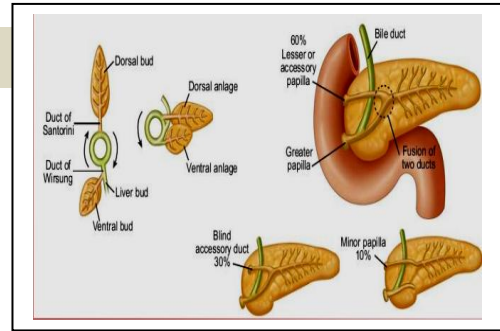


SUMMARY OF PANCREATIC IMAGING

EMBRYOLOGY

- From the **endoderm** of the **primitive duodenum**
- It develops in **two parts**.
 - **Dorsal & Ventral parts**
- Duodenum partial rotation → approximate 2 parts & fuse.



NORMAL PANCREAS

- **Site:** retroperitoneum , **anterior para-renal space**,
- the most anterior of the three retroperitoneal compartments,.
 - Oblique position - at approximately **L1 level**.
 - Sloping upward from the **C-loop of the duodenum** to the **splenic hilum**



- **Weight:** in Adult: 75 to 100 g
- **Length:** about 15 to 20 cm long
- **Peritoneal covering:** It is retroperitoneal with the exception Of the tail,
- which lies in the splenorenal ligament
- **Architecture** : finely lobulated / "old age → Atrophy + Fat infiltration

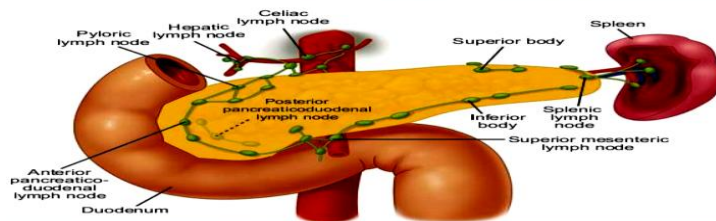
Other structures occupying the anterior pararenal space:
duodenal loop - ascending & descending colon



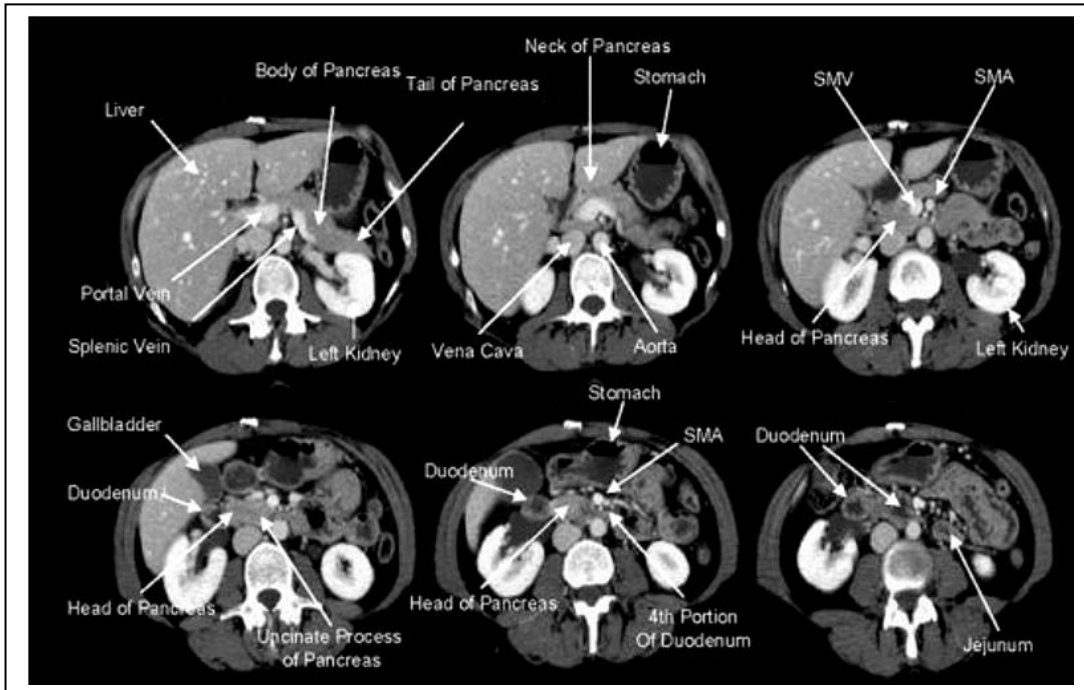
- **Relations:**
 - Ventrally → posterior parietal peritoneum.
 - Dorsally → anterior renal or **Gerota's fascia** and more laterally by the lateral **conal fascia**.

