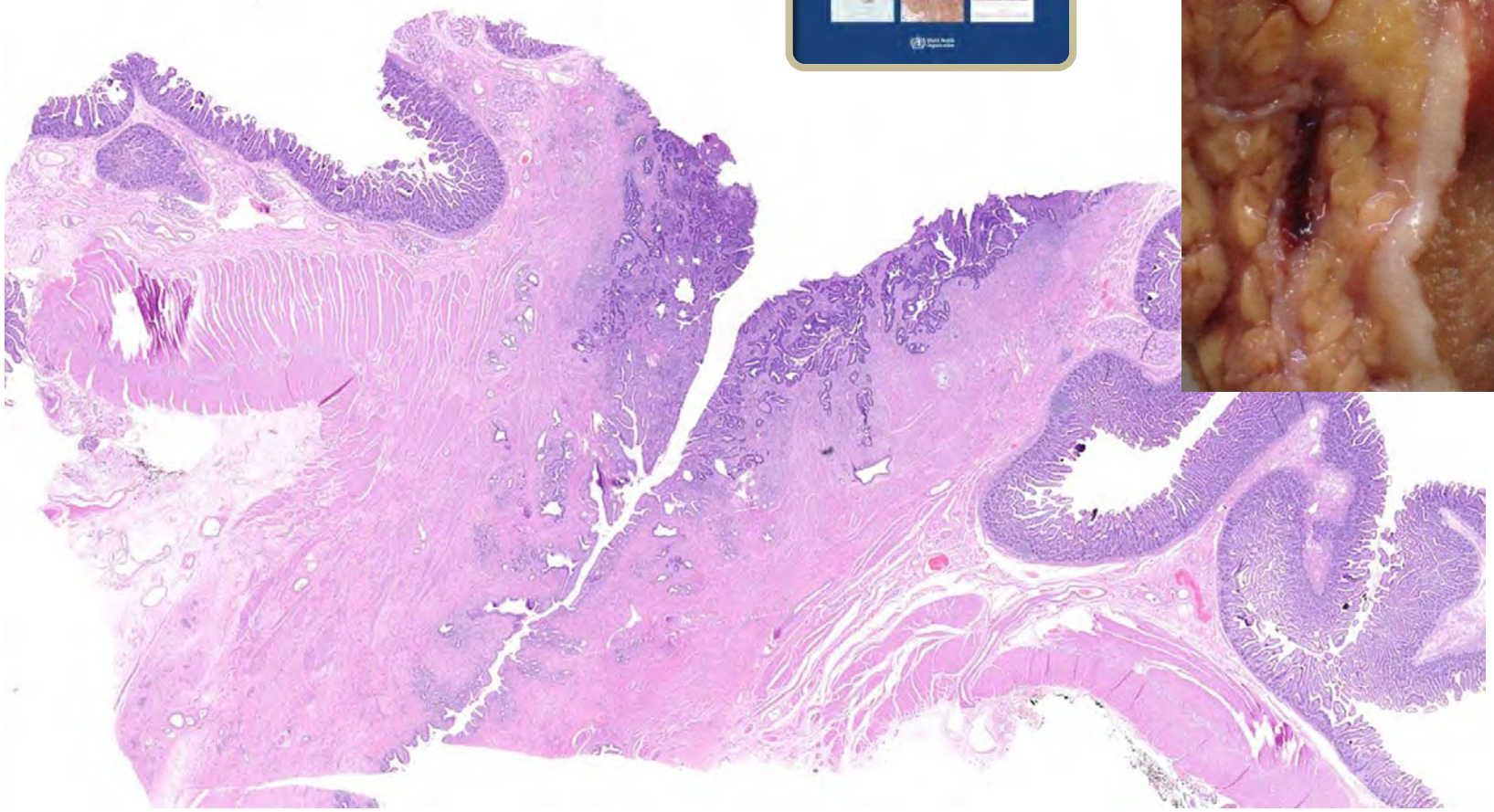


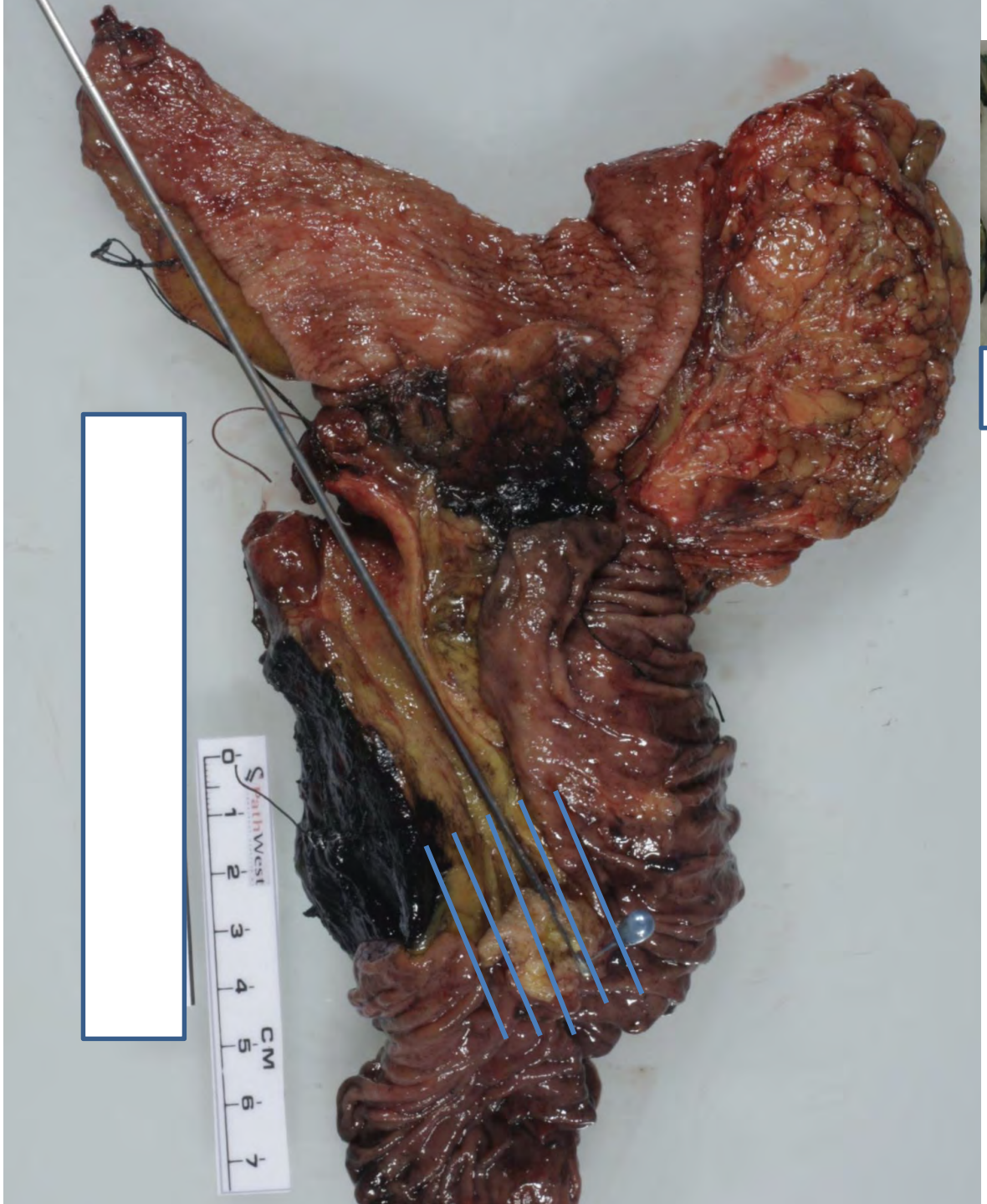


Carcinomas of ampullary ducts





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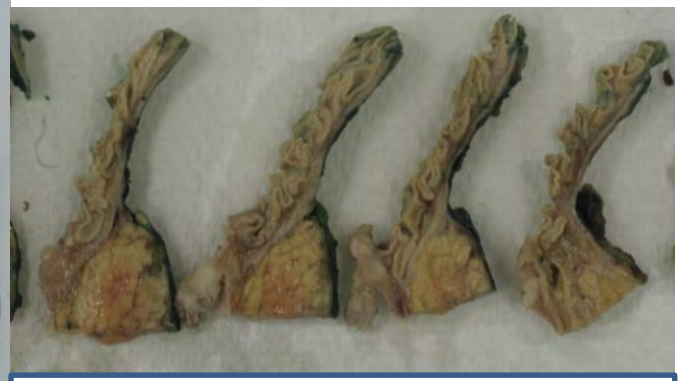
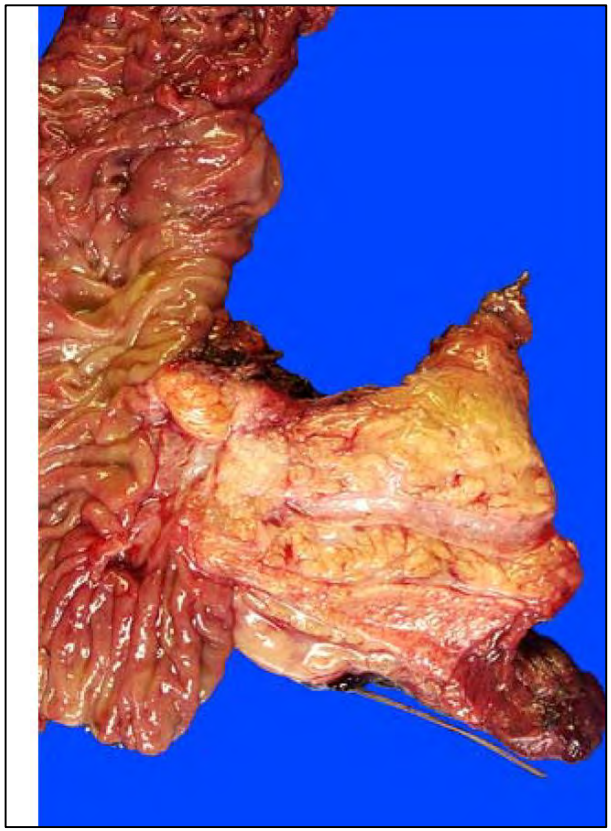




Macroscopic Clues: Intraductal neoplasms

Knowledge of prior diagnosis (Cytology), Clinical and radiologic findings

- Often present as cystic tumours (intraductal nature is often presumed rather than documentable)
- Origin: Pancreatic ducts

- Gross examination: critical
- Microscopic: issues

  Main pancreatic duct vs. larger branch ducts: nothing unique.

  Dilatation in the main duct (“pseudo IPMN”) : due to small lesions, e.g. PanNETs

