PANCREATIC ADENOCARCINOMA

Dr.Shaymaa Khalid Abdulqader

CABHS(RAD.)

Department of Radiology, Al-Kindy College of Medicine, University of Baghdad.

PANCREATIC DUCTAL ADENOCARCINOMA (PDAC)

- **Pancreatic ductal adenocarcinoma (PDAC)** makes up the vast majority (~90%) of all pancreatic neoplasms and remains a disease with a very poor prognosis and high morbidity.
- Approximately 15 % of all patients have presumed resectable disease at diagnosis and of those, only a subgroup has a resectable tumor at surgical exploration.
- Pancreatic cancer accounts for 22% of all deaths due to gastrointestinal malignancy, and 5% of all cancer deaths . In general, it is a malignancy of the elderly with over 80% of cases occurring after the age of 60 .

Clinical presentation

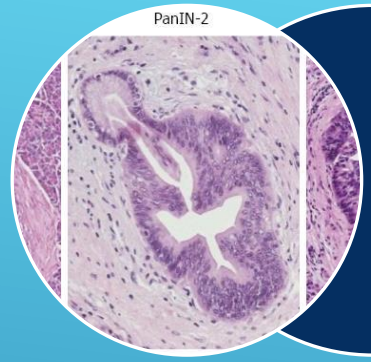
1. pain (most common)
2. Courvoisier gallbladder: painless jaundice and enlarged gallbladder.
3. Trousseau syndrome: migratory thrombophlebitis .
4. new-onset diabetes mellitus.
5. lipase hypersecretion syndrome (10-15%) ·
   - polyarthralgia and subcutaneous fat necrosis +/- lytic bone lesions
   - elevated serum lipase and eosinophilia

Serum markers

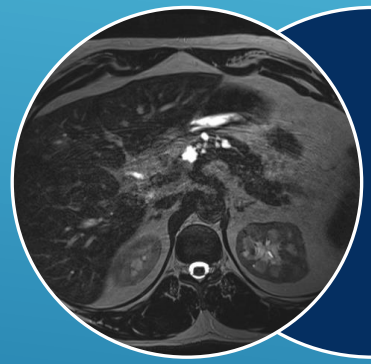
1. CA19-9
2. CEA (carcinoembryonic antigen)

- The serum levels of these antigens are frequently raised in people with pancreatic cancer and can be used to track a patient's response to treatment. However, **these markers cannot be used for population screening due to a lack of sensitivity and specificity**

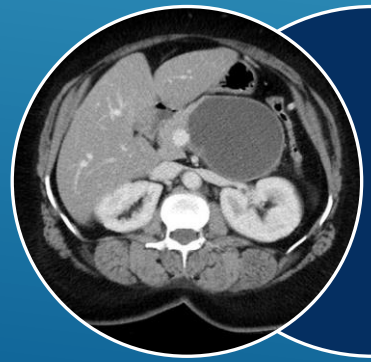
Three precursor lesions for pancreatic adenocarcinoma have been identified



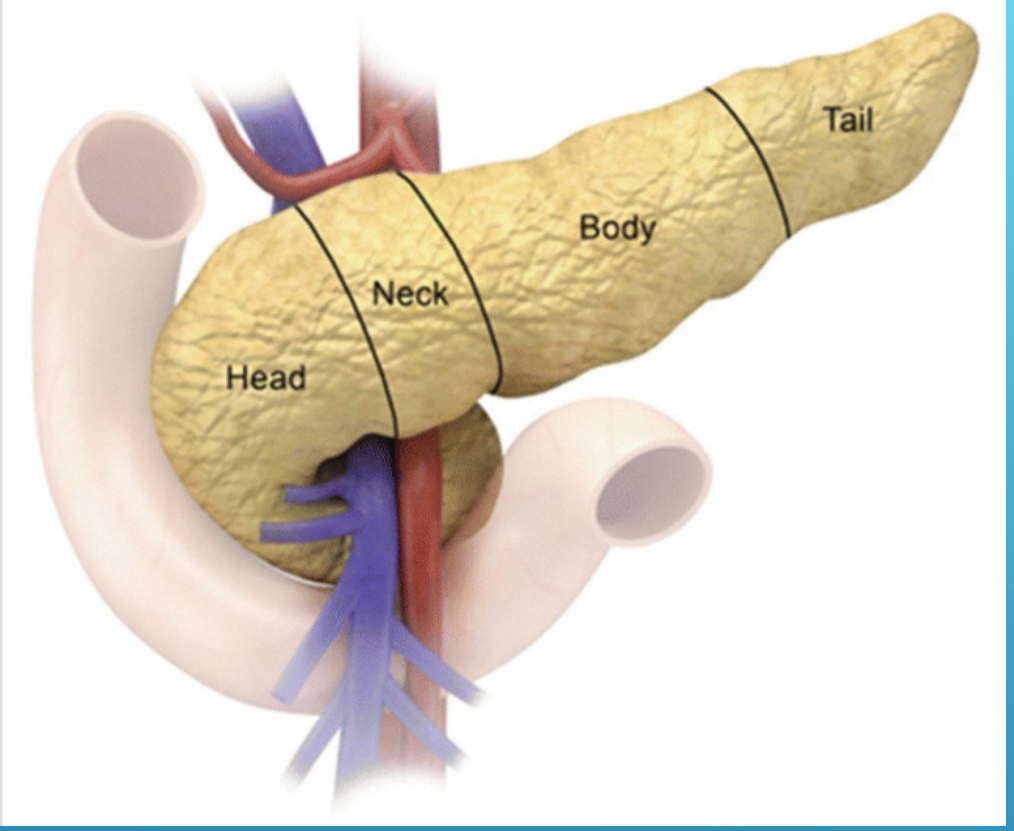
pancreatic intraepithelial neoplasia (PanIN): responsible for more than 90% of pancreatic cancers