- Head (3cm) neck, body (2.5cm) and tail (2cm) - No firm capsule
- **Density** : 40±10HU slightly less than Liver similar to un-opacified bowel & vessels.

Lymphatic drainage of the pancreas



SUMMARY OF PANCREAS IMAGING



CT PROTOCOL

CT protocol

Slice thickness 2-3 mm
130ml contrast (3ml/sec)
Pancreatic or early portal phase
Arterial phase not necessary

- Water → oral contrast material.
- A **pre-contrast scan** of the pancreas can be performed to look for calcifications.
- 130 ml contrast 3ml/sec. - **Arterial phase** is not necessary.
- **Early-portal phase "pancreatic phase"**
 - Scan-delay of 40-50 sec.
 - Most important phase → detecting and staging a pancreatic tumor.
- Normal pancreatic parenchyma will enhance optimally,

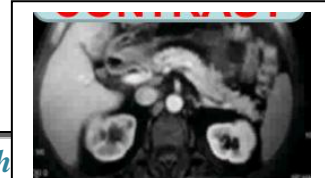
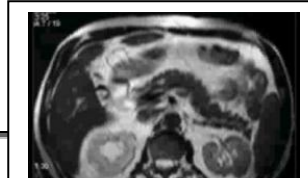
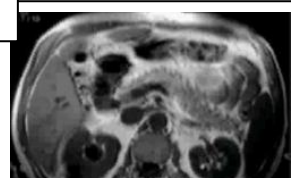
MRI PROTOCOL

- **T1- without fat suppression**,: is isointense or slightly hyperintense to the liver.
- **With fat suppression**, is hyperintense to the liver or other solid organs.

High signal intensity on T1 ← aqueous protein in the glandular tissue

- **T2-weighted images**,:
 - It has **similar** signal to the **liver**
 - & **hypointense** compared with the **spleen** or **kidneys**.

T1, T2 & +C



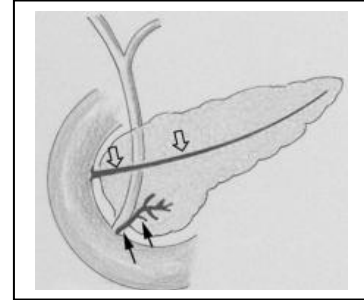
CONGENITAL ANOMALIES

Several congenital anomalies ← failure of normal embryological development.

PANCREAS DIVISUM *commonest congenital pancreatic anomaly*

5–10 % of population

- Dorsal and ventral ducts fail to fuse → forming a pancreas divisum
- → *functional stenosis* and *pancreatitis*.
- → *Malignancy* incidence is increased.
- **Diagnosis:**
 - *Endoscopic retrograde cholangiopancreatography* (ERCP)
 - *Magnetic resonance cholangiopancreatography* (MRCP) → enable visualization of the duct anomaly.

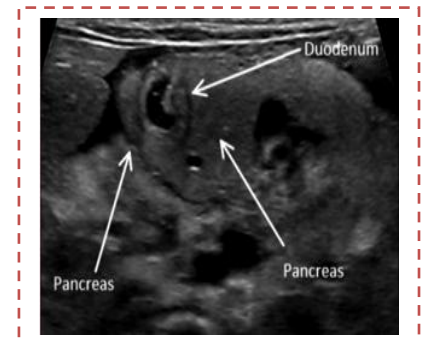


ANNULAR PANCREAS *second most common congenital anomaly*

- **Etiology:** *failure of normal rotation* → pancreatic tissue *partially* or *completely encircling the duodenum*.
- → duodenal dilatation and symptomatic narrowing.
- It May associated with:

*duodenal atresia *duodenal stenosis, *oesophageal atresia

*Down's syndrome. *tracheo-oesophageal fistula

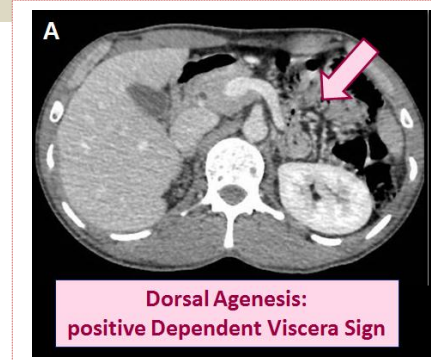


- **Diagnosis:**
 - *Barium studies* → narrowing of the duodenum at the level of the major papilla
 - *CT*: pancreatic tissue is seen surrounding the second part of the duodenum.
 - (*ERCP*) or (*MRCP*): → a *segment of pancreatic duct encircling the duodenum*.