- Targeted sampling: solid, granular areas


Lab Number:

MARGINS and sampling

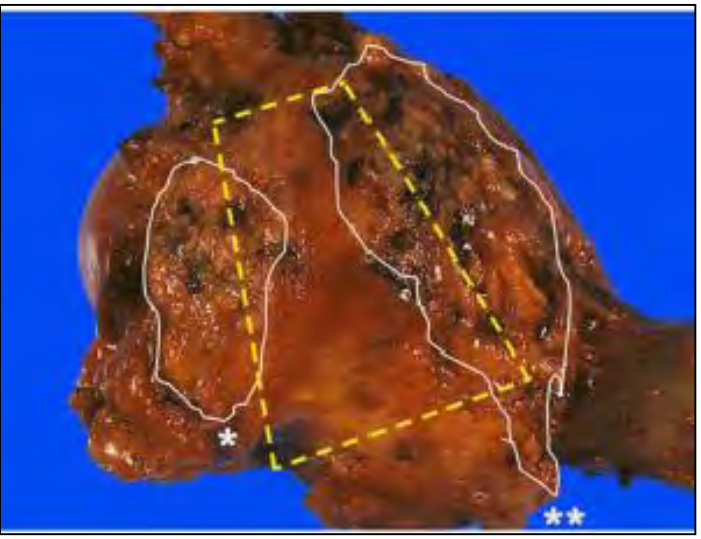
- **Pancreatic transection margin (neck or body)**
- ***Superior mesenteric artery margin (uncinate margin)***
- **Bile duct margin**
- Posterior pancreatic margin/surface
- Vascular bed
- *Proximal gastric or duodenal margin*
- *Distal duodenal or jejunal margin*
- ***Portal vein and superior mesenteric vein flap/segment and margins if included***

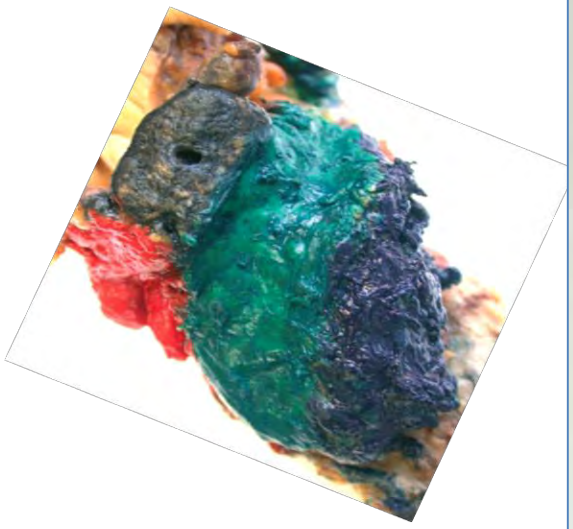
- Frozen section

- *Before dissection*

Pancreatic neck margin

Where the pancreatic neck is transacted and the head is surgically separated from the rest of the pancreas

