2025

KARNATAKA RADIOLOGY EDUCATION PROGRAM

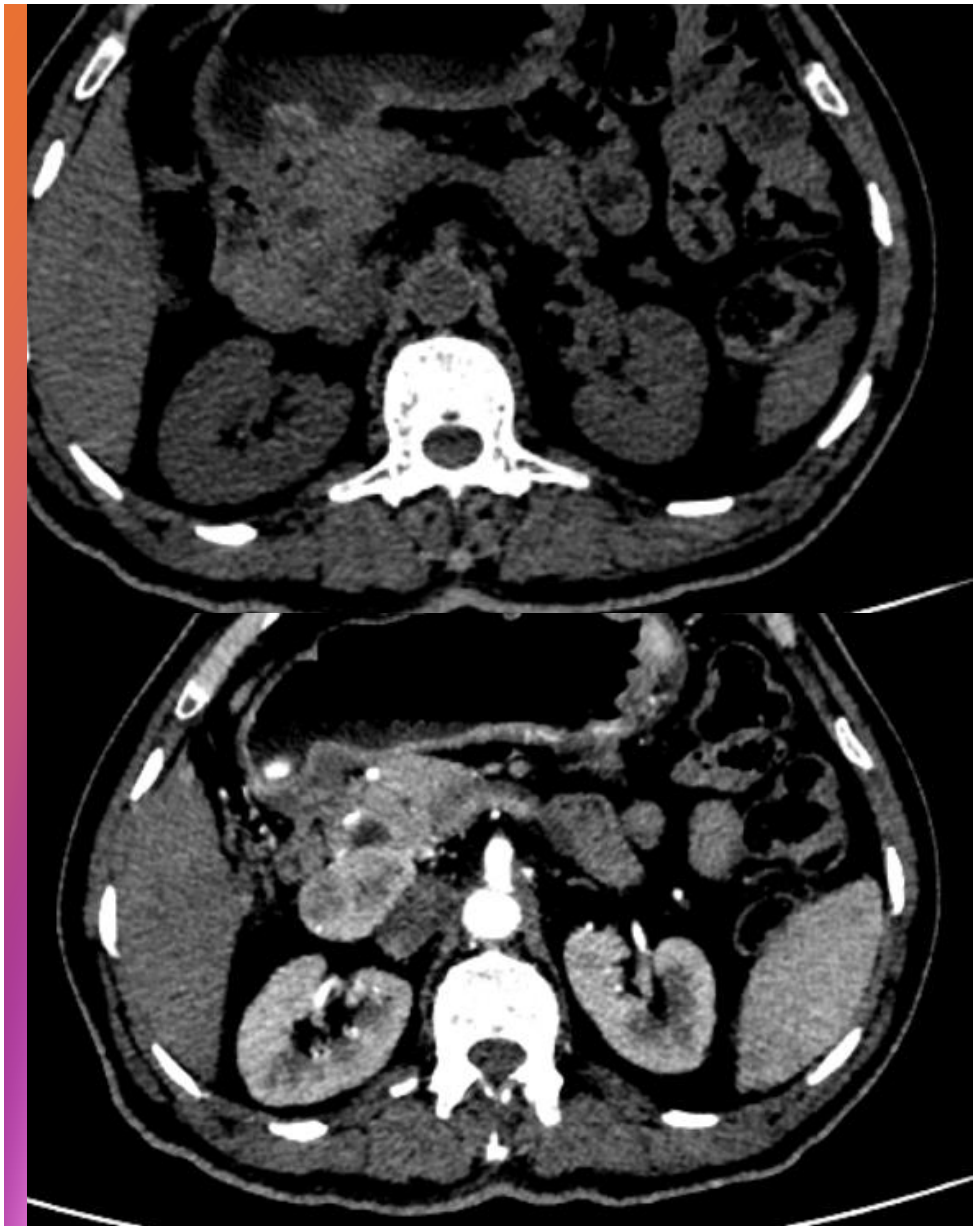
CASE 2

- 66 yr male
- c/o fatigue, vomiting (2-3 episodes) x 1 month
- h/o weight loss & loss of apetite
- K/c/o DM, HTN on Rx

- Outside USG:

well defined hypoechoic lesion in head of pancreas with
multiple hyerechoic lesions showing targetoid apperance in liver –
likley metastasis

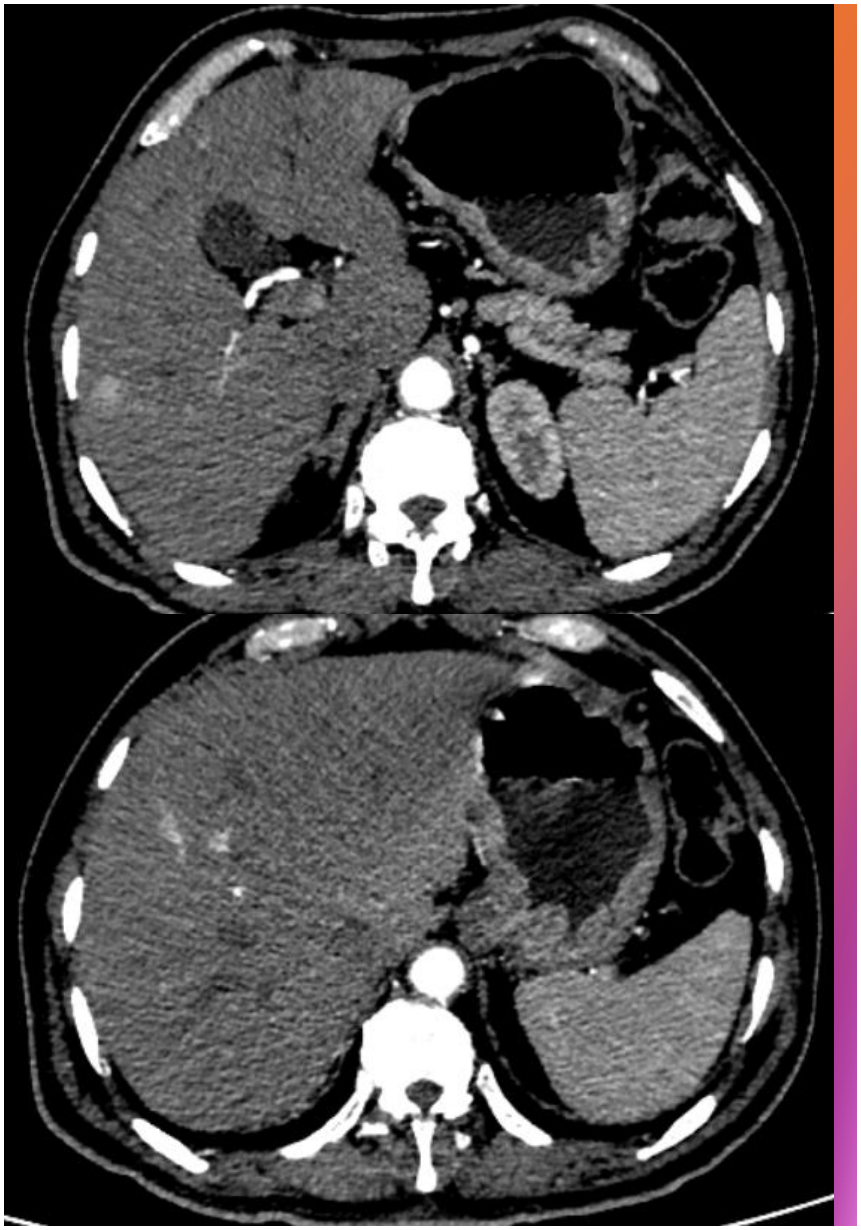
- CECT abdomen was advised for furthur evaluation.



CT Findings

- Well defined hypodense mass with areas of hypoattenuation showing heterogenous arterial enhancement with non enhancing areas in head of pancreas

- Mutiple small homogenously arterially enhancing lesion in liver, suggestive of hepatic metastasis.



- Diagnosis:

Pancreatic NET with hepatic metastasis

- Endoscopic USG guided biopsy was done

Well differentiated neuro endocrine tumour

- Pt was started on somastostain analogues:

Inj Octreotide 30mg once a month x 3 months

- Lost to follow up

DISCUSSION

NEUROENDOCRINE TUMOURS

- Neuroendocrine cells / APUD cells (Amine precursor uptake & decarboxylation cells)
- Heterogenous spectrum of tumours:

1. Carcinoid tumour: enterochromaffin cells in appendix, ovary & thymus
2. Merkel cell CA: merkels cells (mechanoreceptors in skin)
3. Pheochromocytoma: adrenal & extradrenal
4. Endocrine glands: thyroid, parathyroid & pituitary
5. Abdomen: GIT & pancreas
6. Chest: Lungs

- Divided into:

1. Functioning / non functioning
2. Slow growing / aggressive

- Occurs

1. Sporadically(most)
2. Associated with certain s/d

Pancreatic NET

- 1-2% of pancreatic neoplasm
- 30-60 yr age
- Sporadic (mc)
- Associated with:

1.MEN type 1- Pancreas, parathyroid & pituitary

2.Von Hipplenlendau s/d

3.Tuberous sclerosis

		Location	Malignancy
Insulinoma	50%	Pancreas (99%)	10%
Gastrinoma	30%	Duodenum (mc), pancreas, LN	70%
VIPoma	3%	Pancreas (90%) Adrenal gland (10%)	50%
Somatostatinoma & Glucagonoma	rare	Pancreas	malignant
Non functioning & Pancreatic polypeptide secreting tumour	20%	Pancreas	malignant

GIT NET & pancreatic NET

Pathology classification

- Non functioning / malignant : large, hence easy to locate
- Functioning : small, multiple sites, challenging to locate

Clinical s/d

Insulinoma: Whipple triad

1. fasting hypoglycemia (<50 mg/dL)
2. symptoms of hypoglycemia
3. immediate relief of symptoms after the administration of intravenous glucose