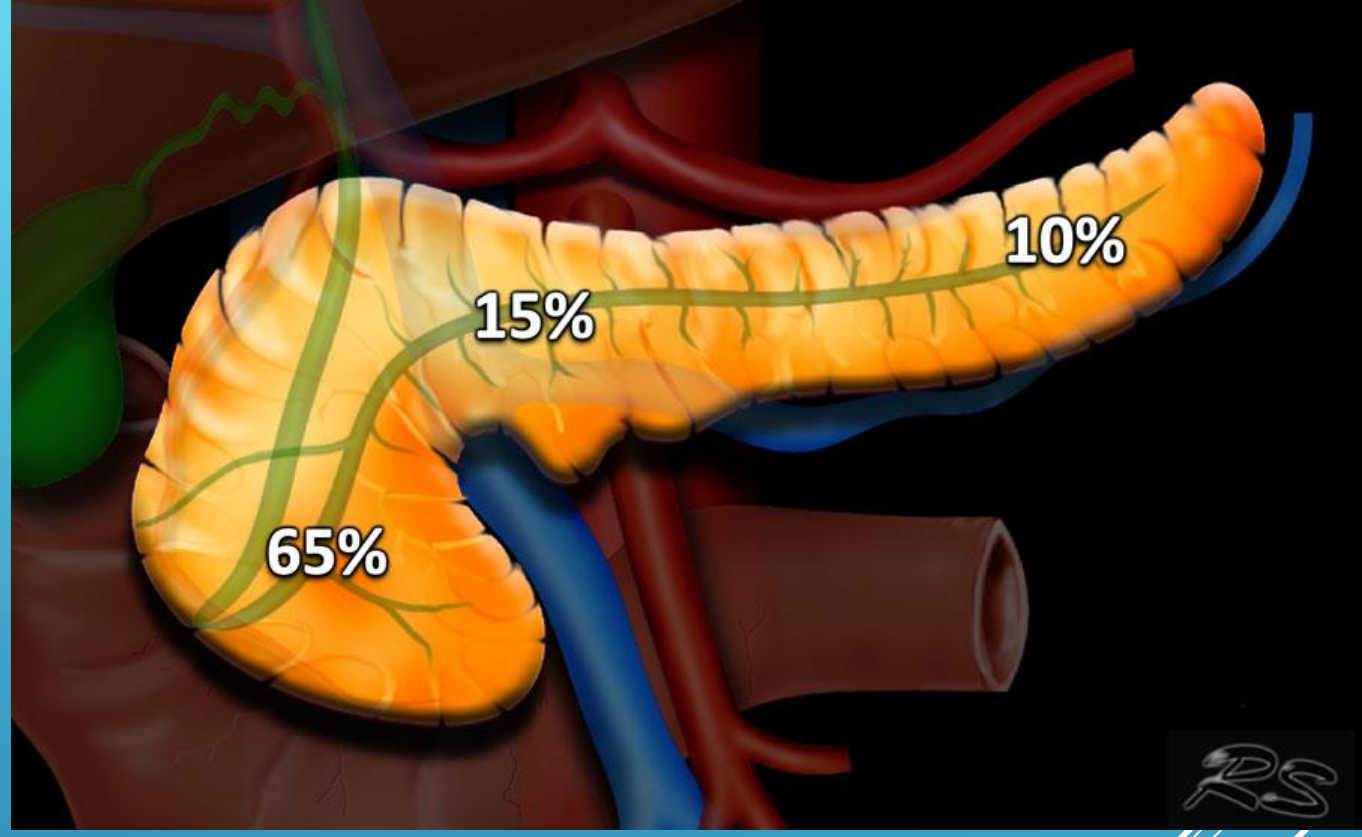


intraductal papillary mucinous neoplasm (IPMN)



mucinous cystic neoplasm





Location

- 65% of pancreatic adenocarcinomas are located within the head, 15% in the corpus and 10% in the tail. The remaining 10% being multifocal or diffuse .
- Tumors of the head usually present earlier due to obstructive jaundice. Tumors of the body and tail tend to present late and they are associated with a worse prognosis.

IMAGING

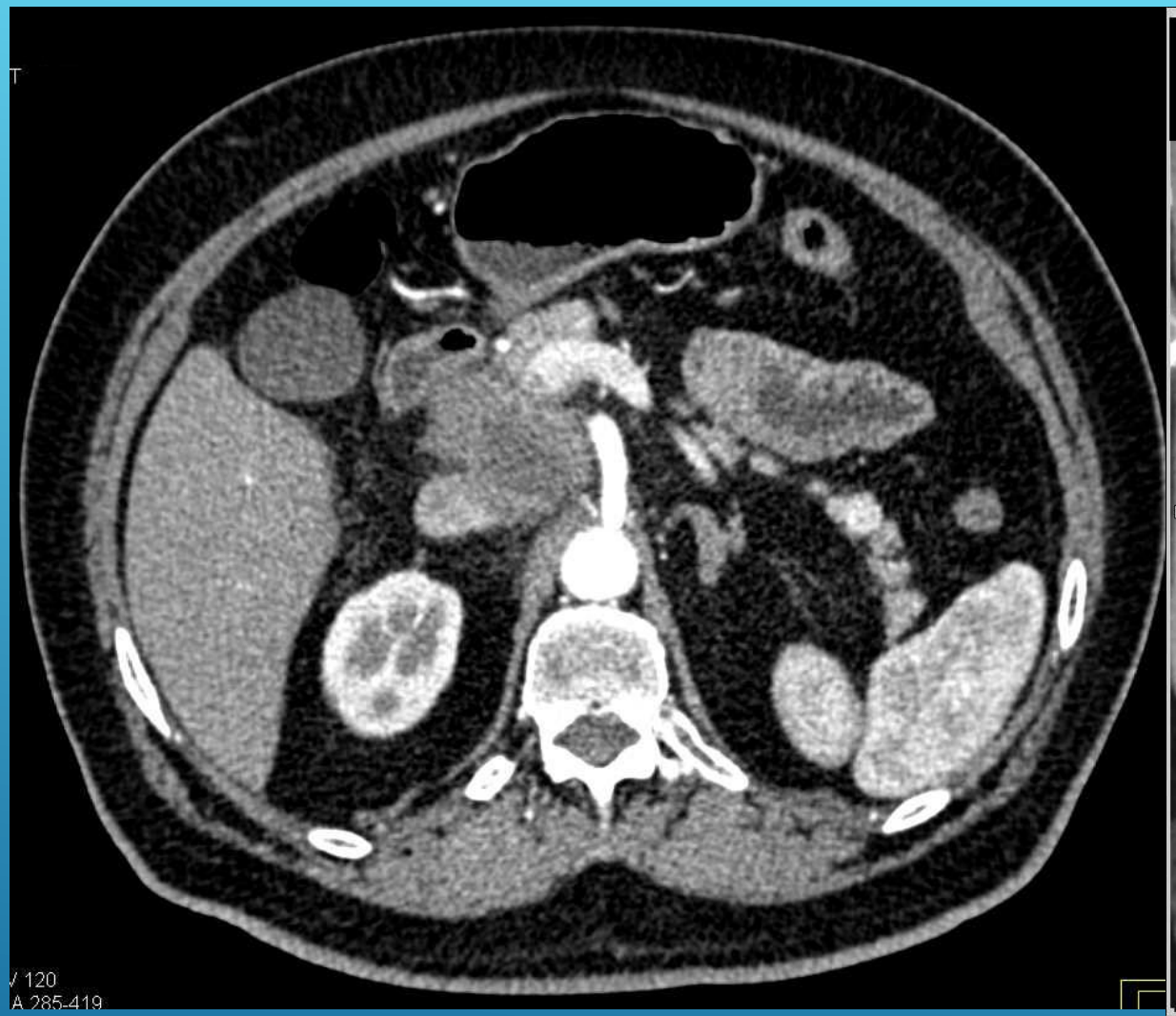
Ultrasound

Findings are non-specific and include:

- hypoechoic mass
- double duct sign may be seen

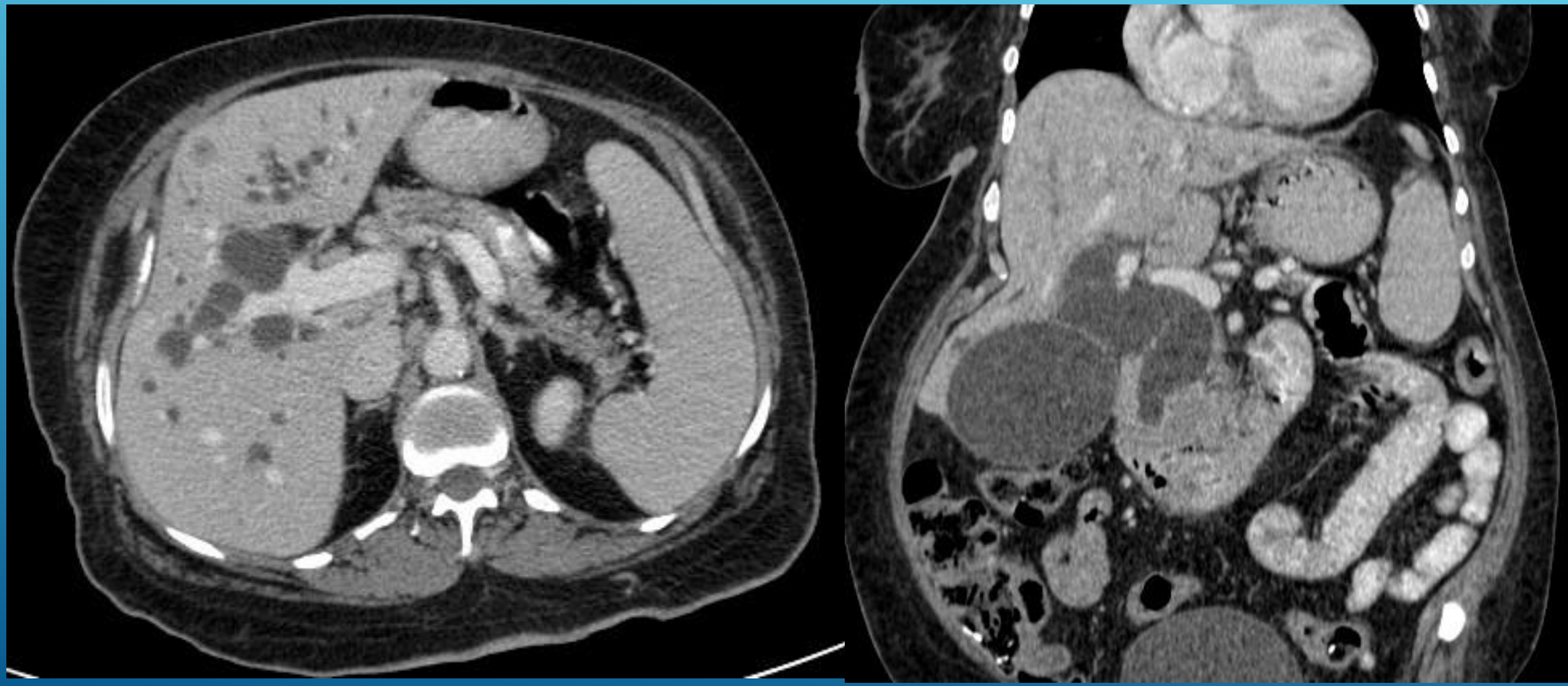
CT

- CT is the investigation of choice of pancreatic imaging. Typically ductal adenocarcinomas appear as poorly defined masses with extensive surrounding desmoplastic reaction. They enhance poorly compared to adjacent normal pancreatic tissue and thus appear hypoattenuating on arterial phase scans in 75-90% of cases, but may become isoattenuating on delayed scans (thus the need for multiple phase scanning when pancreatic cancer is the clinical question).
- The double duct sign may be seen. Calcifications are very rare in adenocarcinoma and when present are more likely due to a pre-existing condition such as chronic pancreatitis ·
- CT correlates well with surgical findings in predicting unresectability (positive predictive value of 89-100%). The most important feature to assess locally is the relationship of the tumor to surrounding vessels (superior mesenteric artery and celiac axis). If the tumor surrounds a vessel by more than 180 degrees, then it is deemed T4 disease and is unresectable

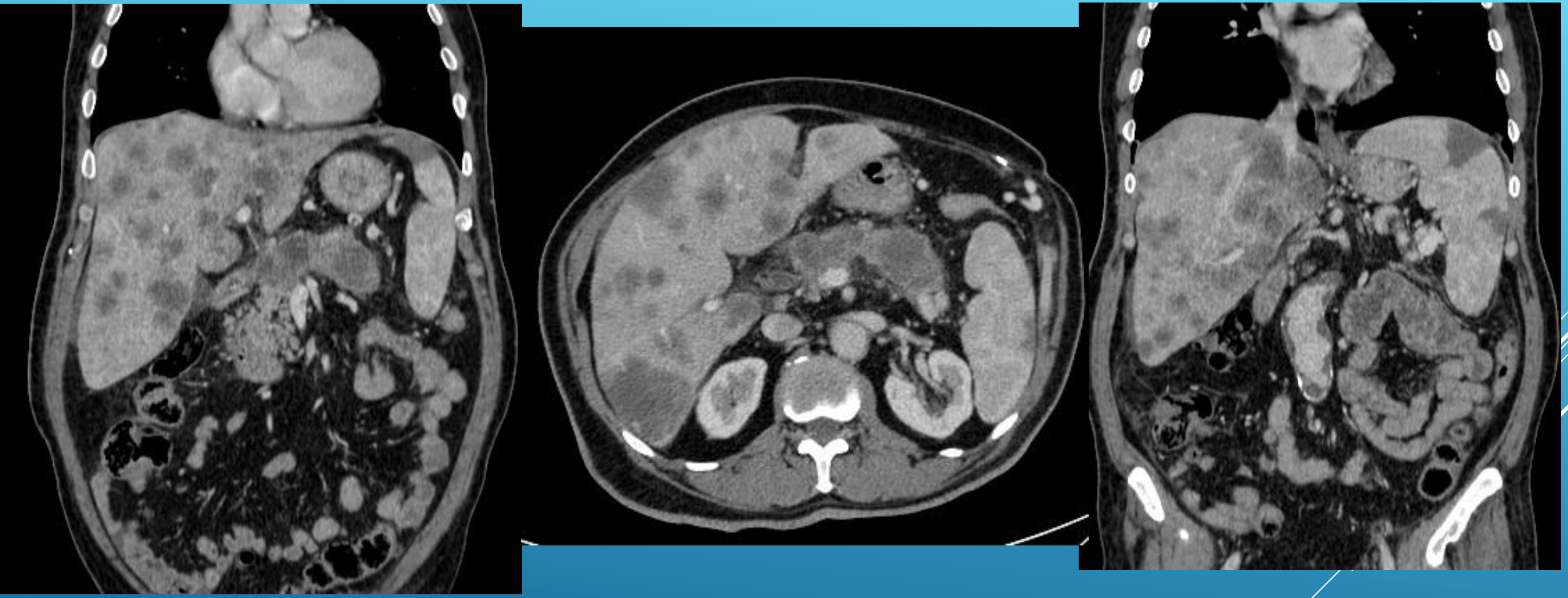

T
V 120
A 285-419


H
LAO/RAO 0
CRAN/CAUD 0
05:00:27
CT
R
L
kV 120
mA 264-420
SL 0.75
SP 0.50
PX 0.84
512x512x1018 [12 bit]
A
B 25 W 512
O 50 C 15
F