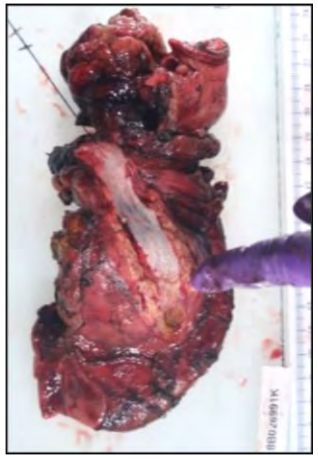


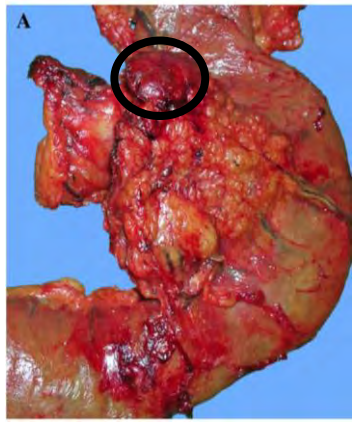


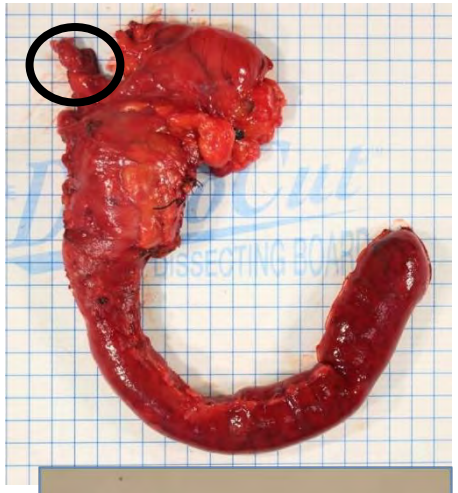
CBD margin

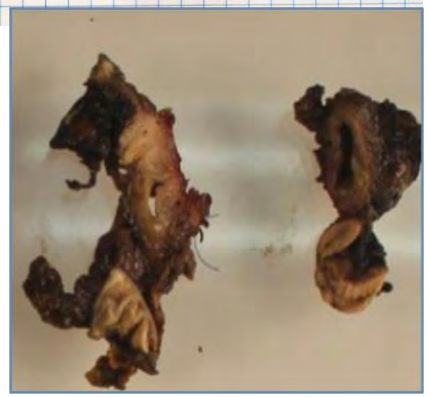
- Typical tubular appearance and the bile stained mucosa when visualised.
- Margin is easily identified: frozen section (suspected CBD ca)
- Often a large benign node
- Some times with the cystic duct

(double barrel); hepatic duct margin



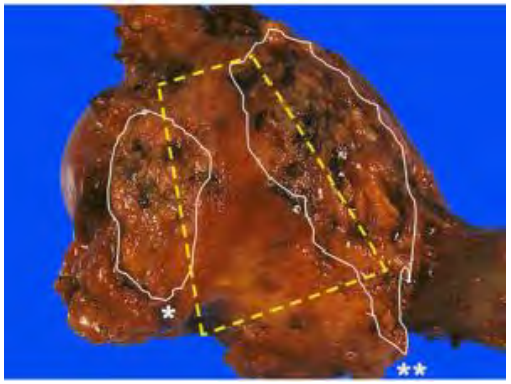


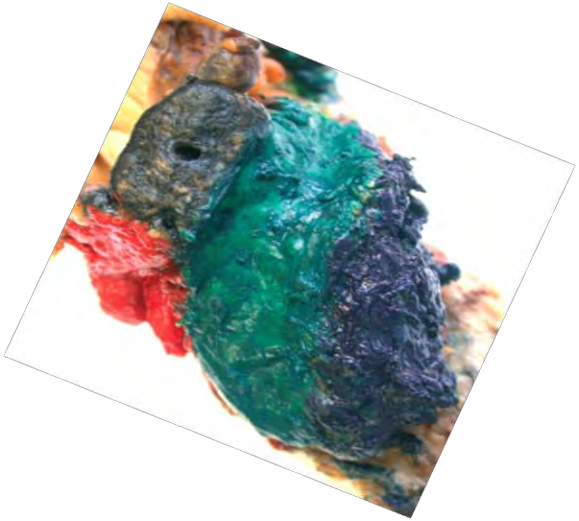


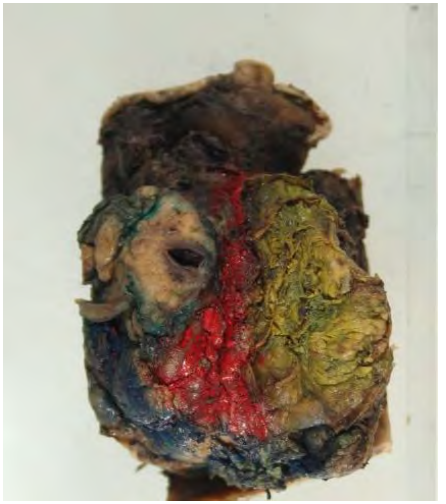


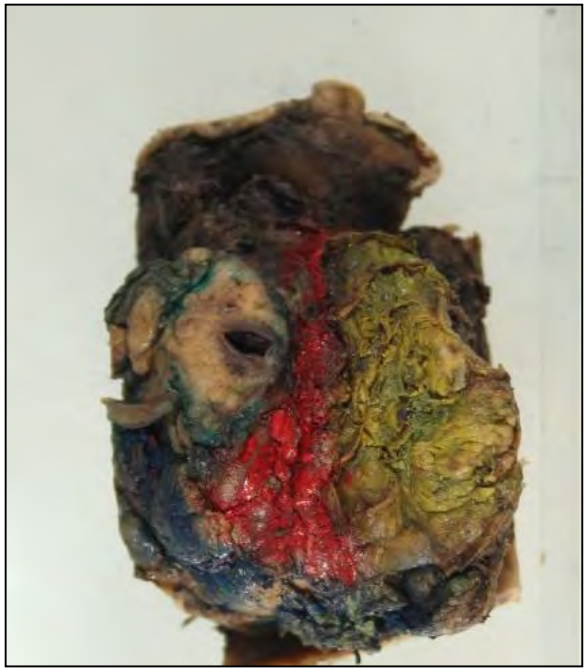
Uncinate/SMA margin

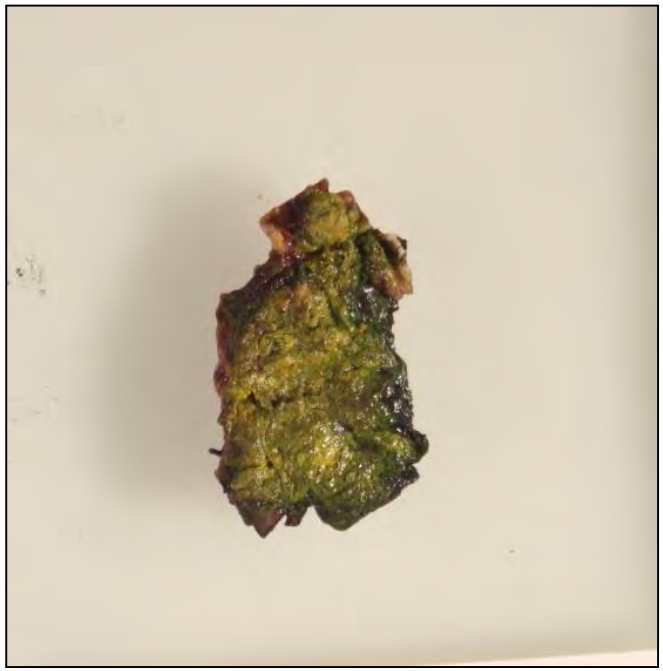
- Area that is surgically dissected from the posterior retroperitoneal soft tissues