Gastrinoma: Zollinger Ellison s/d

1. Tumour of duodenum & pancreas
2. Hypergastrinemia (gastritis, GERD & diarrhoea)
3. Peptic ulcers

Glucagonoma: 4D s/d

1. Dermatitis
2. DM
3. DVT
4. Depression

Histological grading

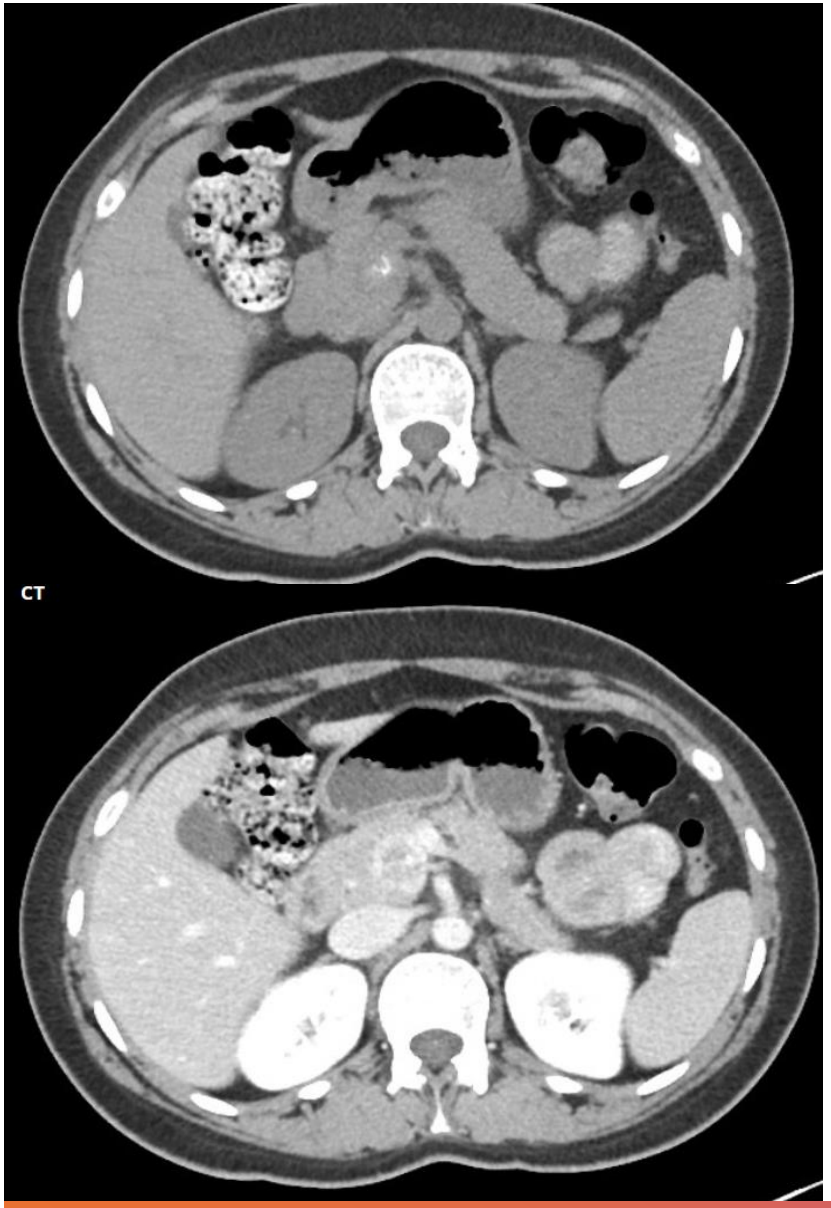
- Well-differentiated:

Depending on mitosis graded as grade 1, 2 or 3.

- Poorly-differentiated:
- containing components of adenocarcinoma

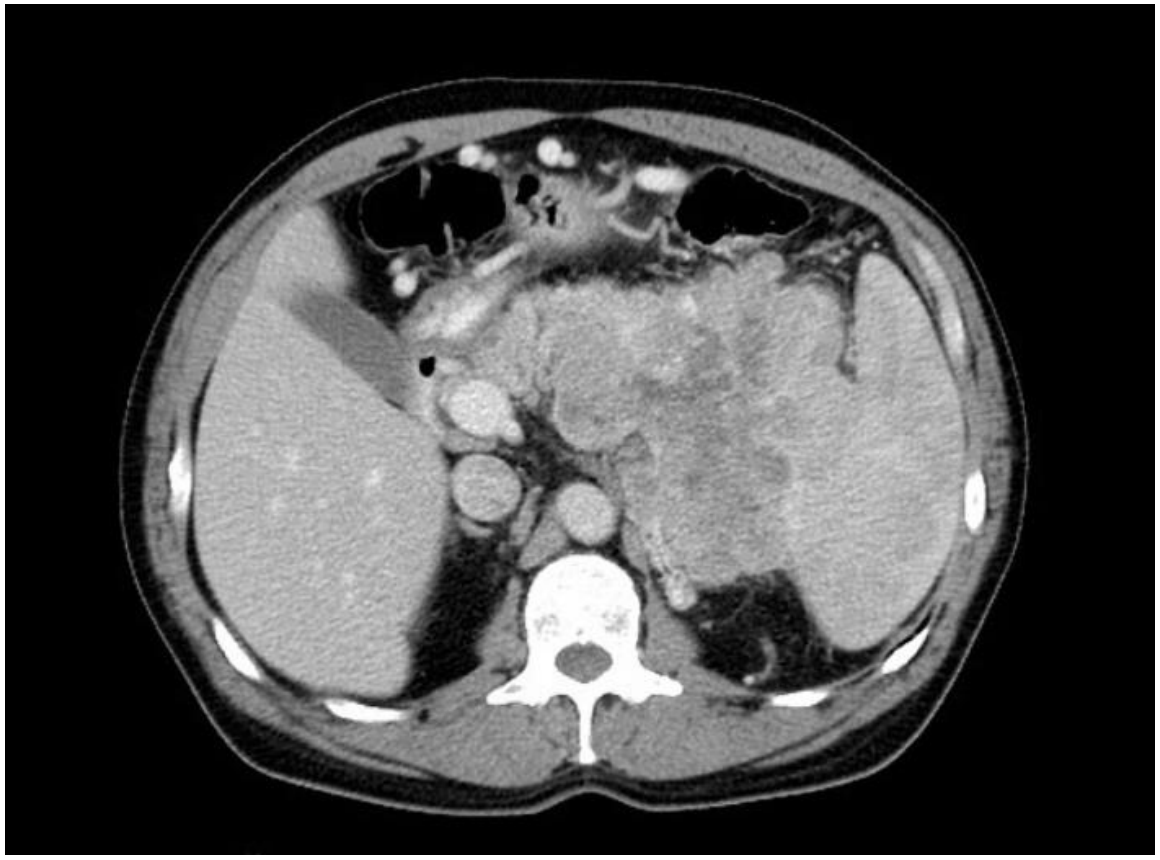
named pancreatic neuroendocrine carcinoma (pNEC)

small cell type / large cell type

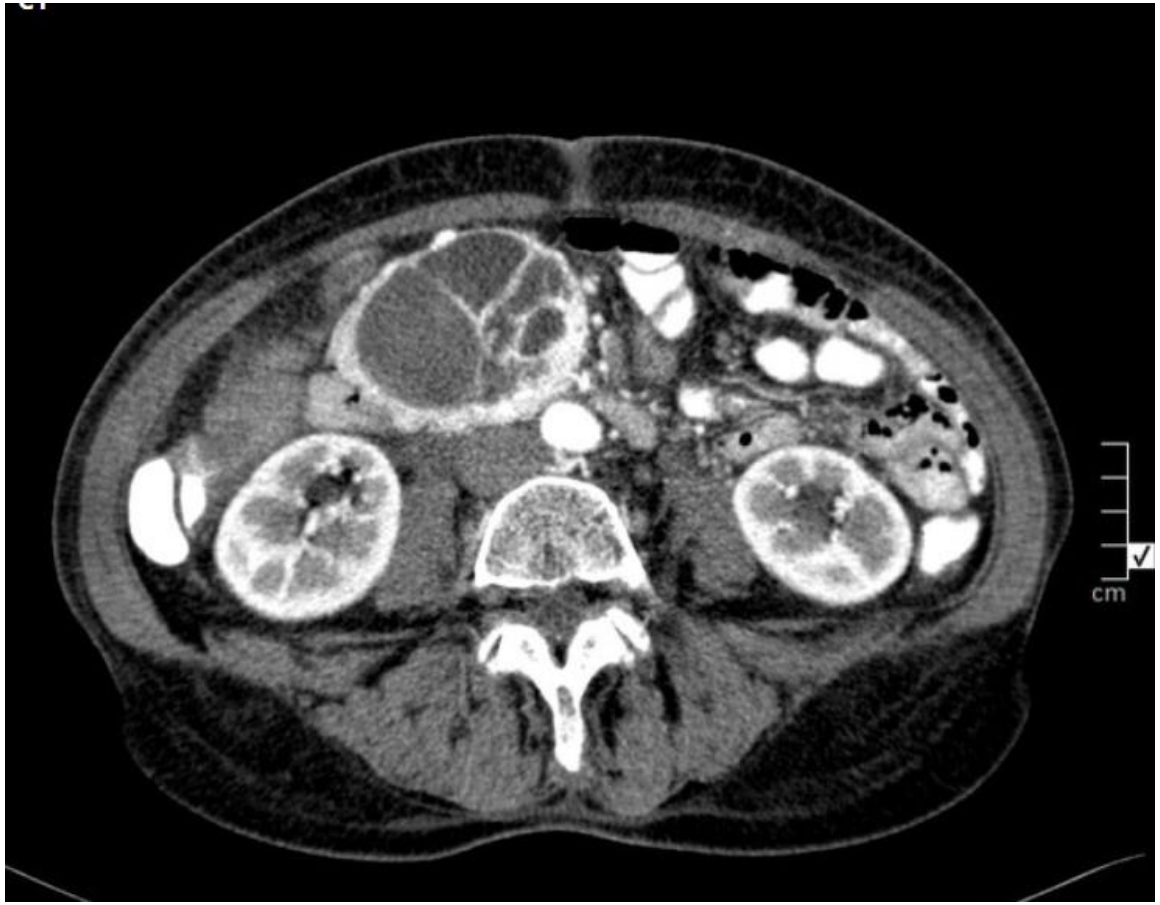


CT findings for pNET

- Ill defined hypodense mass with few foci of calcification showing peripheral arterial enhancement with central non enhancing areas in medial aspect of pancreatic head