73 years old female present with obstructive jaundice



70 years old male present with obstructive jaundice



- 62 years old female present with hx of IBS for 6 months

CA19-9= 1000

- Complete resection of the tumor is the only curative treatment, but pancreatic cancer is seldom detected at an early stage, as 40% of patients present with distant metastases and 40% present with locally advanced pancreatic cancer (LAPC), which is unresectable.

WHEN THERE ARE NO DISTANT METASTASES, THE RESECTABILITY MAINLY DEPENDS ON THE LOCAL STATUS DETERMINED BY:

1. Size of the tumor
2. Involvement of critical vascular structures .
3. Invasion of nearby structures like transverse mesocolon, root of the mesentery and perineural invasion
4. Lymph node involvement locoregional or extraregional

ASSESSMENT OF VASCULAR INVOLVEMENT

- Involvement of critical vascular structures is the most important factor, which determines the resectability of a pancreatic adenocarcinoma .

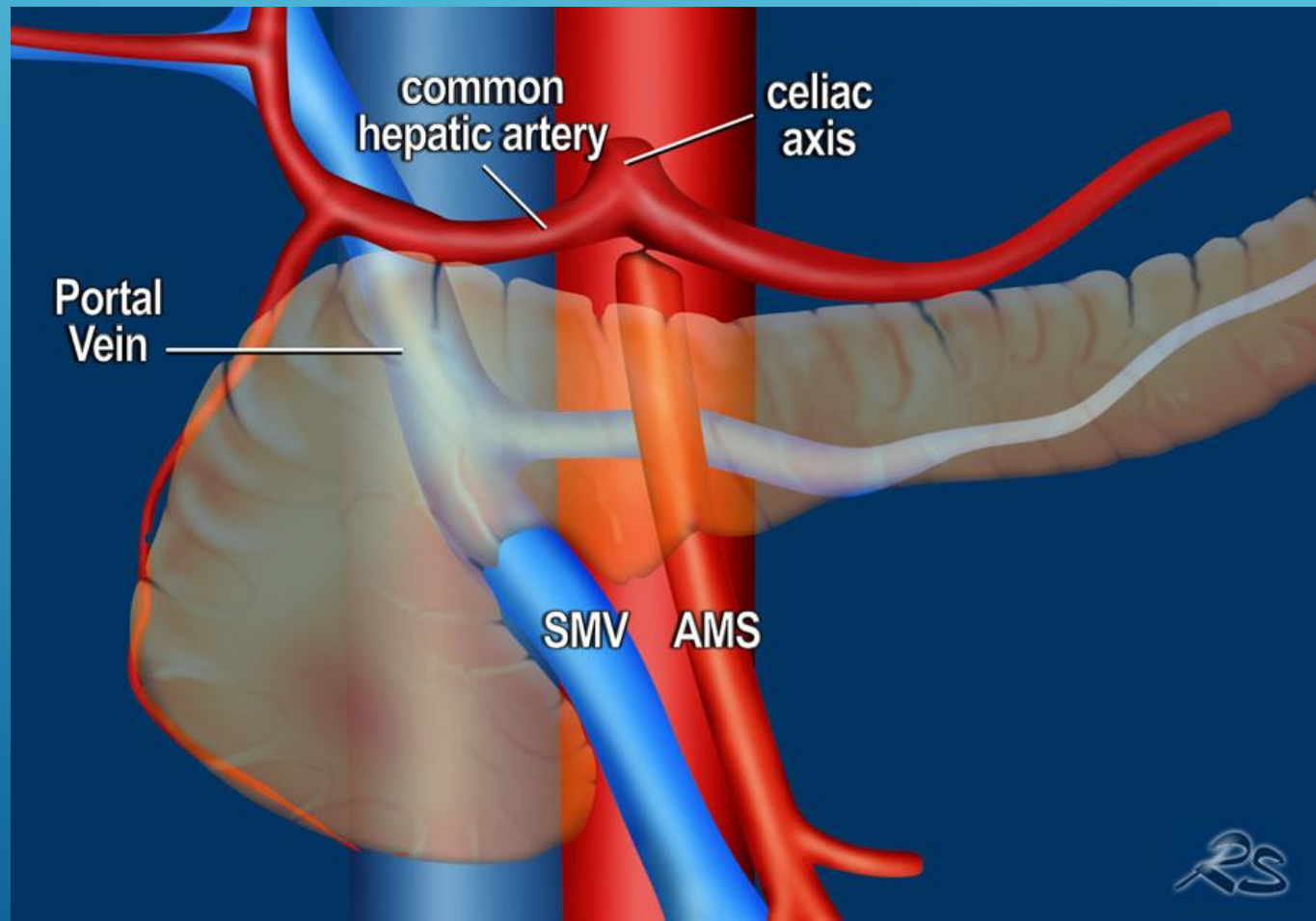
Resectability criteria

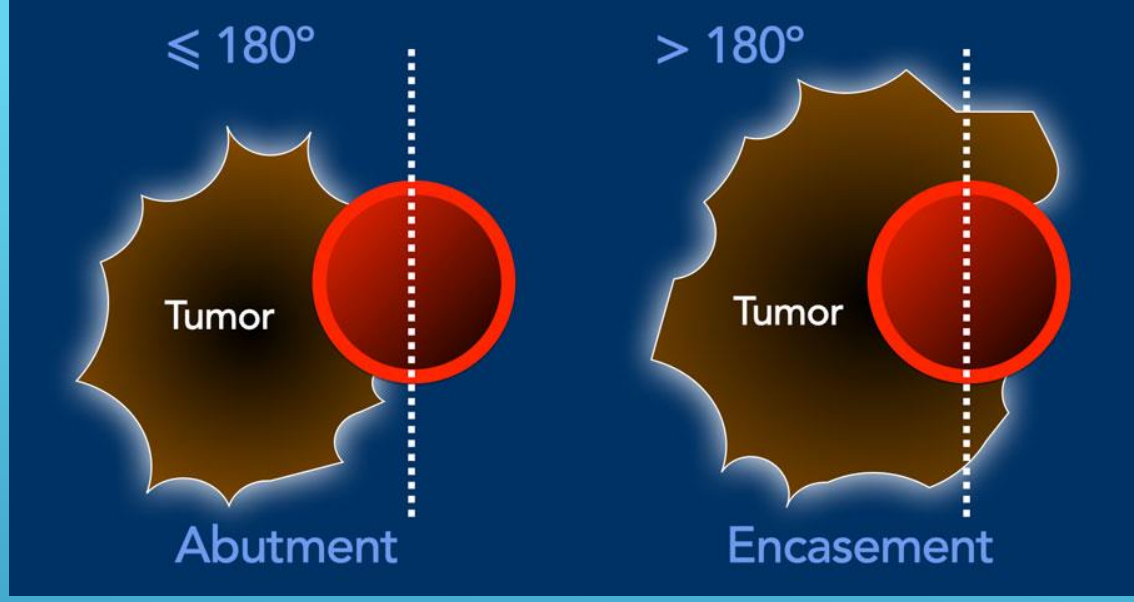
Dutch Pancreatic Cancer Group - DPCG

	Resectable	Borderline	Irresectable