PANCREATIC AGENESIS, HYPOPLASIA

- Agenesis of whole pancreas → rare,
 - Agenesis or hypoplasia of the dorsal anlage may occur.
- Ⓡ *CT*: absence of the body and tail of the gland.
- Ⓡ *ERCP* or *MRCP*: a corresponding short duct in the dorsal part.



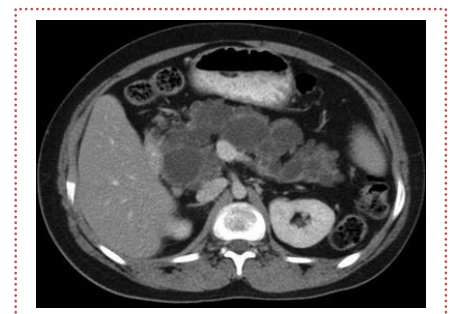
ECTOPIC PANCREAS

- *Sites*: most commonly in the **gastric** or **duodenal** wall.
- *Diagnosis*: is usually *incidentally* during **barium examination** or **upper GI endoscopy** → ectopic pancreatic tissue is seen as a smooth mural nodule, often with central umbilication representing a rudimentary pancreatic duct.

MULTISYSTEM DISEASES WITH PANCREATIC INVOLVEMENT

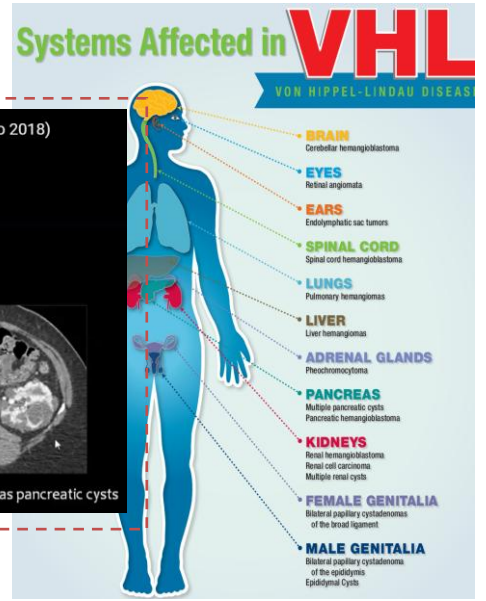
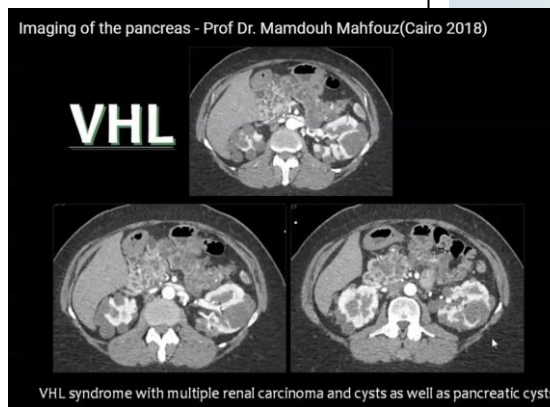
CYSTIC FIBROSIS

- Autosomal recessive inheritance
 - *Pathology*: defects of *serous* and *mucoous secretion* involving *multiple organs*;
- Inspissated secretions → **Duct Obstruction** → acinar and ductal **dilatation** → Acinar tissue **Atrophy**.
- *C.P*: 85 % severe exocrine pancreatic insufficiency and steatorrhea.
- Ⓡ (*US*), (*CT*) and **pancreatic duct imaging**. may show abnormalities, including:
- * Marked **fatty** replacement of the normal pancreatic parenchyma
 - * **Calcification** Dystrophic and
 - * **Cysts** Pancreatic ← ductal obstruction.