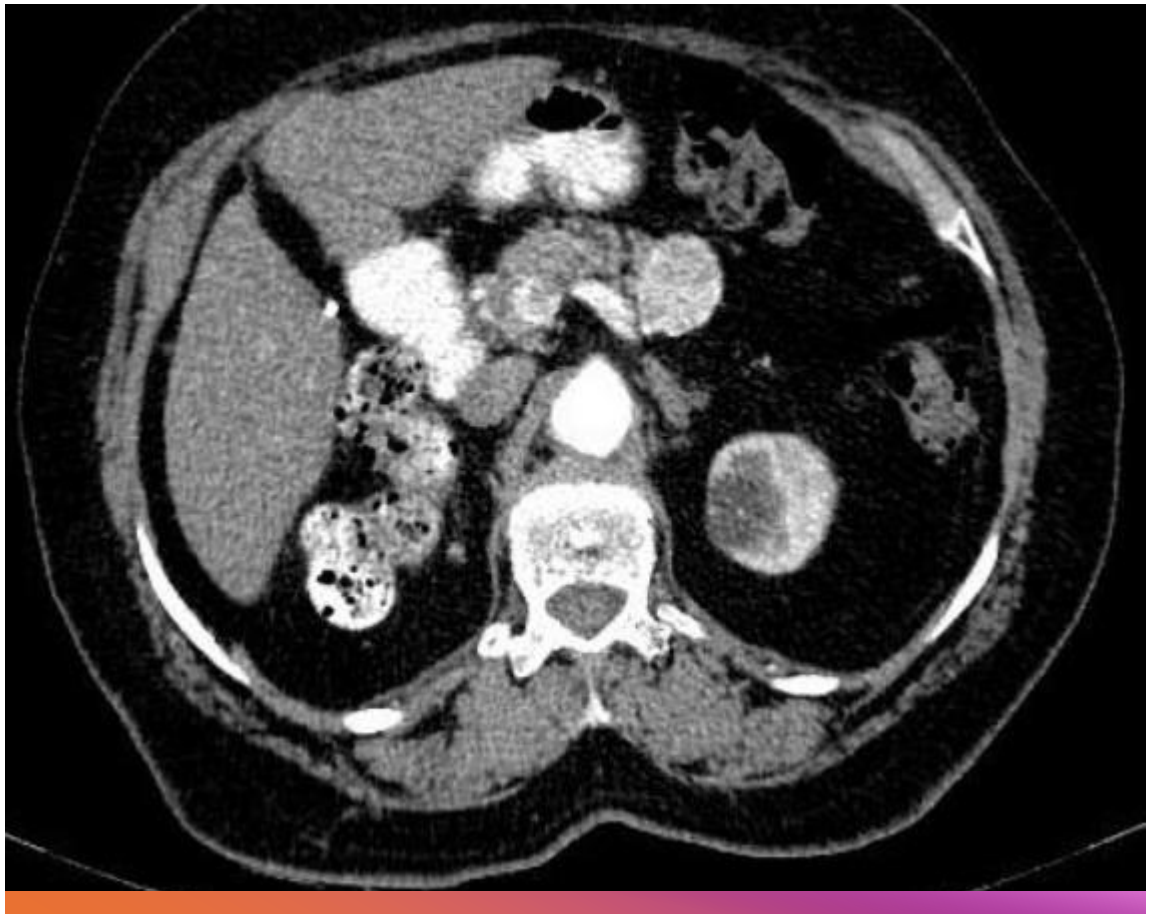


- Large lobulated mass with areas of hypoattenuation showing heterogenous arterial enhancement with non enhancing areas in body and tail of pancreas.
- Evidence of splenic invasion



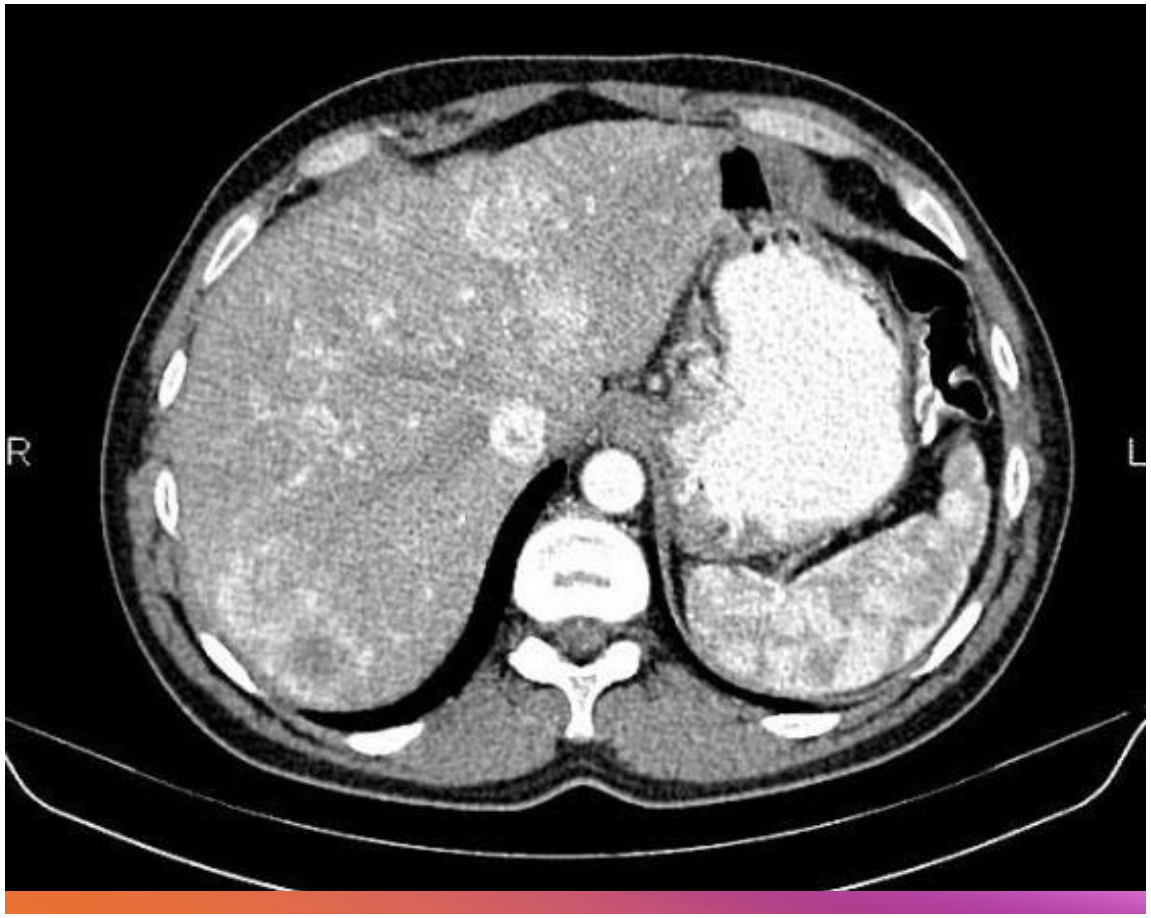
- Large mass with solid and cystic components and focal calcifications. Solid component is showing arterial ehancement

- Well defined hypodense mass with areas of hypoattenuation showing heterogenous arterial enhancement with non enhancing areas in body of pancreas