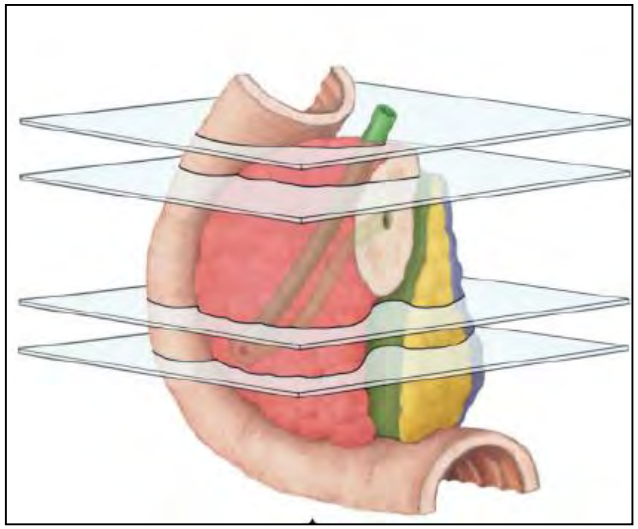


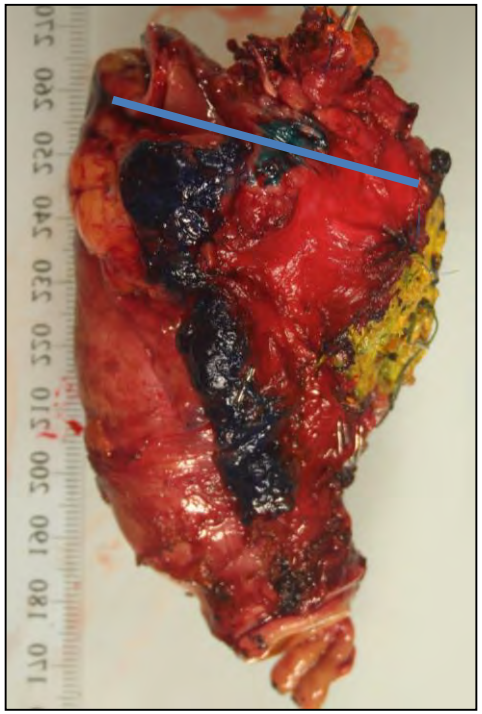


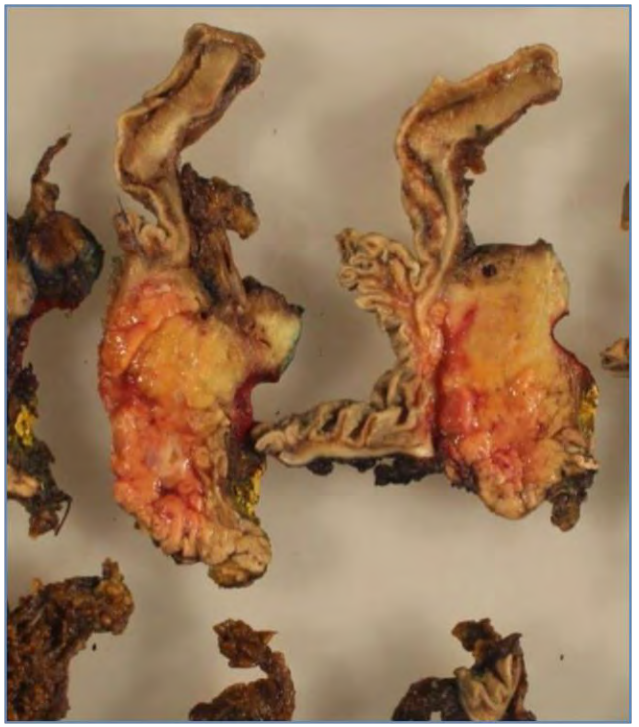


Uncinate/SMA margin

British Journal of Surgery 2012; 99: 1036–1049







Most important driver of survival

SMA margin (uncinate)

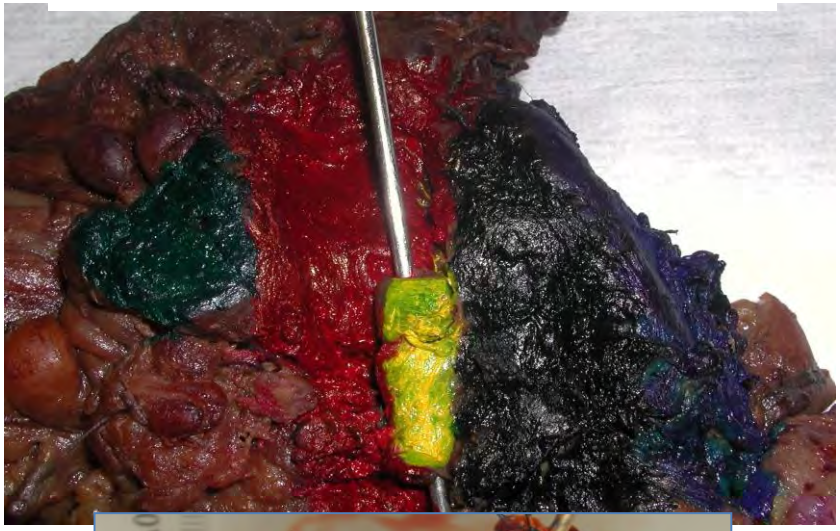
- Most important driver of survival
- Most frequently involved margin (in up to 85%)
- No buffer of fat and areolar tissue between the uncinate process and the SMA

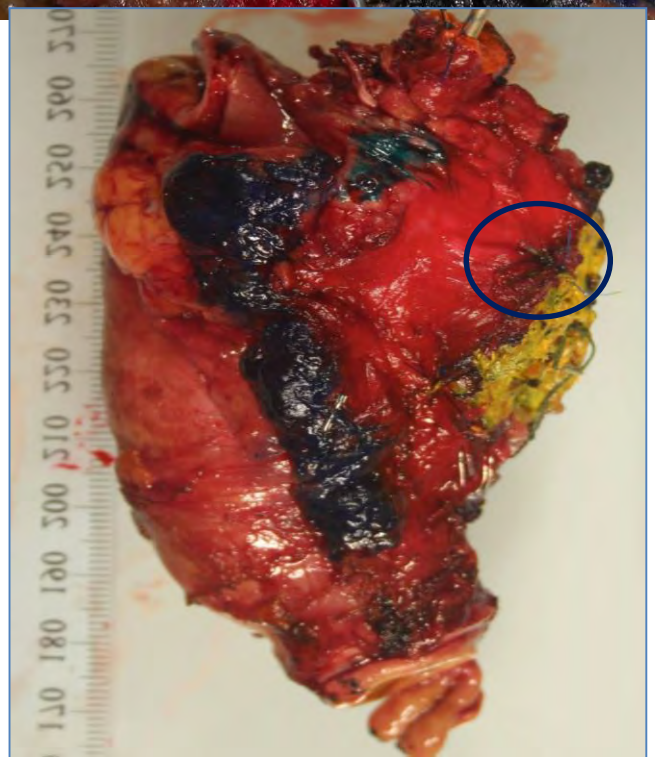
Vascular Margins?