Von hippel–lindau disease

- Autosomal dominant
- Characterized by:
 - * *Renal cell carcinomas*,
 - * *Phaeochromocytomas*,
 - * *Retinal angiomatosis* &
 - Haemangioblastomas* of the cerebellum



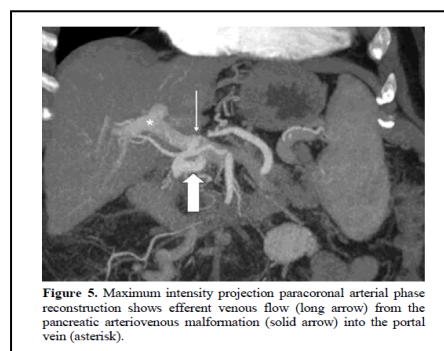
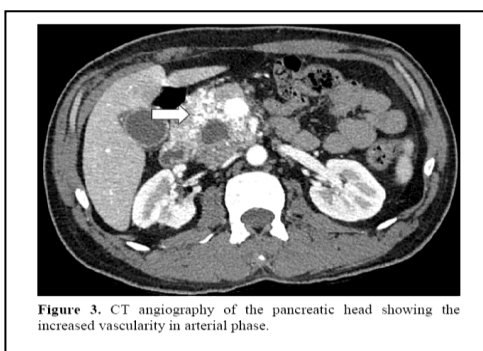
- *Simple pancreatic cysts*:. most common pancreatic lesions in this condition.
- *Serous cystic pancreatic neoplasms* and *pancreatic islet cell tumours* may also occur.

POLYCYSTIC KIDNEY DISEASE

- Autosomal dominant inherited form of polycystic renal disease is the presence of multiple renal cysts .
- Other organs may also be involved → 10 % **Hepatic cysts** may occur and , pancreas also shows cystic change.

OSLER–WEBER–RENDU DISEASE **GS LUMP**

- Vascular disorder, Characterized by **TELANGIECTASIA** of:
 - GIT, Skin, Liver, Urinary tract, Mucous membranes, & Pancreas.
- *The angiographic* findings of pancreatic involvement are characteristic and consist of *dilated pancreatic arteries* supplying a collection of vessels with early draining veins.



ACUTE PANCREATITIS

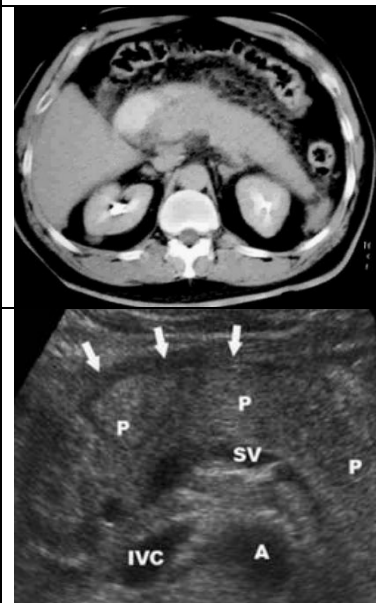
Causes

- **Non-traumatic(75%)**
 - **Biliary tract diseases**
 - **Alcohol**
 - Viral infection(EBV, CMV, mumps)
 - Drugs(steroid, thiazide, furosemide)
 - Scorpion bites
 - Hyperlipidemia
 - Hyperparathyroidism
- **Traumatic (5%)**
 - Operative trauma
 - Blunt/penetrating trauma
 - Lab test(ERCP / angiography)
- **Idiopathic(20%)**

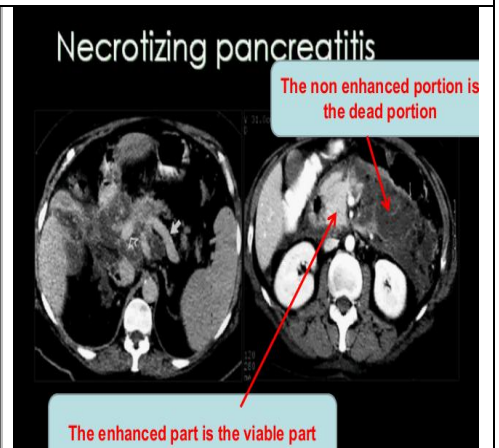
Clinical Presentation

- **Pain (95%)**
 - Acute onset
 - Mid-abdominal or mid-epigastric
 - Radiates to the back (50%)
 - Peak intensity in 30 minutes
 - Lasts for several hours
- Nausea and vomiting (80%)
- Fever
- Shock
- Abdominal distension (75%)
- Abdominal guarding and tenderness (50%)
- Restlessness and agitation
- Grey-Turner's sign (hemorrhagic discoloration of the flanks)
- Cullen's sign (hemorrhagic discoloration of the umbilicus)