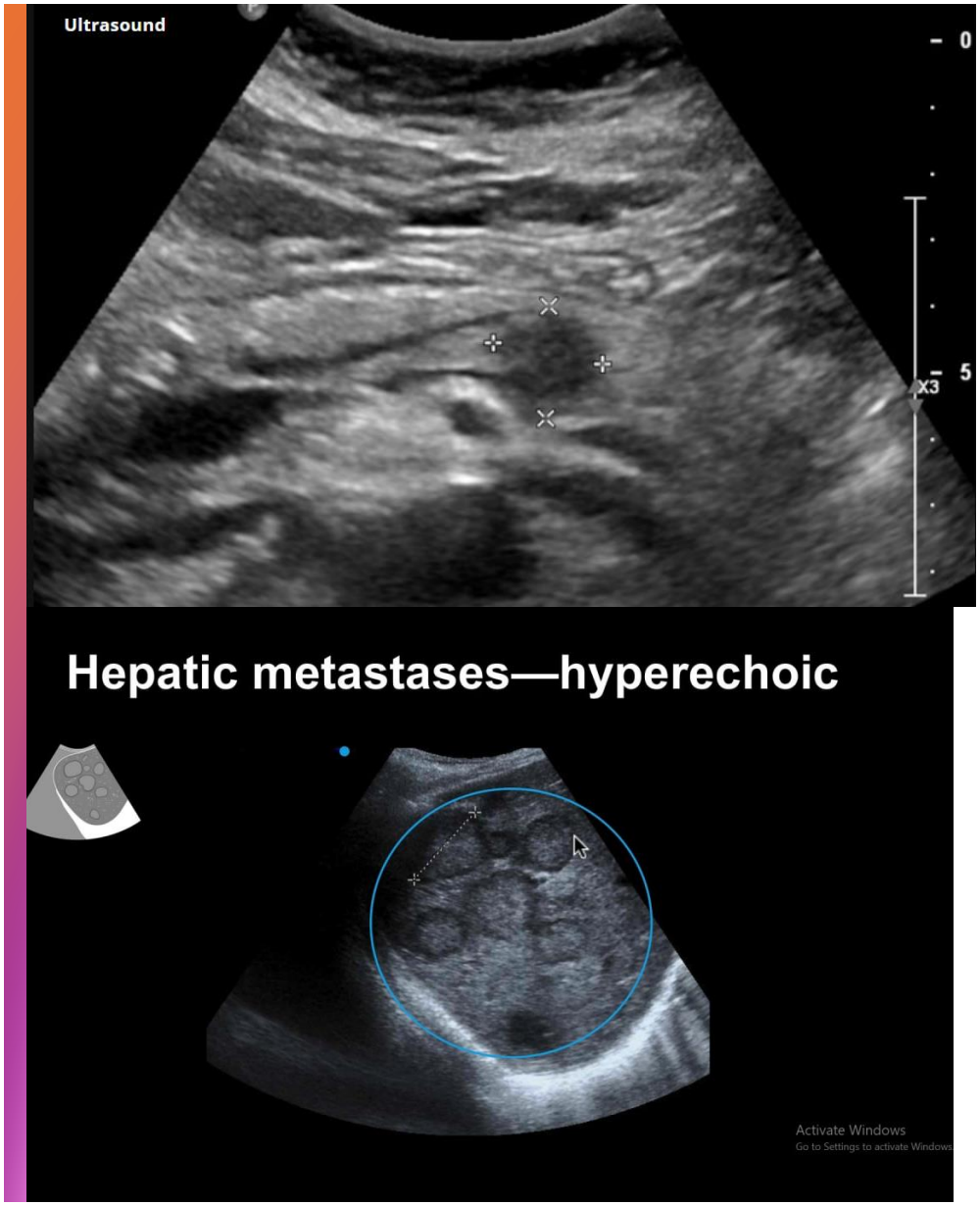


- Well defined round mass showing homogenous arterial enhancement

- Large well defined exophytic mass with mutiple foci of calcifications showing heterogenous arterial enhancement



- Mutiple hypodense lesions peripheral arterial enhancement with central non enhancing areas noted in liver, suggestive of metastasis



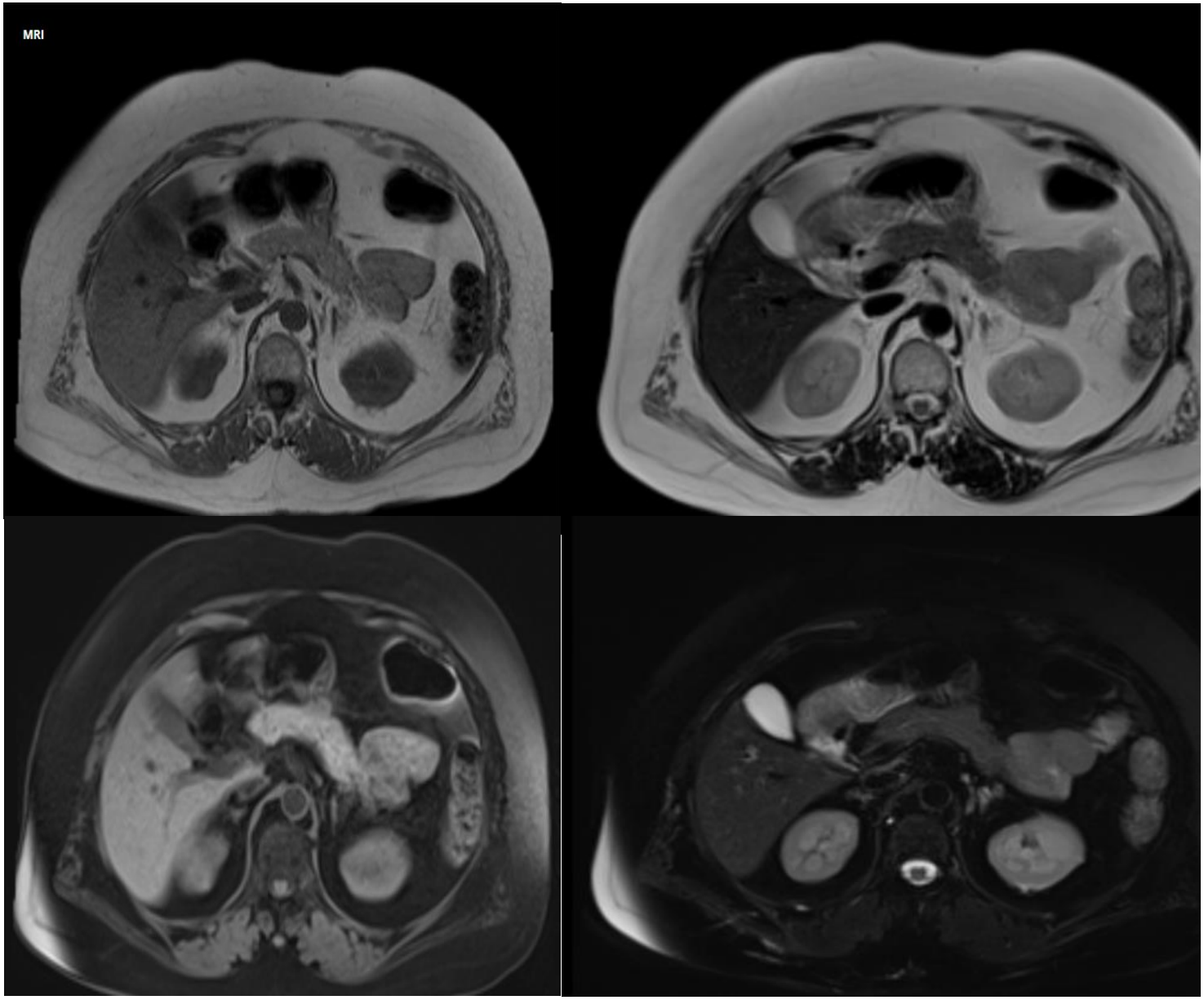
USG

- Well defined
- round / oval
- hypoechoic mass

- Liver metastasis: hyperechoic, targetoid apperance

MRI of normal pancreas-

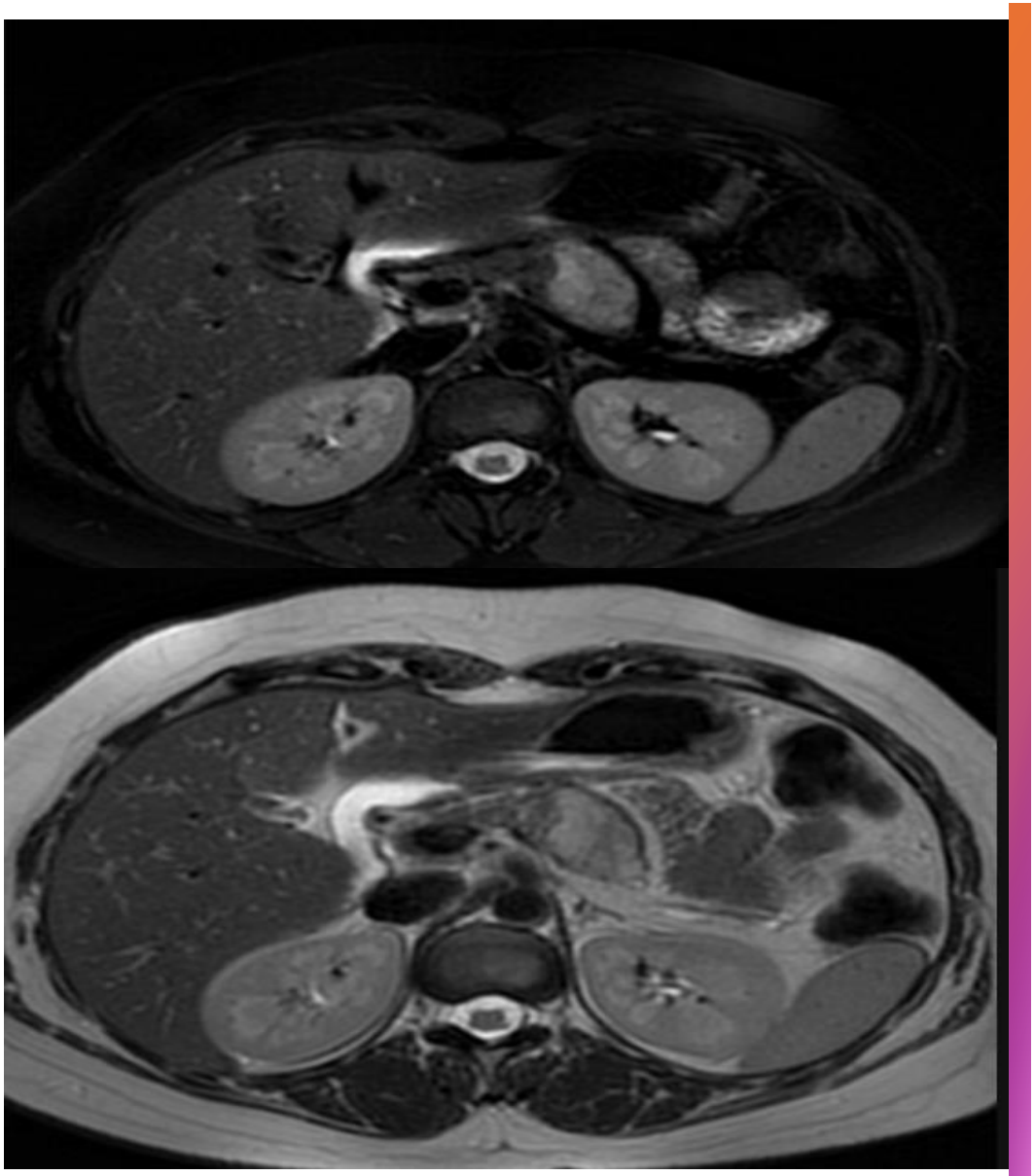
- T1: isointense to liver
- T1 FS: hyperintense to liver
- T2 & T2 FS: hypointense to spleen & kidney