Arteries: CA, SMA or CHA	no contact	≤ 90°	> 90°
Veins: SMV, PV	≤ 90° contact	90°-270° no occlusion	> 270° or occlusion

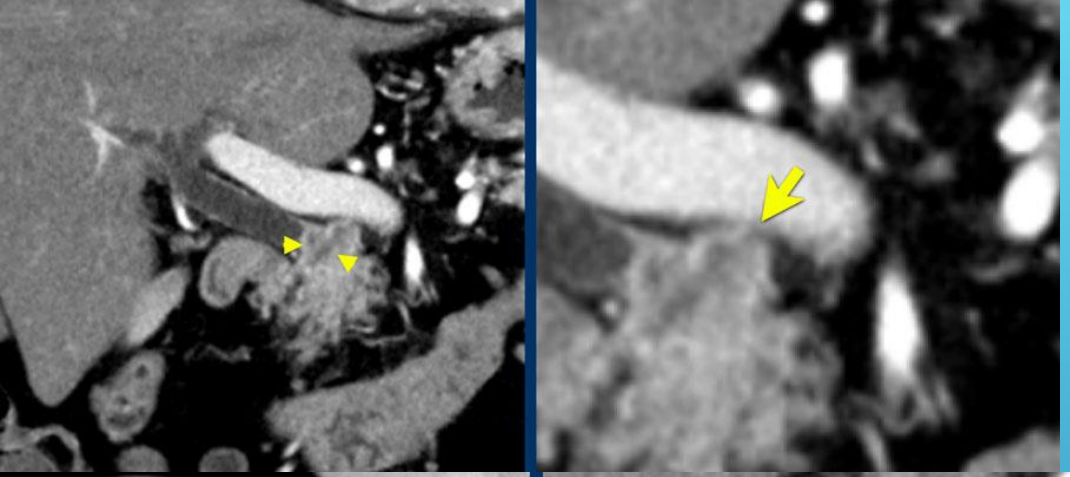
Additional criteria

	Resectable	Borderline	Irresectable
Metastases	no	no	yes
N-stage	Locoregional	Locoregional	Extraregional

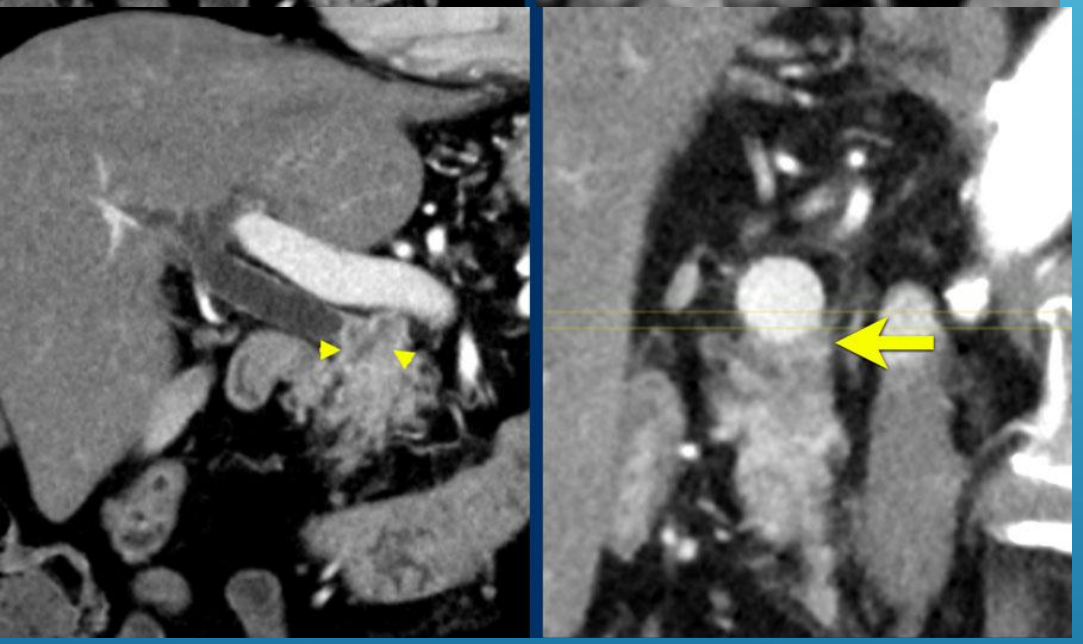




- Assessing the degree of circumferential vascular involvement is done in 90 degree steps. Less than 180 degrees contact is called abutment and more than 180 degrees contact is called encasement.
- The probability of vascular invasion is 40% for abutment and 80% for encasement, up to 100% when the tumor is completely surrounding the portal vein or SMV.
- In case of venous involvement the length of invasion is also mentioned as this may guide the surgeon in assessing the possibility of reconstruction.



The specificity of CT for detecting vascular invasion ranges from 82-100% and sensitivity from 70-96%.
A coronal reformat shows a small tumor in the pancreatic head (arrowheads) with obstruction of the common bile duct. There seems to be just limited contact with the portal vein (arrow).