Edematous 95%	Haemorrhagic 5%	Necrotic
<ul style="list-style-type: none"> ↘ Diffuse pancreatic swelling ↘ Peripancreatic dirty fat planes ↘ -Peri pancreatic fluid: <ul style="list-style-type: none"> ○ Free in the lesser sac ○ Loculated → pseudocyst 	Complicate From Edematous As edematous + Hyperdense areas of haemorrhage	-Life Threatening -Areas of Necrosis → Non enhanced
<div style="border: 1px solid black; padding: 2px; display: inline-block; background-color: yellow;"> Other Finding: </div>	<ul style="list-style-type: none"> ○ Blurring of the pancreatic margins ○ Thickening of the perirenal fascia ○ Renal halo sign [sparing the perirenal space] ○ Focal gastric wall thickening ○ Left sided pleural effusion 	



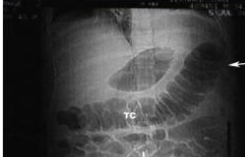
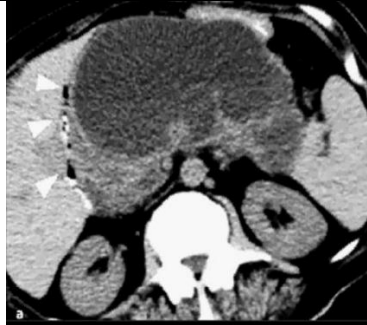
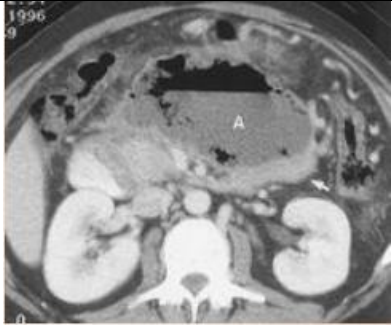

- ↘ US primary modality to use
- ↘ **CECT → Modality of Choice**
- ↘ + increase Serum Amylase
- ↘ MRI Limited role



☒ **COMPLICATIONS:**

- | | |
|---|--|
| <ul style="list-style-type: none"> ○ Haemorrhagic or Necrotizing pancreatitis ○ Vascular Thrombosis | <ul style="list-style-type: none"> ○ Pseudocyst ○ Abscess 4% |
|---|--|

SUMMARY OF PANCREAS IMAGING

Pseudo-cyst	Abscess	
<p>Area of Fluid Collection</p> <p>Any fluid collection persisting for > 4 weeks after an attack of acute pancreatitis,</p>	<p>+ Air Foci ← Sure Sign</p> <p>-More Air → Air-Fluid level</p> <p>-Thick enhancing wall</p>	 <p>Cut off sign and Ileus Transverse colon cut off at splenic flexure No air in descending colon</p>
 <p>50 % resolve spontaneously</p> <p>Pain-hage-Infection -Rupure</p>	 <p>ttt: -Fine needle /Cath./Surgical drainage</p>	<p>Peri pancreatic Collection</p> 

NB. Iodinated contrast agents may exacerbate pancreatic necrosis and renal impairment.

CHRONIC PANCREATITIS




- **Pathology:** irreversible inflammatory disease of the pancreas → Loss of exocrine and endocrine functions.
 - The pancreas size is very variable:
 - fibrosis → **Atrophy** of the whole gland is a common.
 - **Enlargement:** may also be seen, either *g*eneralized or *f*ocal.
 - Longstanding chronic pancreatitis → high incidence of **vascular complications:**
 - Splenic, Mesentric , P.v. **Thrombosis**
 - Arterial **stenosis** or **occlusion.**
 - Arterial **pseudoaneurysms.**
- **History :** of attacks of pancreatitis.
 - **C.P.:** Loss of endocrine function → *weight loss*, and *diabetes.*
 - Abdominal *pain.*
 - Loss of exocrine → *steatorrhea.*



SUMMARY OF PANCREAS IMAGING

Endoscopic US assessment of the pancreas → high-resolution images → allow parenchymal changes to be detected early, but its role is still unclear.

⊕ MRCP avoiding the complications of ERCP as: Acute pancreatitis (up to 1/10 cases), Haemorrhage & cholangitis.