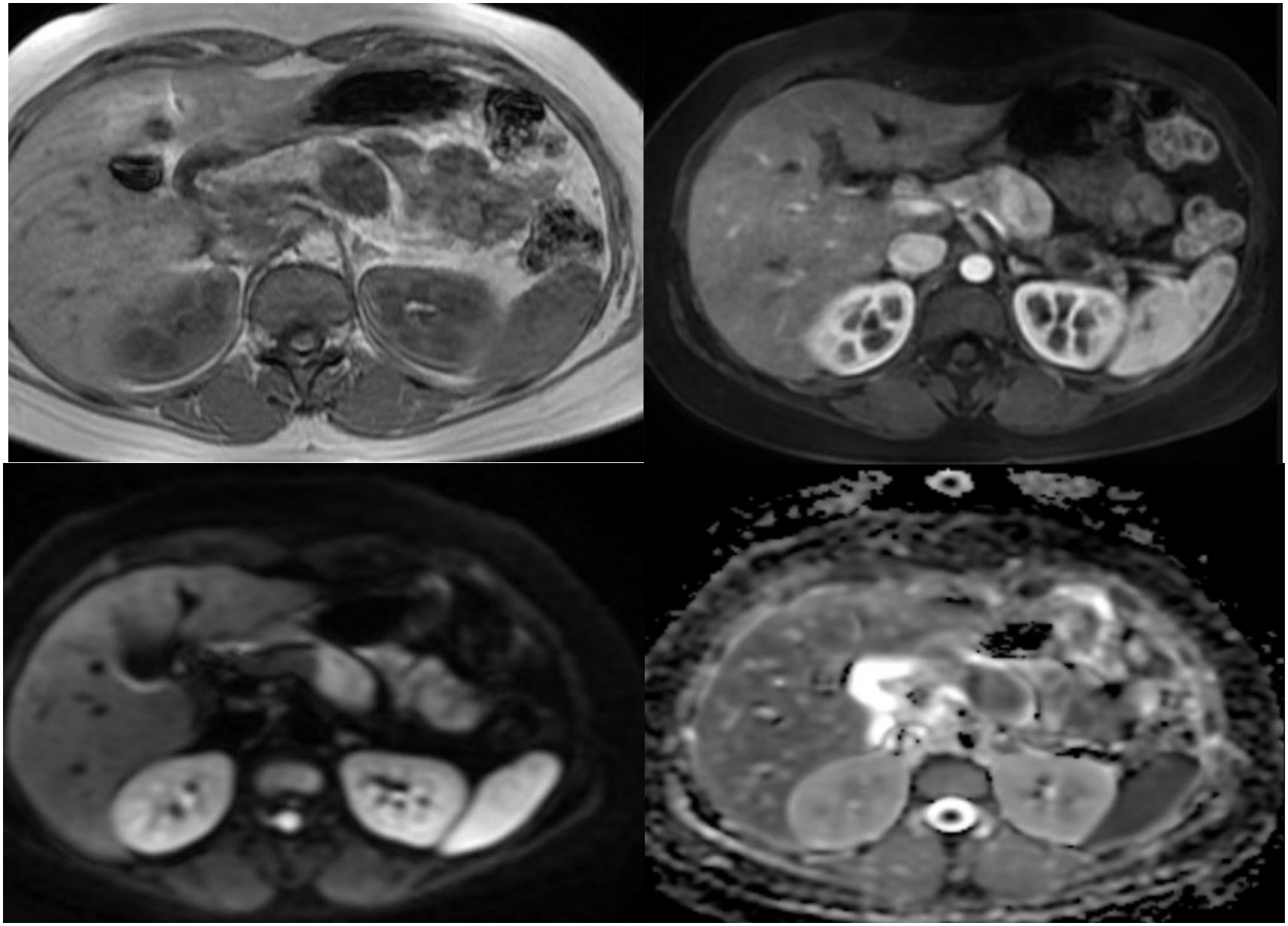


MRI findings

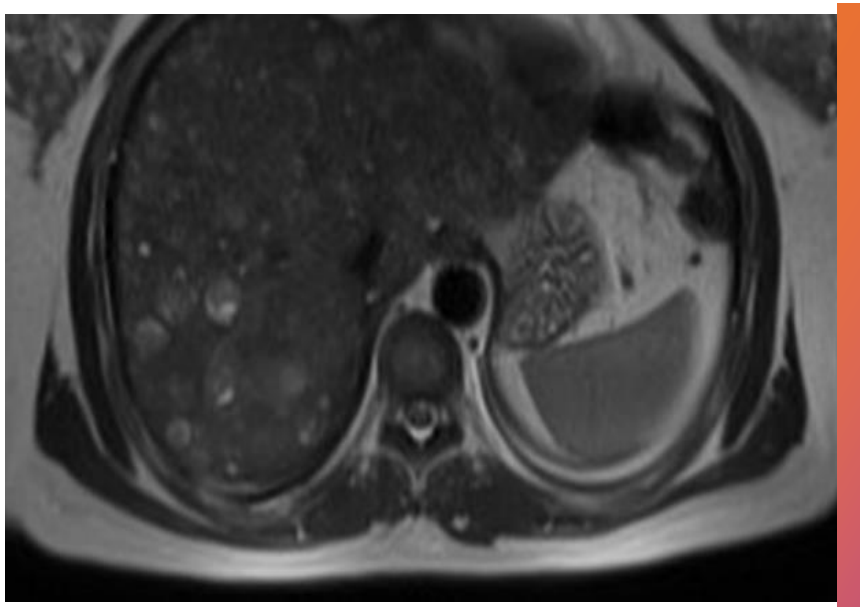
- **T1:** hypointense relative to pancreas
- **T2:** hyperintense relative to the pancreas
- **T1 C+ (Gd):** hyperintense relative to pancreas
- **DWI/ADC:** restricted diffusion is usually present and tends to correlate to the degree of tumour differentiation

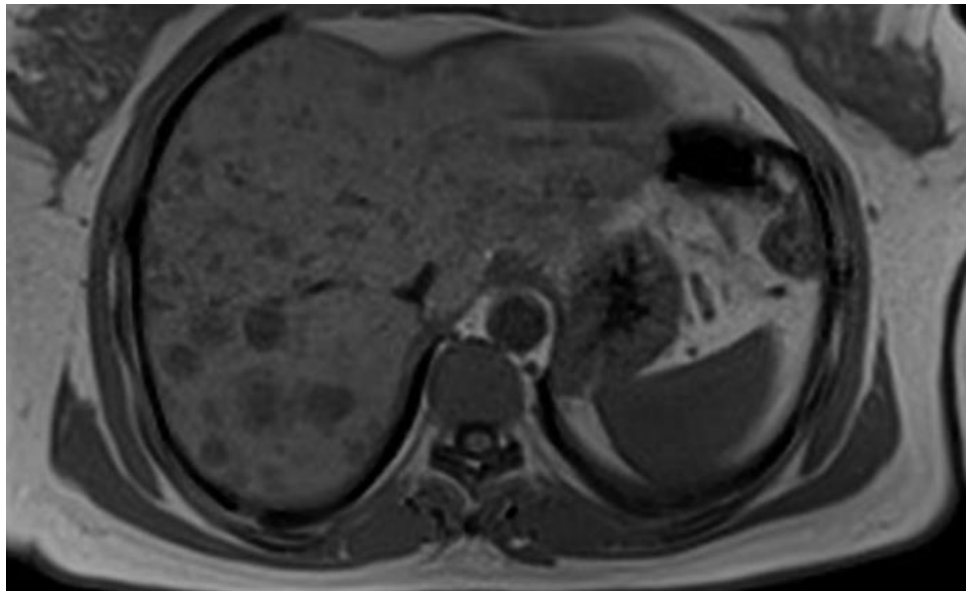
- Well defined lobulated mass showing low signal on T1, high signal on T2, diffusion restriction on DWI / ADC and homogenous arterial enhancement

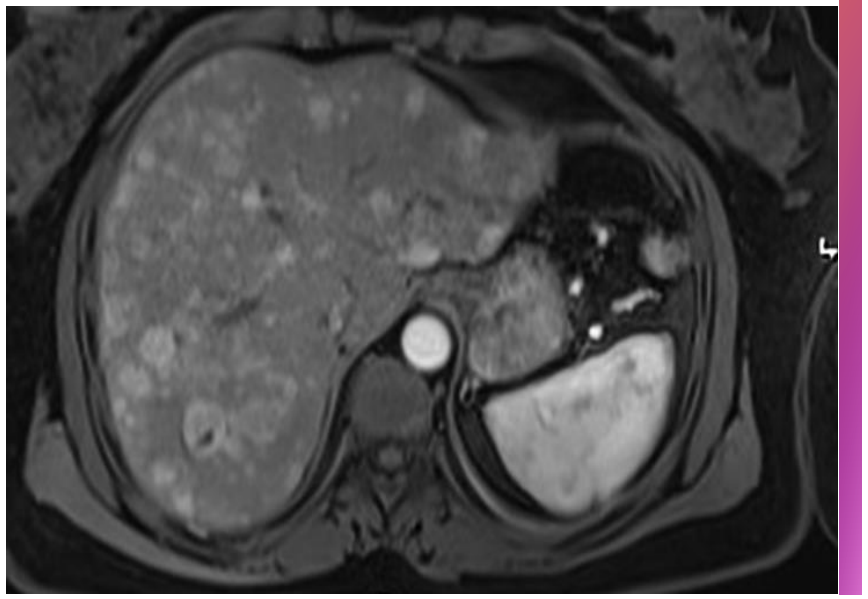




- Mutiple lesions showing low signal on T1WI, high signal on T2WI and arterial enhancement, suggestive of hepatic metastasis







Nuclear Medicine

Somatostain receptor expression imaging:

1. OcteroScan:

SPECT

In111-pentertreotide

Normal uptake:

Spleen

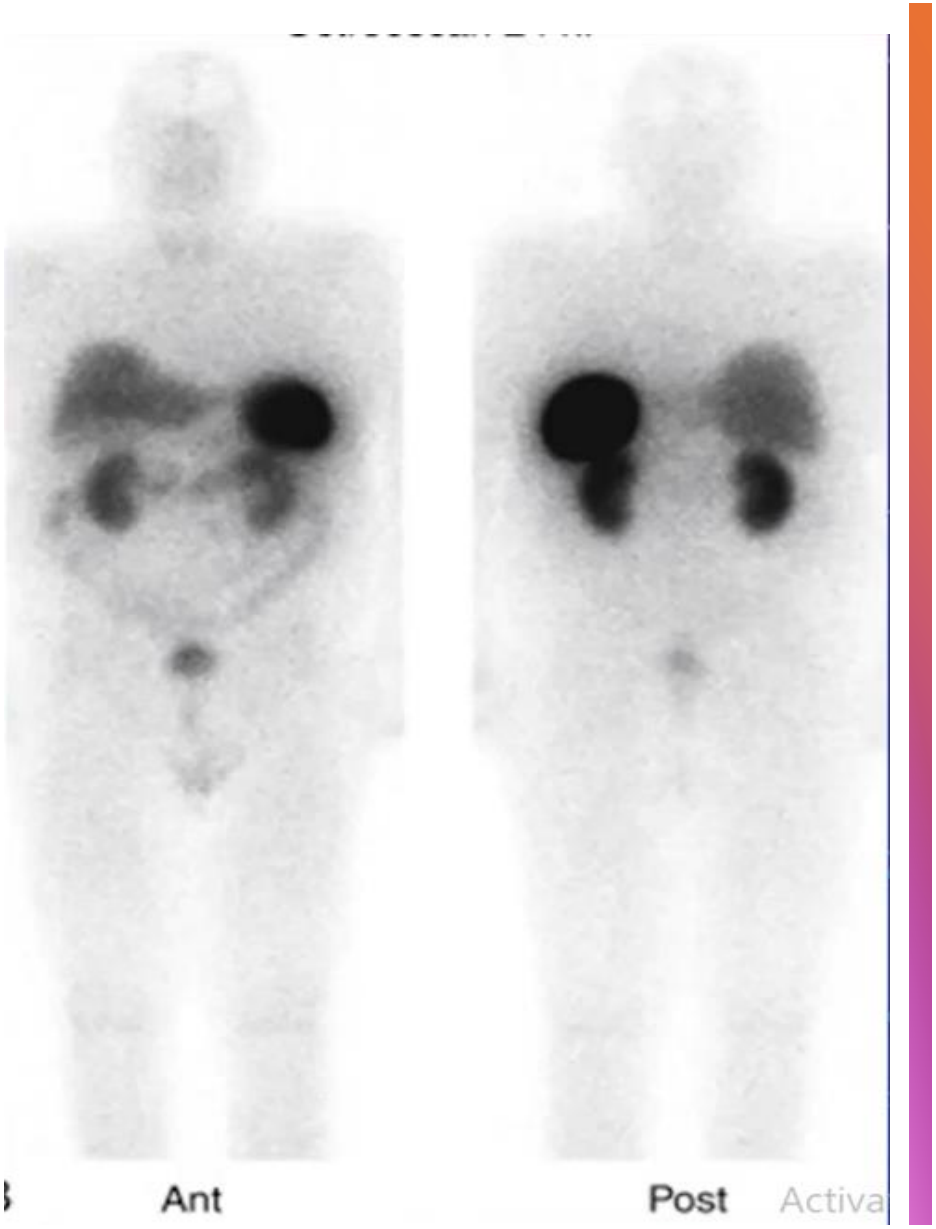
Kidneys

Liver (moderate)