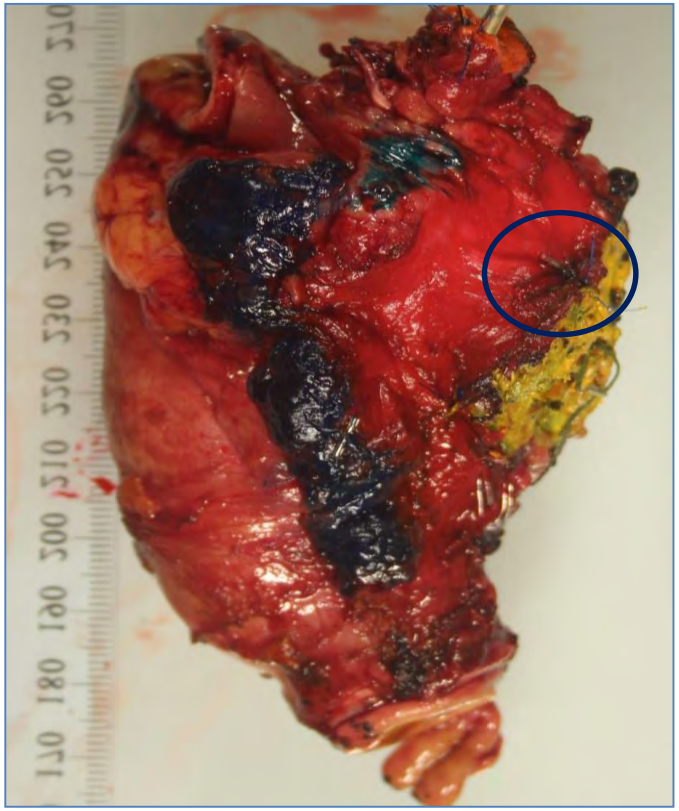
- Cut ends of a segment of superior mesenteric vein or portal vein attached to the vascular groove represent true resection **margins.**

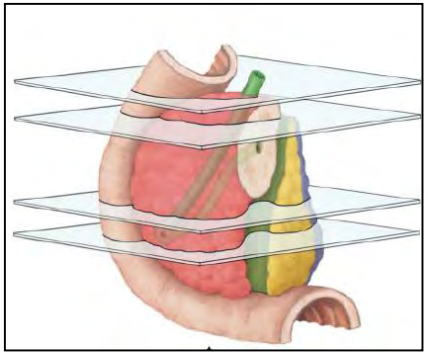
- Sides of a portion of the circumference of the vessel is included (tangential resection): the sides are also resection **margins.**

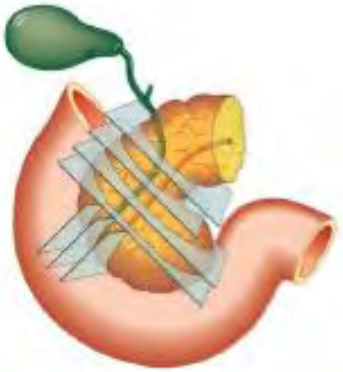
Maksymov V, Hogan M, Khalifa MA, HPB, 2012