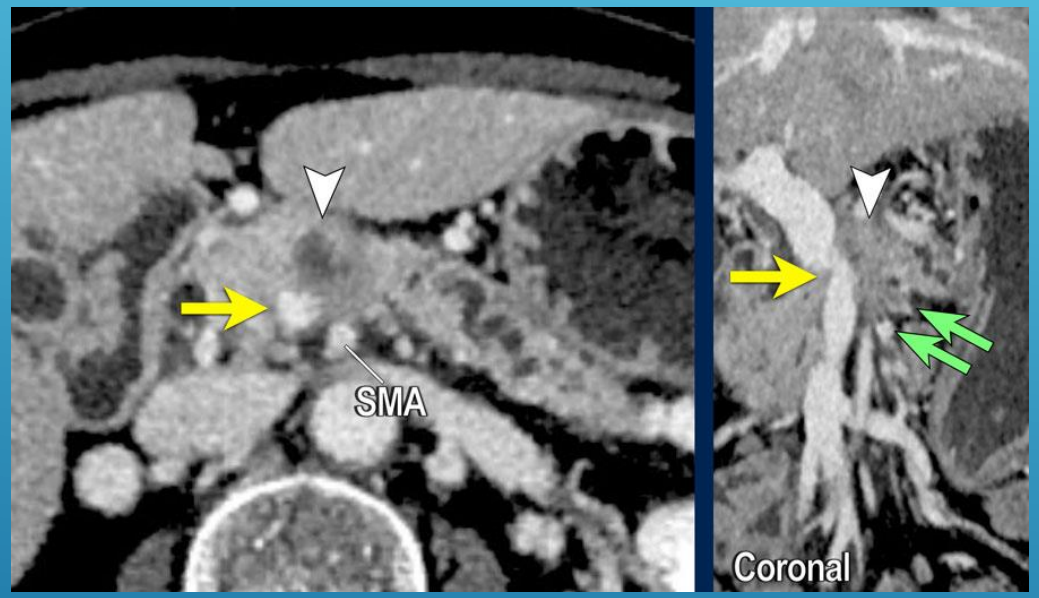
A multiplanar reformat perpendicular to the portal vein shows that there is more extensive contact with the portal vein, 90 – 180 degrees (arrow).

Without contour irregularity this is classified as borderline resectable according to the DPCG criteria.

MORPHOLOGIC CHANGES THAT SUGGEST VASCULAR INVASION

1. **Teardrop sign**
   Refers to a change in shape of the PV or SMV from oval or round to a teardrop. This can be caused by tumor encasement or tethering by adjacent fibrosis.
2. **Vessel contour irregularity**
   Irregularity of a vessel is suggestive of vascular invasion. Even more so in arteries, since the wall of an artery is thicker than of a vein.
3. **Thrombosis**
   The presence of thrombus in an artery is suggestive of vascular invasion.

Teardrop sign. A large tumor in the body of the pancreas, 90 – 180 degrees contact with the SMV, but moreover deformation of the SMV into a so called teardrop, highly suspicious for invasion.



Vessel irregularity
Axial CT shows:
Tumor in the body of the pancreas (white arrowhead).
Focal < 90° contact with the SMA.
More extensive 90° – 180° contact with the SMV , which is slightly narrowed and deformed (yellow arrow).
Dilatation of the pancreatic duct
The coronal reconstruction shows
Vessel wall irregularity of the SMV is better appreciated on this coronal reformat (arrow).
Tumor in the body of the pancreas (white arrowhead).

- Coronal reformats show a large tumor originating from the pancreatic neck with an infiltrative growth pattern .
  There is encasement of the celiac artery for 360º degrees (arrow in A).
- The axial MIP at the level of the celiac artery shows narrowing of the encased common hepatic artery (arrow), highly suspicious for invasion.

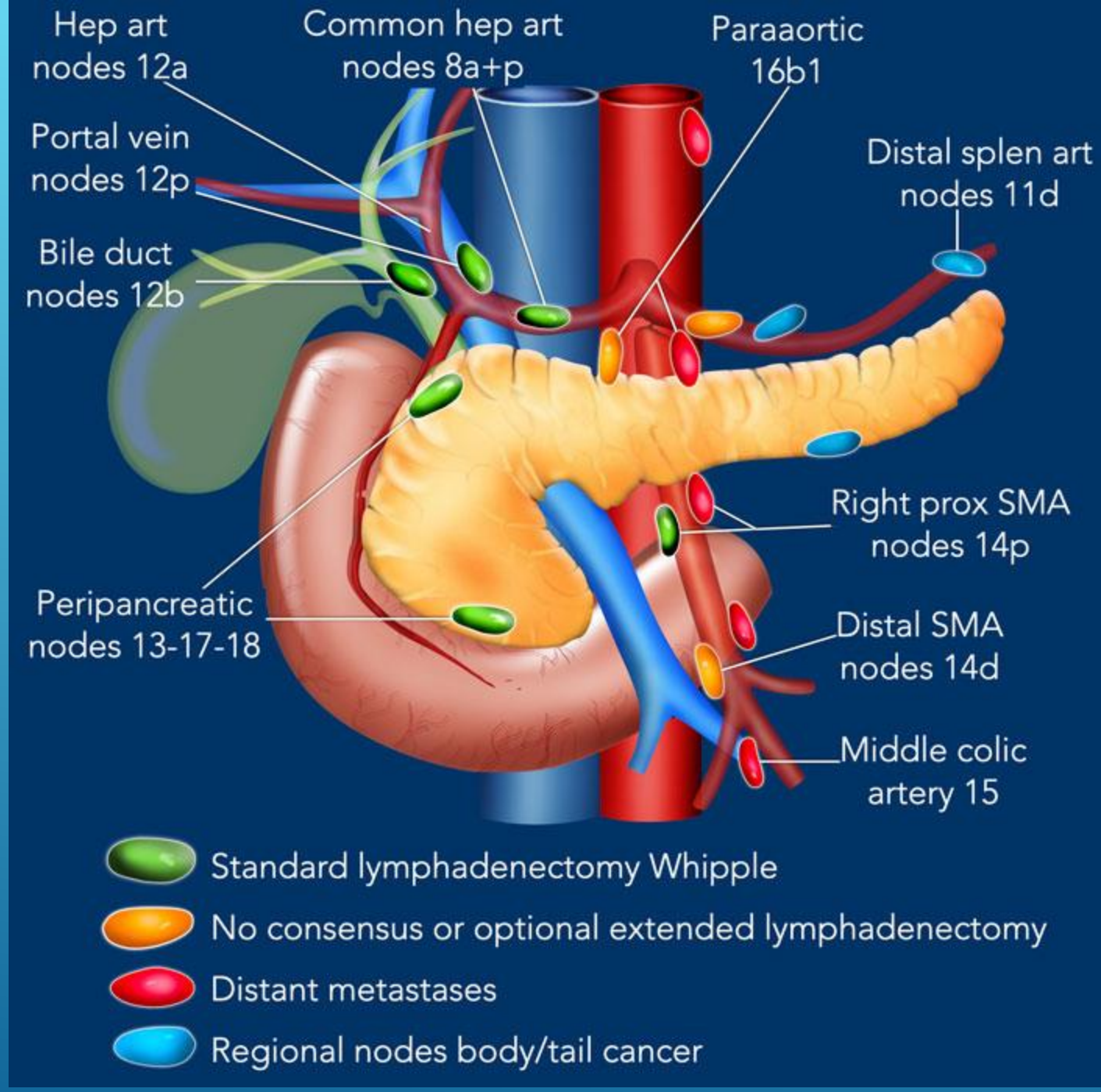
T STAGE

- The T-stage does not determine whether a tumor is resectable or not, but has merely prognostic implications.