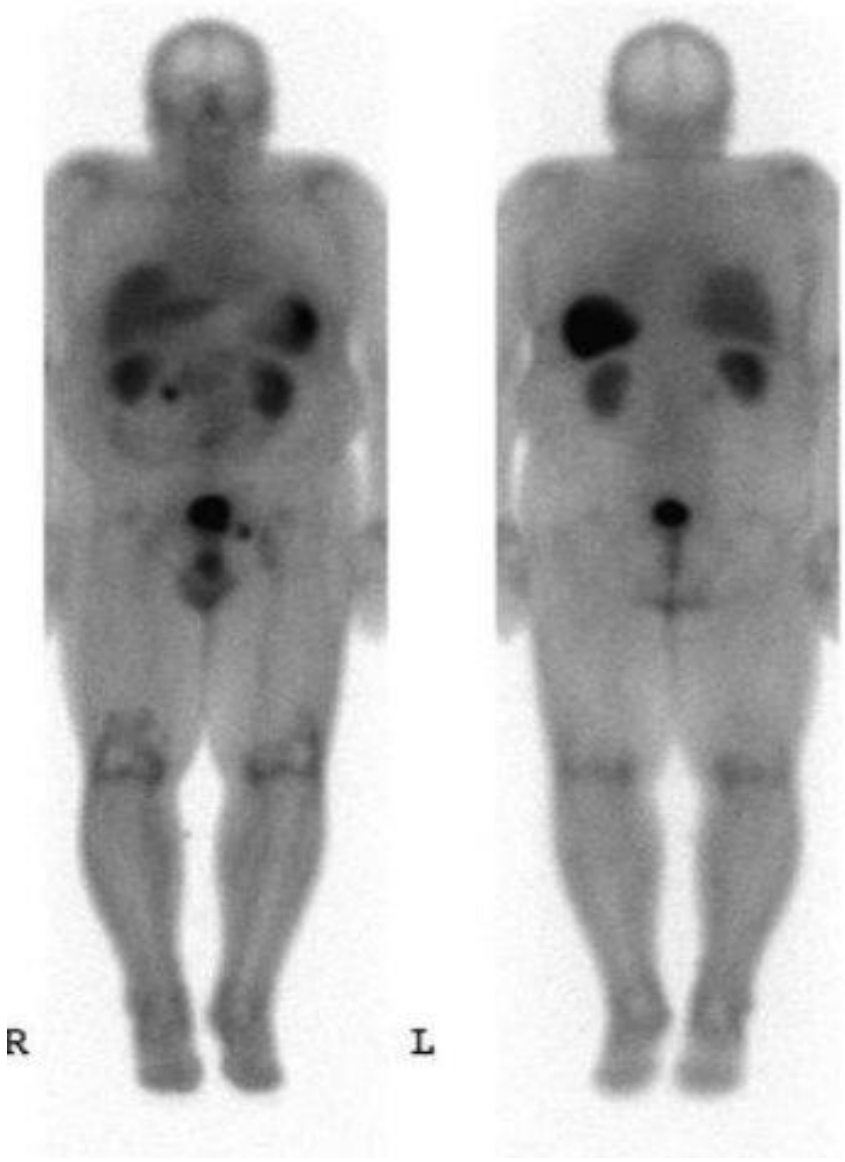
Colon

UB

Replaced by PET



OcteroScan scan showing uptake in head of pancreas



2. NETSPOT

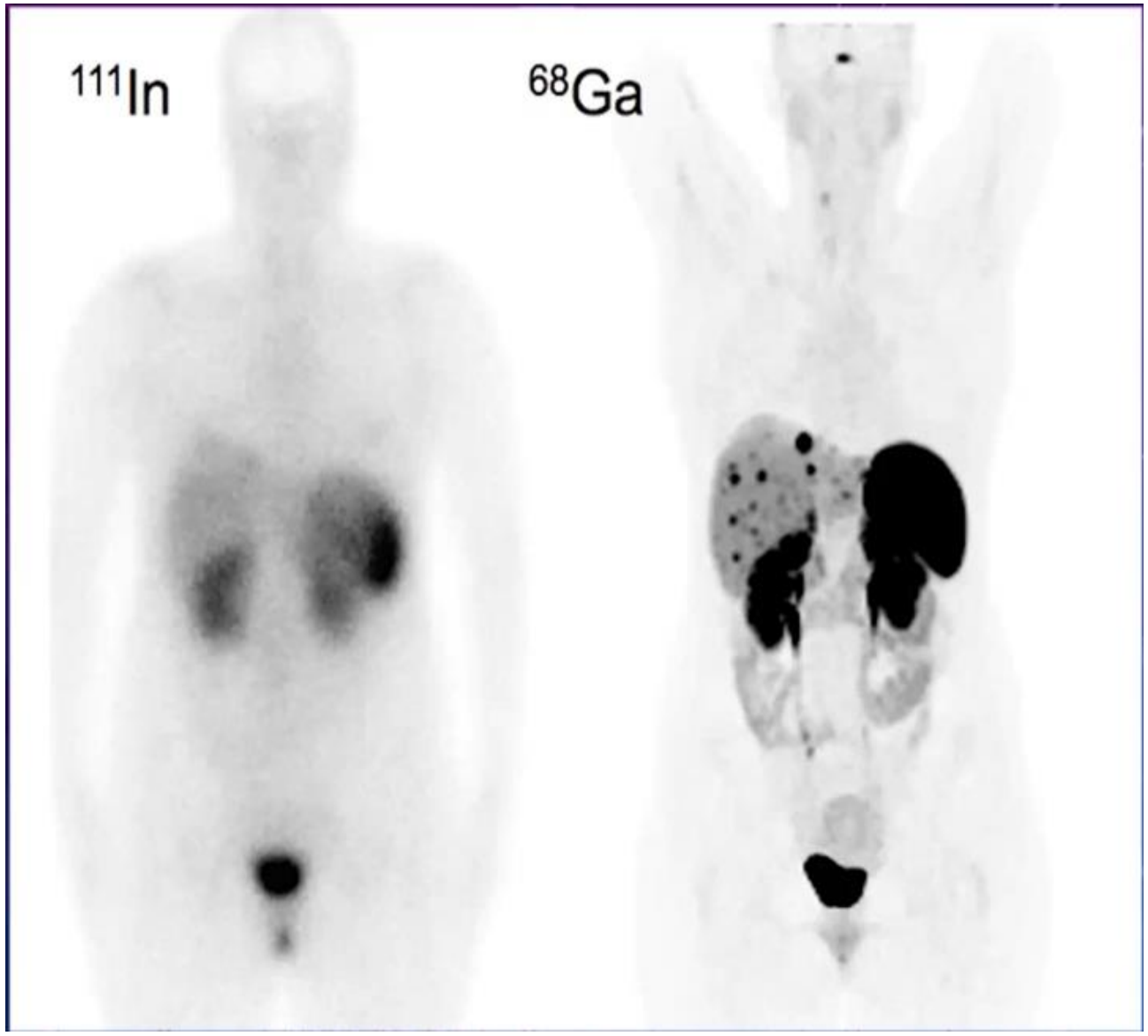
PET

Ga68-Dotatate

Normal uptake is similar to OcteroScan

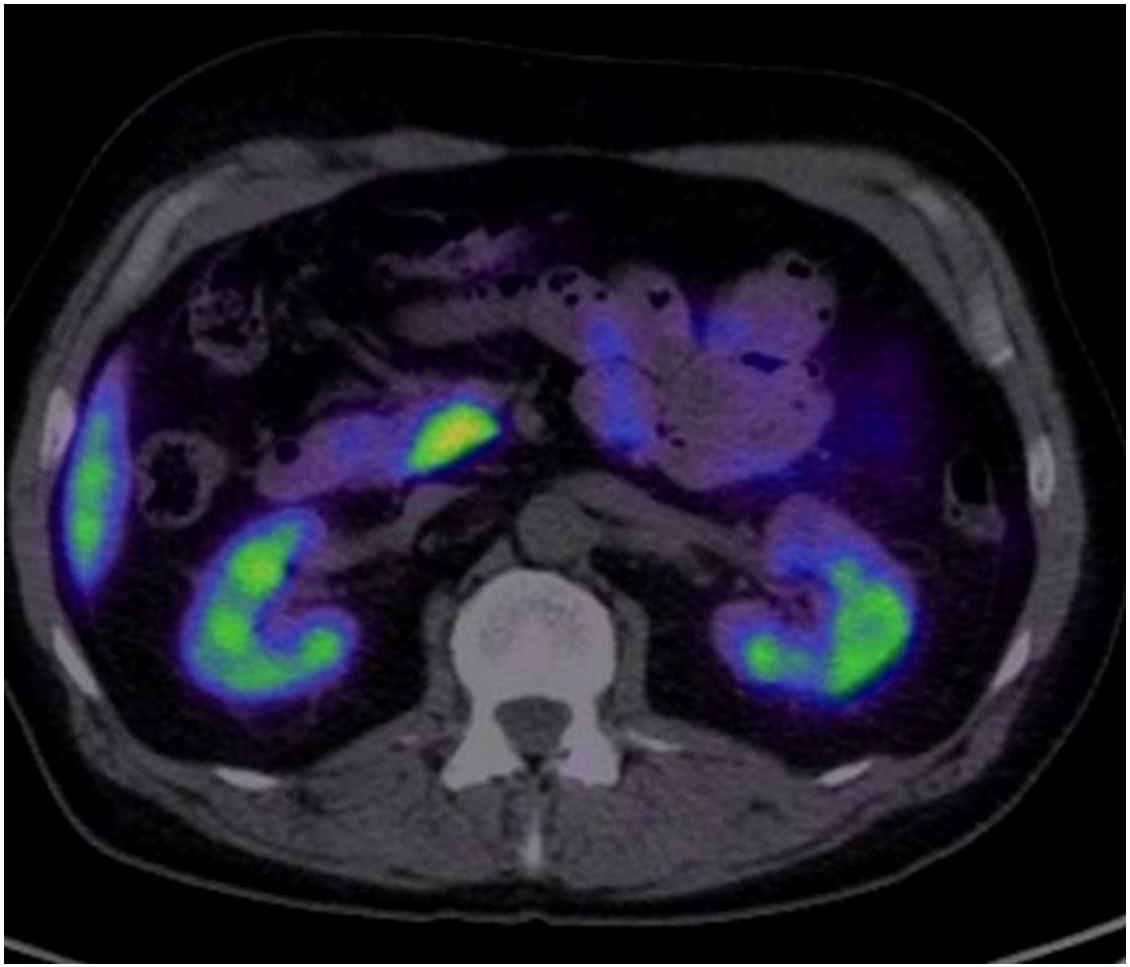
+ PG, uncinate process of pancreas

Superior to OcteroScan



- Ga68-Dotatate PET CT:

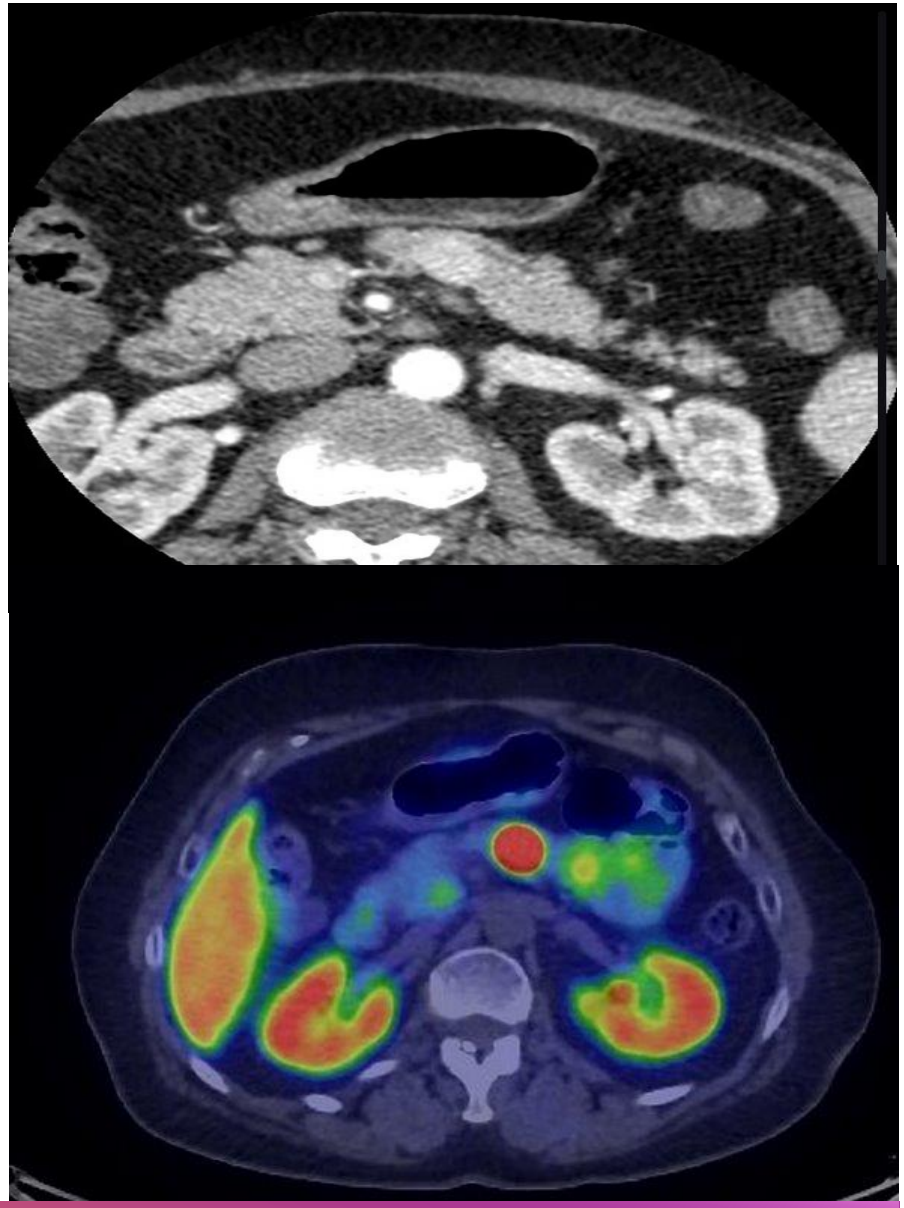
Normal uptake in uncinate process

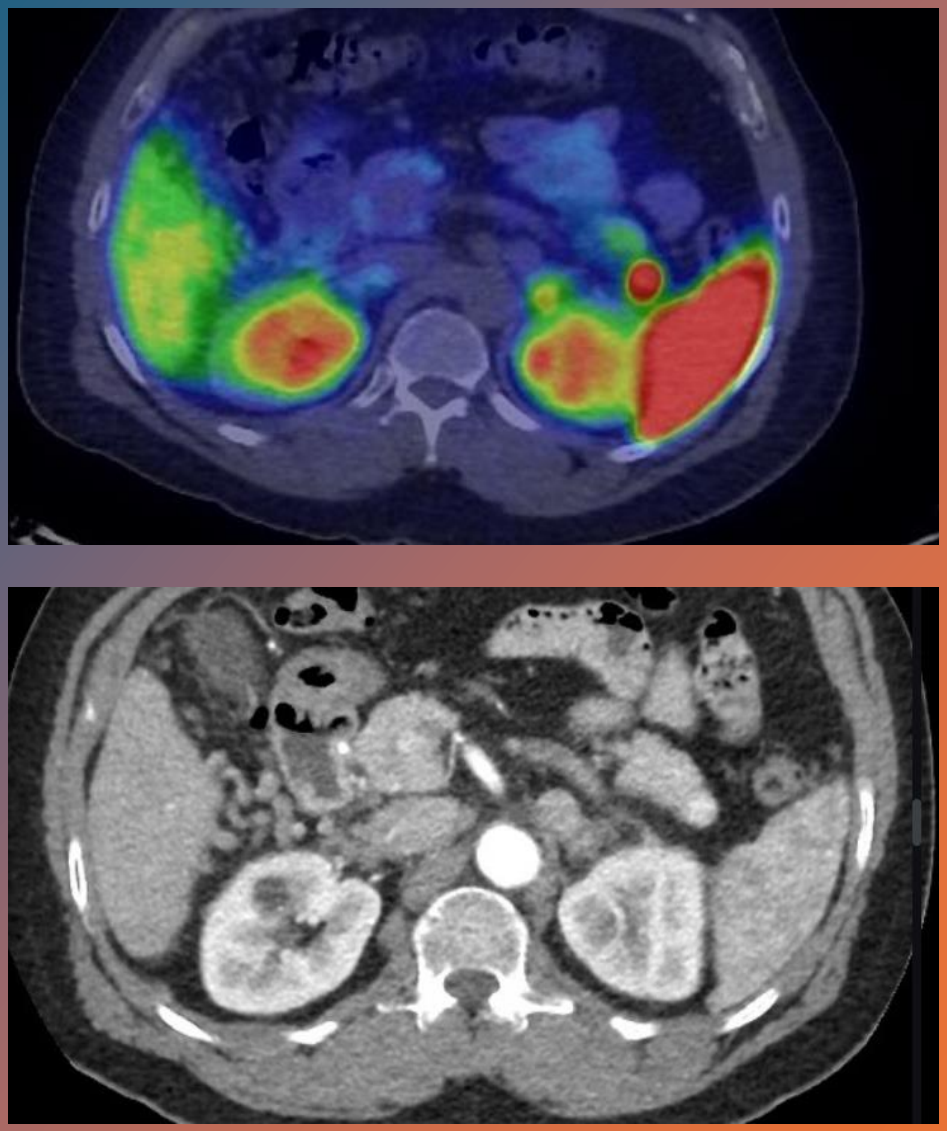


Ga68-Dotatate PET CT:

Increased uptake in-

1. Body of pancreas





2. Tail of pancreas

3. DETECTNET

PET

Cu64-Dotatate

Recently FDA approved alternative to Ga68

- Glucose metabolism - FDG

PET

F18-deoxyglucose

Used in all cancer imaging, uptake is proportional to glucose utilization by tissues, more in cancer cells

Fasting of minimum 4 hr is required before scan

Scan done after 1 hr

Higher uptake is shown by poorly differentiated / aggressive cancer

- Normal uptake in-

Brain

Heart (LV)

Bladder, excretory system

Liver, spleen

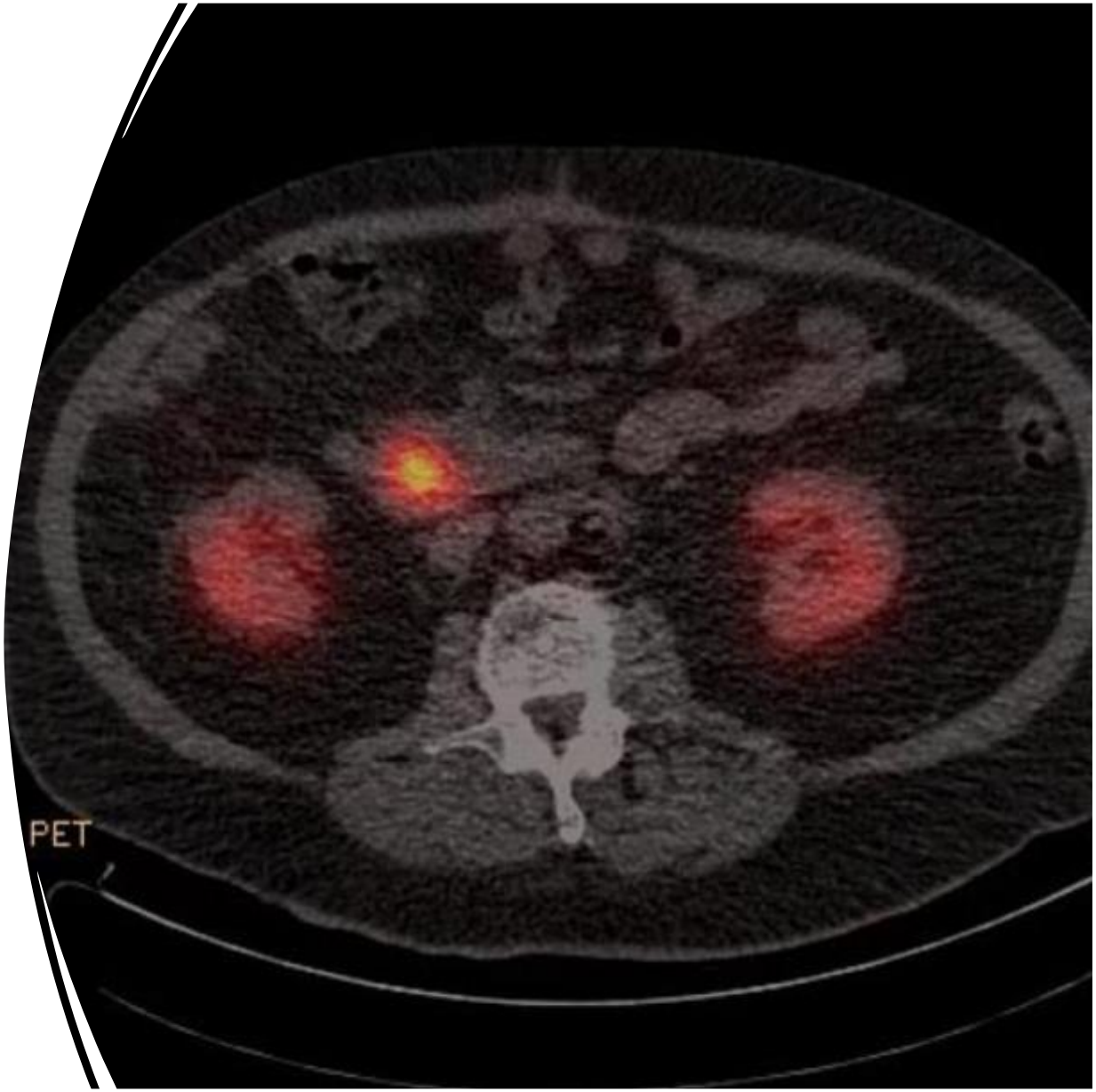
SM, brown fat

GEJ, GIT

Nasophrayngeal mucosa

SG

- FDG PET CT showing increased uptake in head of pancreas



- DD

Pancreatic hemangioma-

Extremely rare disease

No specific symptoms, similar findings of NET, diagnosis confirmed at HPE

- Endoscopic USG guided biopsy is done to confirm diagnosis

- Surgery

Whipple procedure (pancreaticoduodenectomy): head

Central pancreatectomy: neck & body

Distal pancreatectomy: tail

Total pancreatectomy: entire pancraes

Resection is done if spread to distant organs

- Somatostatin analogues:

Octreotide

Lanreotide

- Targeted drug therapy:

Sunitib, Everolimus, Belzutifan

- Peptide receptor radionuclide therapy (PRRT):

Lutathera (Lu177-Dotatate)

Yttrium 90

- Radiofrequency ablation

- Radiotherapy

- Chemotherapy

- Hepatic metastasis:

Embolisation (Arterial, chemo, radio)

Surgical resection

Imaging of GIT NET

- CT enterography protocol:

2 L of oral contrast is given over 1 hr

1800 mL water + 200 mL mannitol (adult)

Alt: PEG, methylcellulose, low density $BaSO_4$

Distension of bowel loops, helps to see bowel mucosa & mesentry

Extent: lung base to pubic symphysis

1 mL/kg contrast + 40 ml NS @3-4 mL/s

Phases: Triphasic-

- Arterial (immediately after bolus tracking)
- Portal (55s after injection)
- Venous (70s after injection)

- CT enteroclyis

Invasive

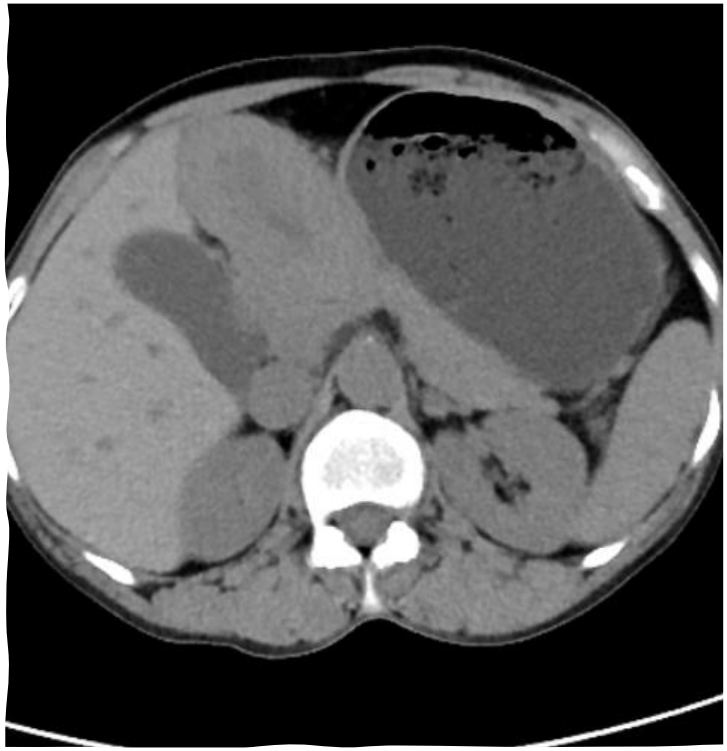
Placement of naso jejunal tube then contrast is given

Done in pt who are not able to tolerate orally

CT findings for GIT NET

- Intra luminal soft tissue density mass showing homogenous arterial enhancement along lesser curvature of stomach, of concern for gastric NET
- No evidence of breech in serosa

Well defined hypodense mass with central decreased attenuation showing heterogenous arterial enhancement with central non enhancing areas noted in supramesocolic space abutting LC and segment IV B of liver supplied by right gastric artery, of concern for omental metastasis. No evidence of invasion to adjacent structures



Signs of malignancy

- Large size
- Areas of necrosis
- Calcification
- Invasion to adjacent structures

Metastasis

- 40-80% present with mets at time of prsentation
- Omentum, mesentry
- Liver
- Lymph nodes
- Bone
- Lung

USG

- Monitor slow growing tumours and metastasis
- USG guided biopsy
- Endoscopic USG

- Nuclear medicine

OcteroScan (In111-pentertreotide)

NETSPOT (Ga68-Dotatate)

DETECTNET (Cu64-Doatate)

FDG PET

- Endoscopic USG guided biopsy is done to confirm diagnosis

- Surgery
- Somatosatin analogues
- PRRT
- Targeted therapy
- RT and CT

- Rx of hepatic meatstasis