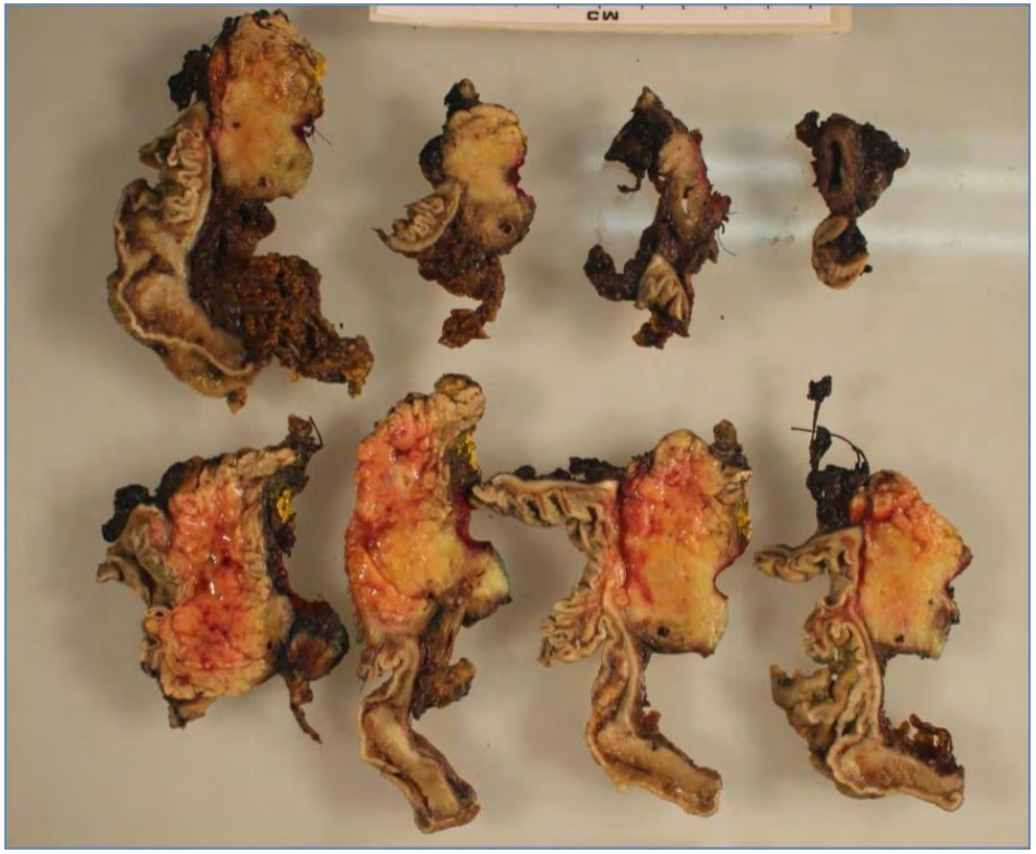


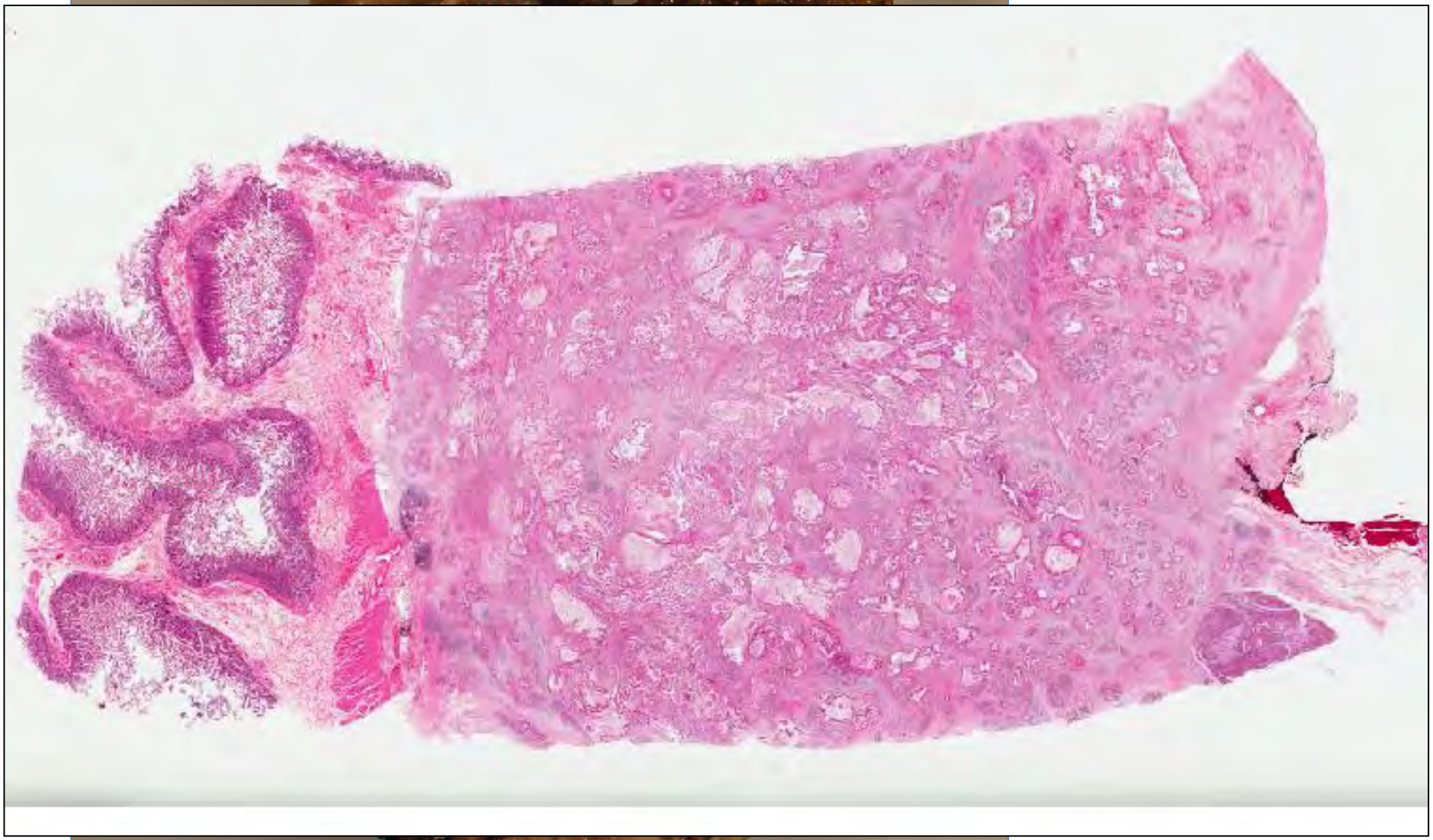


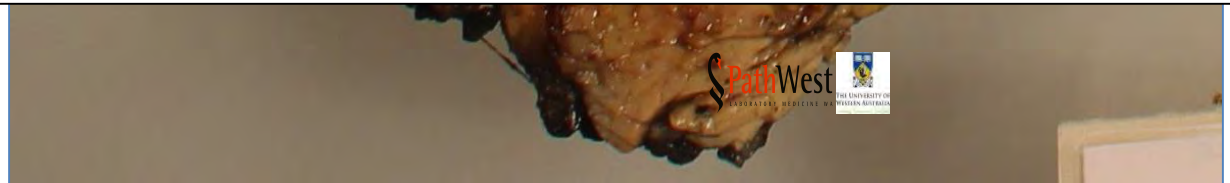








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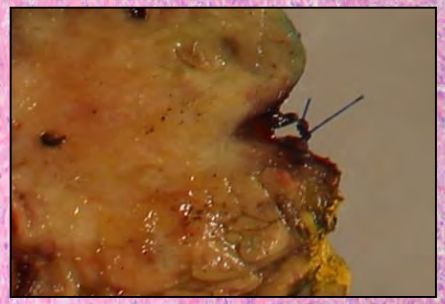

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Harvesting lymph nodes

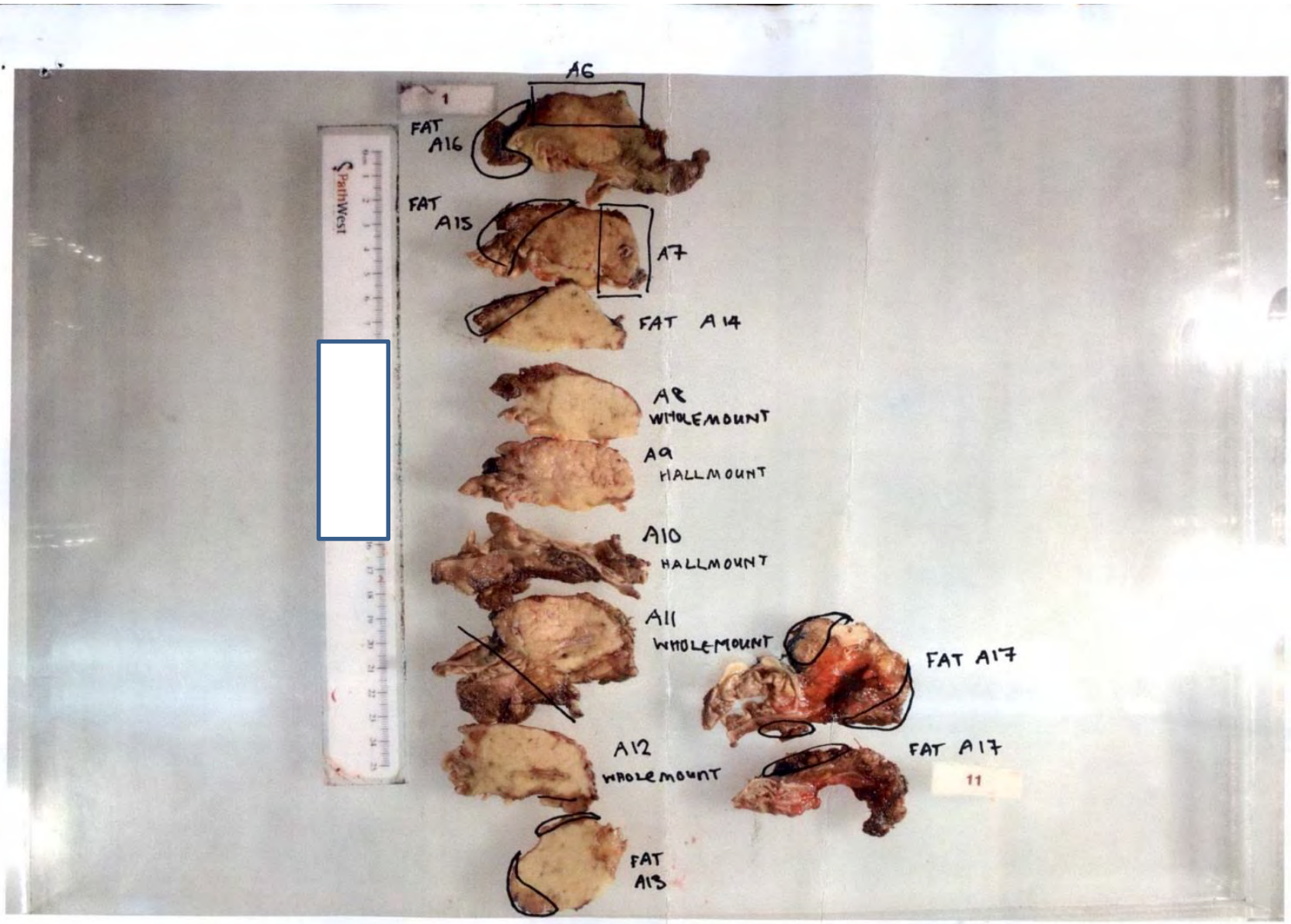
- *Adsay et al: orange peeling method*

- All the free surfaces of the pancreatic head that potentially harbour lymph nodes are shaved off after inking the surfaces and **margin sampling.**

- Involves sampling of external soft tissue covering the pancreas.