T-stage	Pancreatic cancer
T1	⩽ 2 cm
T2	>2 cm and ⩽ 4 cm
T3	> 4cm
T4	Tumor involvement of the celiac trunc, superior mesenteric artery and/or hepatic artery

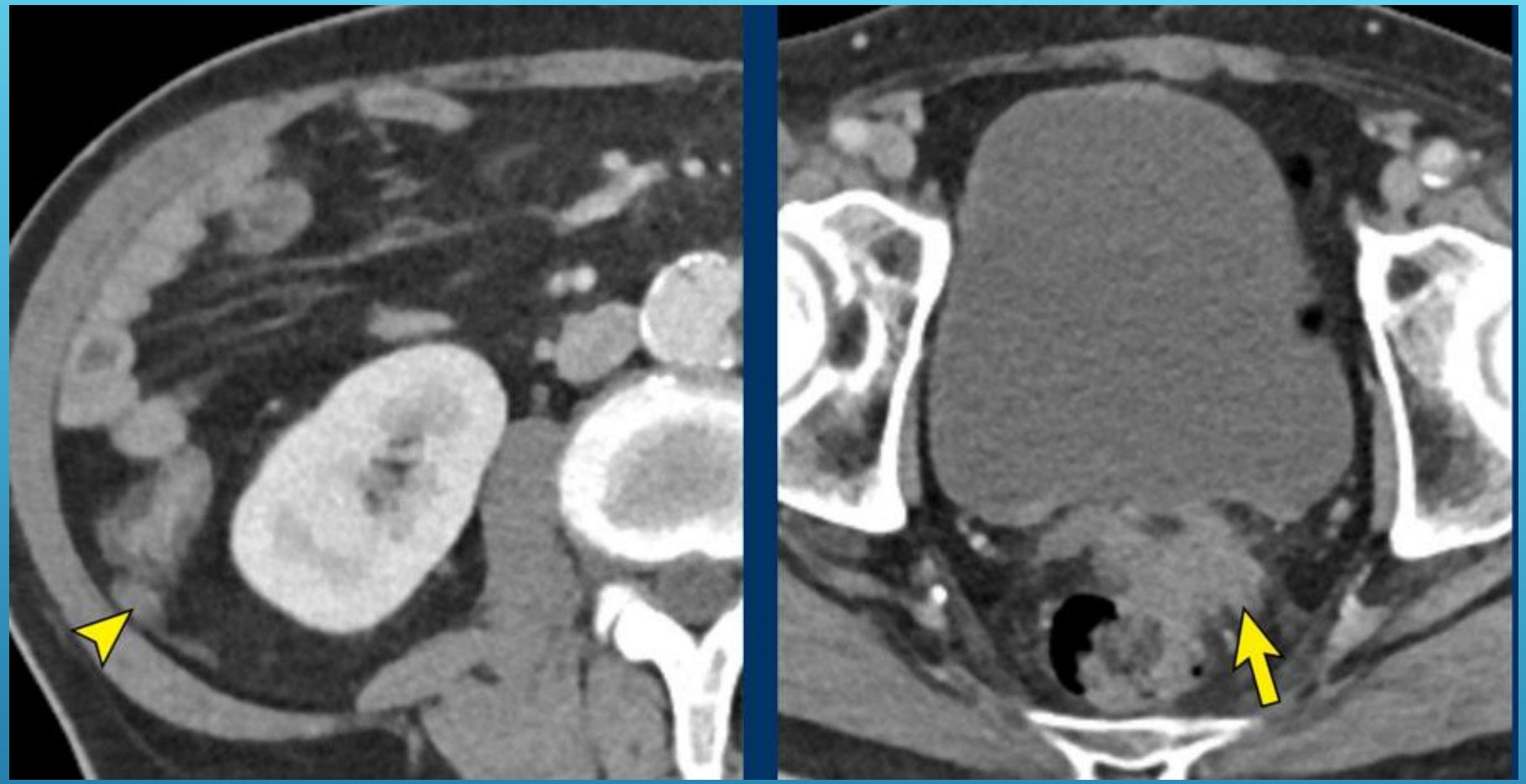
N-STAGE

- It is important to discriminate between regional lymph nodes and extra regional lymph nodes (distant metastases).
  The main extraregional locations are para-aortic and to the left of the SMA.
- Suspicious nodes in these locations should be documented and sampled.
- Lymph node metastases are an important prognostic factor and occur in approximately two-thirds of patients with otherwise resectable pancreatic cancer.



M-STAGE

- 40% of patients with pancreatic cancer have distant metastases at the time of presentation. Next to distant lymph node metastases these are mainly hepatic (20-75%), peritoneal (9%) and pulmonary (<10%).
- Liver metastases frequently present as multiple lesions less than 10mm in size and are predominantly in a subcapsular location. It has been hypothesized that this is a form of peritoneal spread. Subsequently the sensitivity of CT for detecting liver metastases is low, around 75%.
- Furthermore over 50% of hepatic metastases are diagnosed within 6 months of resection of the primary tumor, suggesting synchronous disease and being already present at the time of initial staging.