- Alternatively active search for LNs:

- when slicing the specimen, concentrate on the free surfaces and peripancreatic soft tissue.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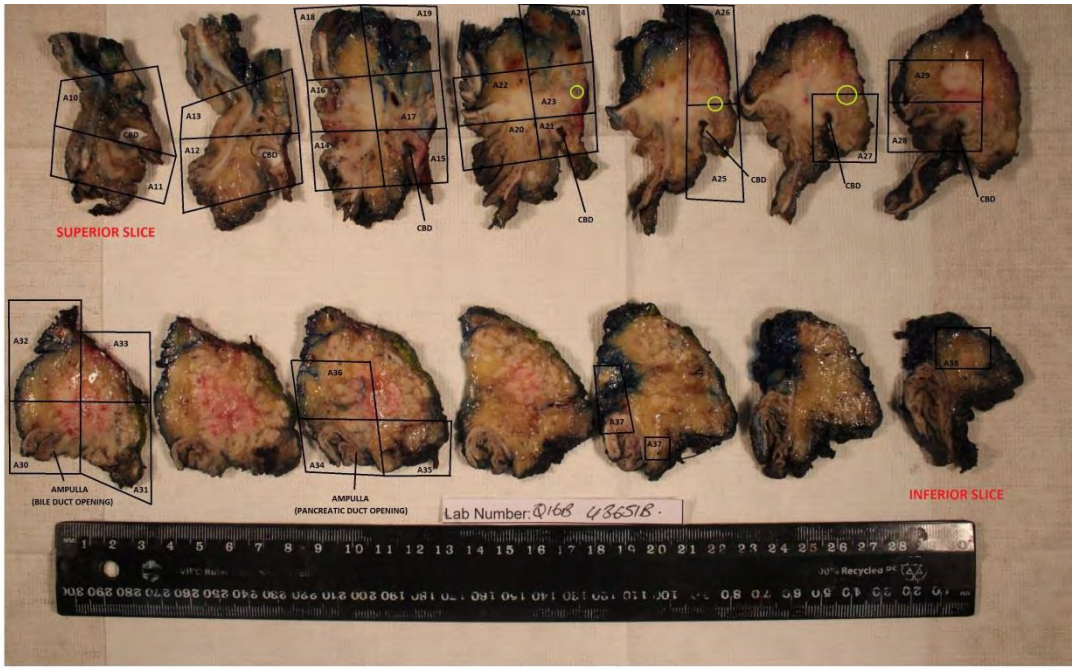
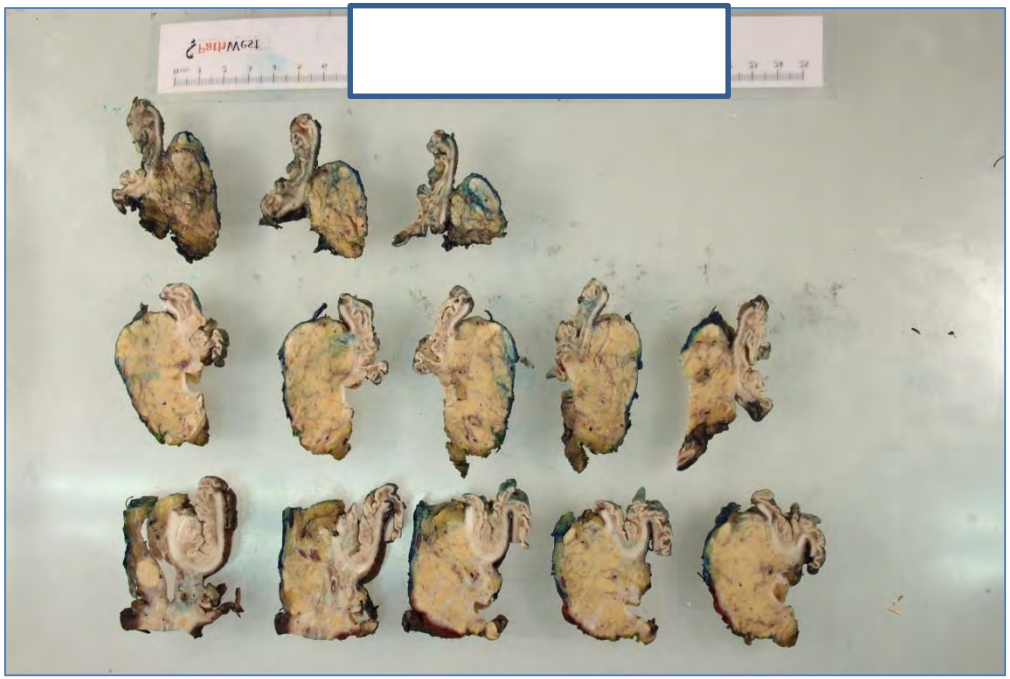
Standard Approach for grossing and reporting

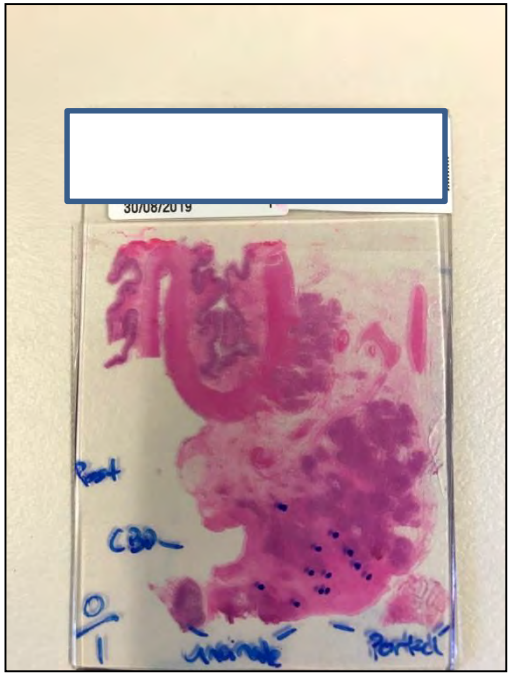
No of blocks: 20-40! levels !!