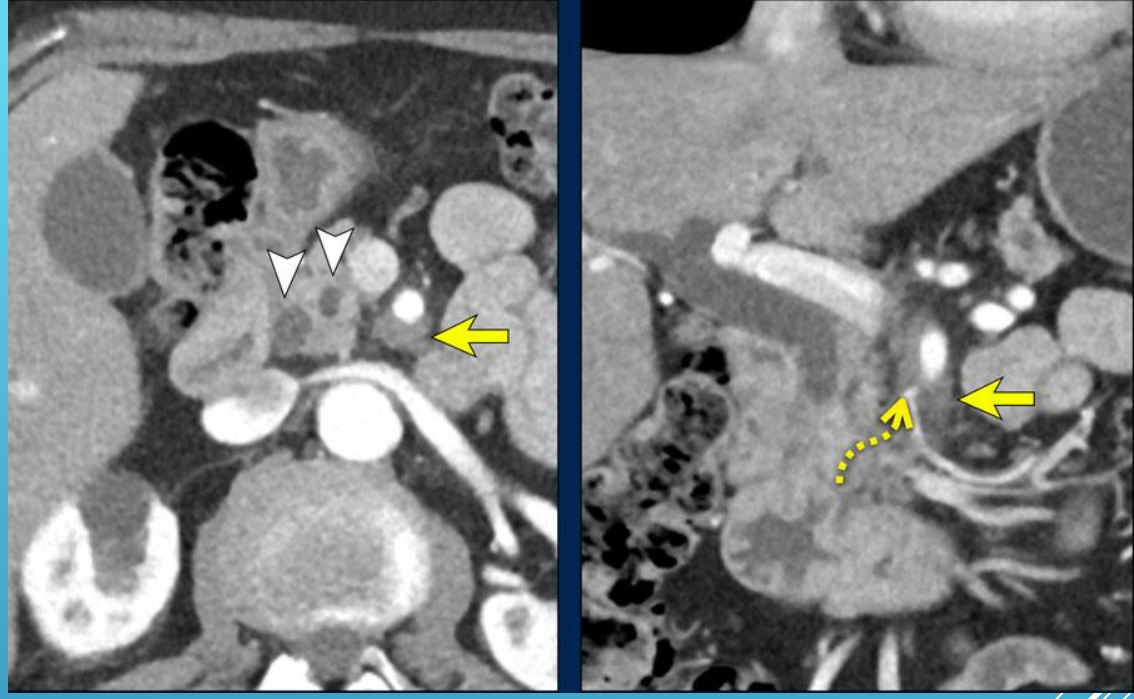


- CT is not sensitive for the detection of small peritoneal lesions, but larger lesions may be noted.

ADDITIONAL FINDINGS OF INTEREST TO THE SURGEON

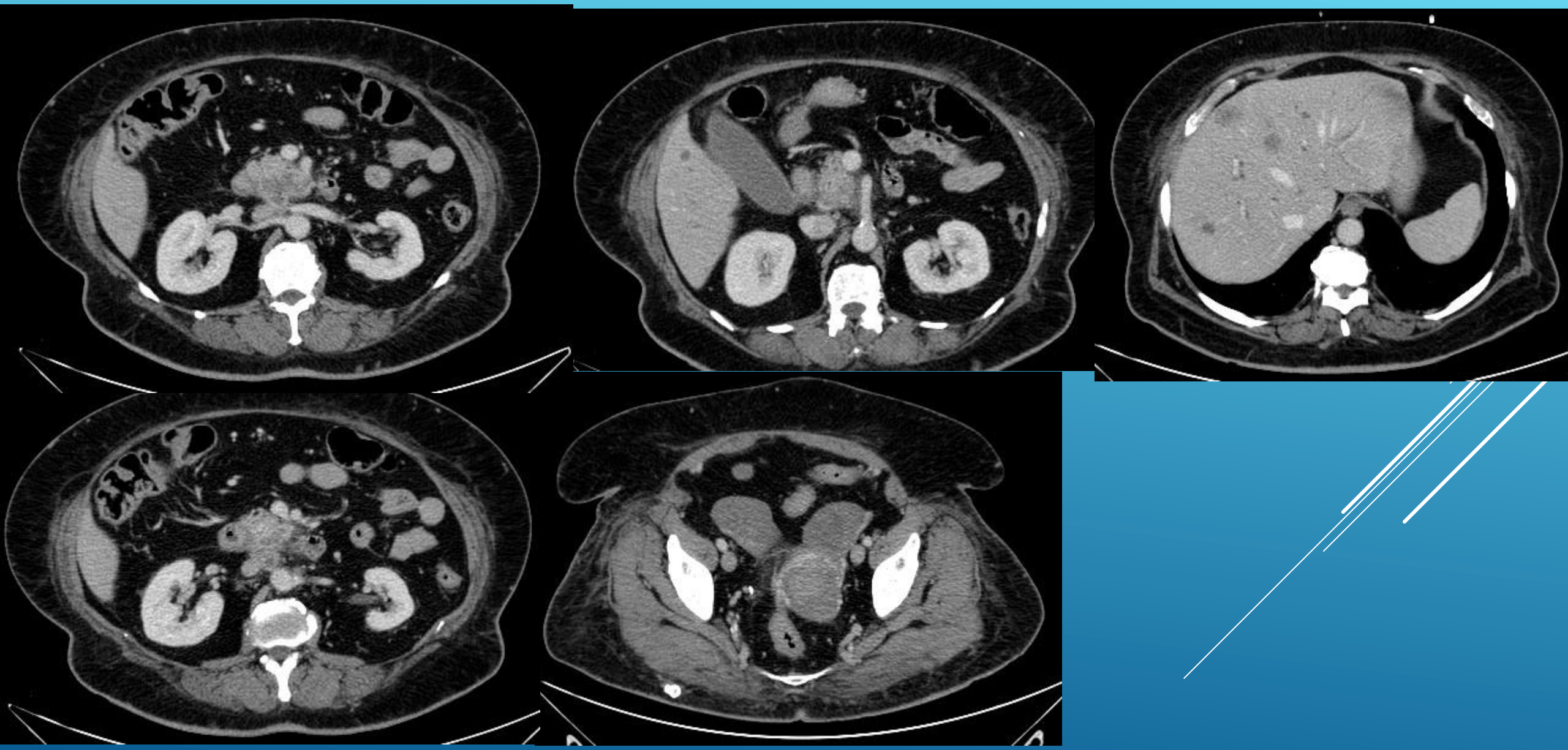
- Next to the assessment of vascular involvement ,the invasion of other surrounding structures and organs should be examined .
- Some of which are directly invaded and don't preclude resection (for instance duodenal invasion, which is taken out in a Whipple procedure.)
  But both spread to the transverse mesocolon and root of the mesentery are commonly overlooked and may warrant extended resections or lead to irresectability.

PERINEURAL INVASION



- Perineural spread is a common finding in pancreatic adenocarcinoma and seen in more than half of the cases.
  It is an important prognostic factor for early recurrence and metastatic disease.
- On CT it is detected as infiltrating soft tissue from the edge of the tumor along known specific peripancreatic neural pathways, which extend from the pancreatic head to the SMA, celiac trunk and the common hepatic artery.
- **Even in small tumors this can lead to unresectable disease.**

50 years old female present with pelvic pain, US show bilateral adnexial masses.



SPREAD TO ROOT OF MESENTERY

- The root of the small bowel mesentery extends obliquely in the abdomen running from the point of termination of the duodenum at Treitz all the way to the cecum.
- The SMA and the SMV and their branches are the predominant vascular structures within the mesentery.
- A carcinoma of the uncinate process can easily involve the jejunal mesentery by spreading along this pathway.
  The first jejunal branches of the SMA and SMV serve as landmarks to identify this type of invasion .

- If invasion is limited resection and reconstruction may be possible, but more extensive invasion is mostly irresectable.

SPREAD TO TRANSVERSE MESOCOLON

- The transverse mesocolon is in contact with the ventral side of the head of the pancreas and can be invaded by a tumor of the pancreatic head.
- It can be identified on CT by following the middle colic vein and right gastro-epiloic vein to the point where they join to form the gastrocolic trunk, which is usually the last vein to drain into the SMV, on the ventral side.
- Invasion of the transverse mesocolon does not necessarily preclude resection, but since additional hemicolectomy might be needed this is essential pre-operative information.


THANK
YOU
DesiComments.com