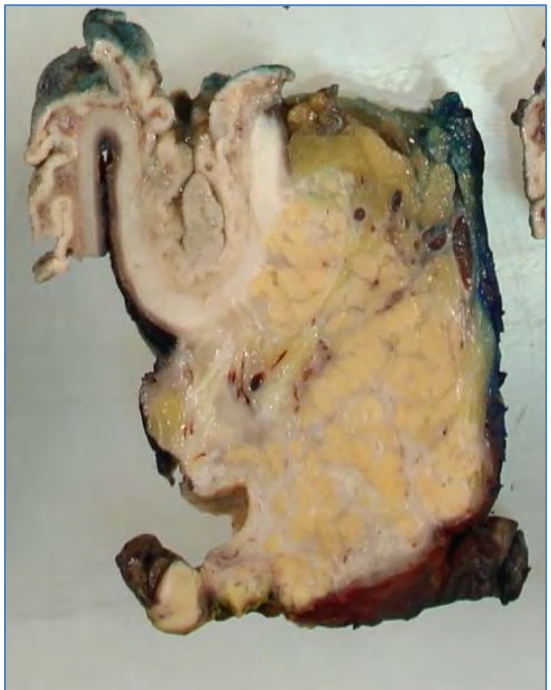
and special stains

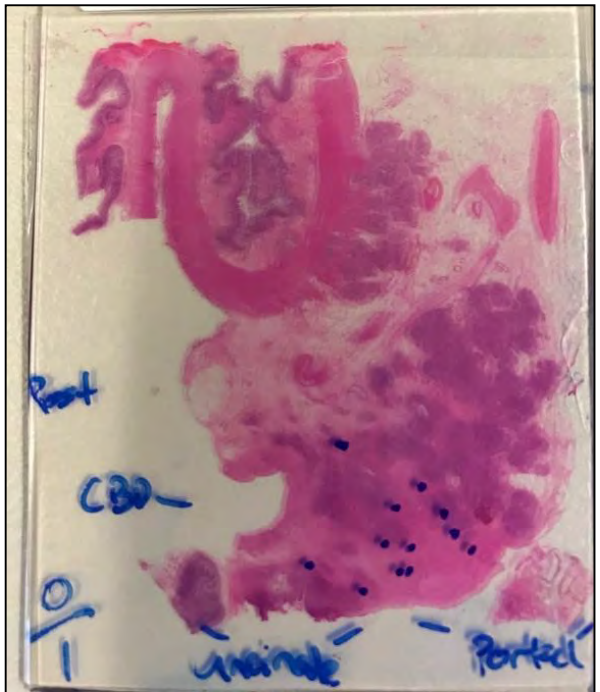
" a few trays of slides"











Issues…

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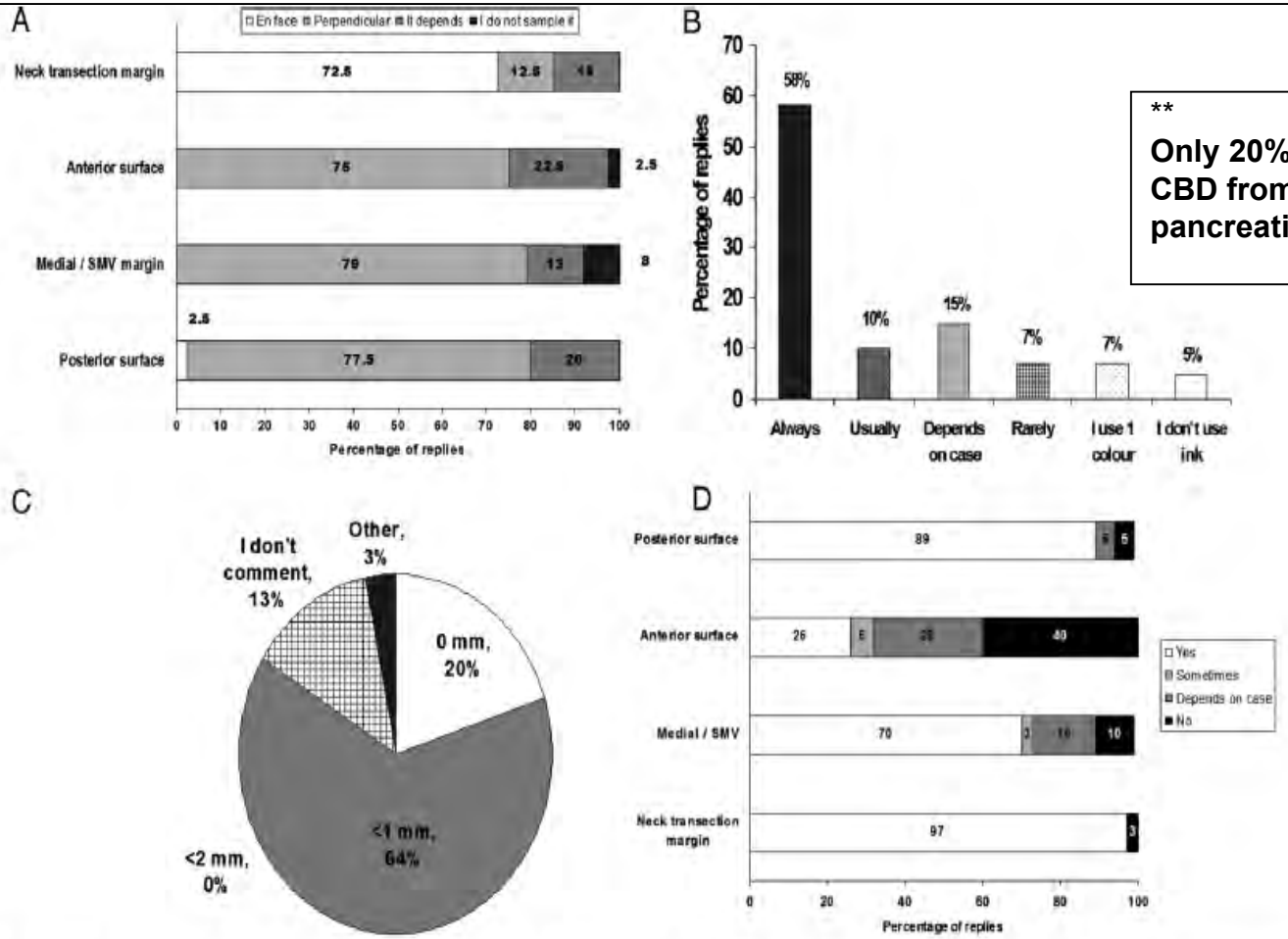
JCP

Survey of UK histopathologists' approach to the reporting of resection specimens for carcinomas of the pancreatic head

Roger Feakins, Fiona Campbell and Caroline S Verbeke



**
Only 20% distinguished CBD from pancreatic cancer

ure 2 (a) Plane in which each pancreatic margin is sampled. (b) Use of multiple coloured inks to identify pancreatic margins and surfaces. Distance from tumour to the margin: the figure closest to the respondent's criterion for incomplete excision. (d) Responses to the question: 'do u record involvement of the following as representing incomplete excision/R1-R2?'

Examination of Whipple resections

Aimed at:

- Confirmation of Pre-operative diagnosis
- Correct identification of the origin
- Assessment of

- Resection margins (R status)
- Response to neoadjuvant Tx

Prognostication and staging (AJCC 8th edition)

- Satisfactory orientation of the specimen and specific margins and surfaces
- Appropriate dissection of the specimen
- Appropriate sampling including margins and surfaces