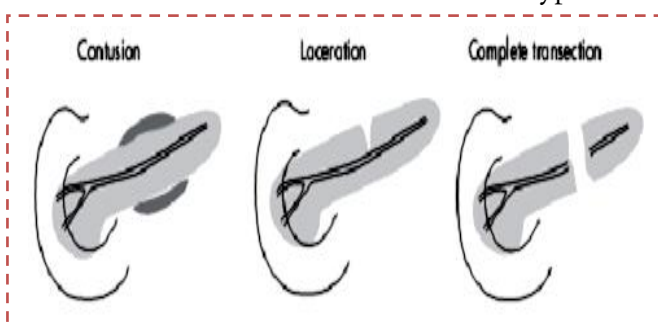
X-RAY	US	CT
		
Pancreatic Calcification	Areas of Calcification → shadow +Dilated Duct +/- Atrophic Changes	Calcification Dilated Duct Size change

Normal Duct diameter 3 mm at head with gradual tapering

TRAUMA

- Blunt / Penetrating * More in Children > Adults
 - Incidence: relatively uncommon, - only 3 % of surgical trauma.
 - Mechanism: severe direct impact *or* forceful deceleration injuries → compression of the pancreas against the vertebrae. (eg. steering wheel or bicycle handlebar)
 - +/- other visceral injuries, esp. of the liver and duodenum.
 - Pathology: Main pancreatic duct disruption is indicator of severity.
- Blunt injuries *without* ductal leakage → resolve spontaneously, no recourse to surgery.
- Leakage from the pancreatic duct → post-traumatic pancreatitis.

- Types of Injuries:



- Simple superficial contusion with minimal parenchymal hemorrhage
- Deep laceration or perforation without duct injury
- Laceration with duct transaction

SUMMARY OF PANCREAS IMAGING

Ⓡ **US:** may show - Peri-pancreatic fluid. - Discontinuity in pancreatic contour.

Ⓡ **CT:** **most effective** / Thin Slice.

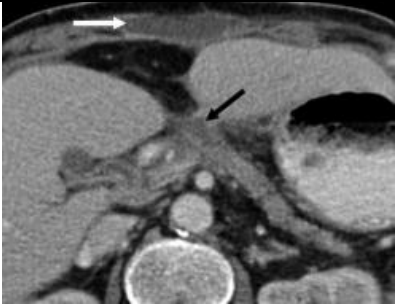

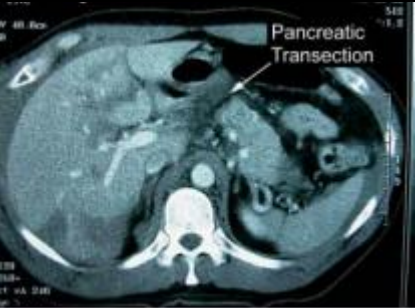
— **Nonspecific findings:**

- Thickened ant. renal fascia
- Fluid in the lesser sac.

— **More specific features:**

- Focal enlargement +/- Haematoma.
- Fluid Peripancreatic
- Increased attenuation of the peripancreatic Fat.
- Fracture line through the pancreas +/- separation of the fracture fragments

— **ERCP** or **MRCP** → for high suspicion of ductal injury.

Contusion	Laceration	Trans section
		

Intraoperative Pancreatography should be performed → evaluate integrity of pancreatic duct (*injury to the duct requires different surgery*)

PANCREATIC TUMORS

Functioning

SOLID

CYSTIC 15%

*Solid Pancreatic mass = Malignancy
Until proved other wise*



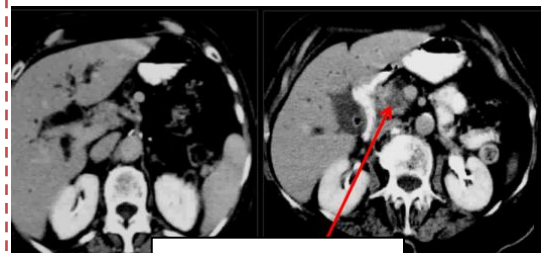
SIGNS OF PANCREATIC NEOPLASMS

- ☠ Focal enlargement 96% of cancer +/- L.N. Enlargement
 - ☠ Abnormal attenuation [30-50HU] IV contrast is mandatory
 - ☠ Obliteration of fat planes almost always due to cancer, but also pancreatitis
- NB. Obliteration of fat near other organ does not mean that this organ is invaded
- ☑ Vascular invasion : SMA or celiac artery inoperable
 - ☑ DUCT Dilatation , CBD – PD or Both

SOLID LESIONS OF THE PANCREAS

PANCREATIC CARCINOMA (Ductal Adenocarcinoma)

- **Incidence:** 3% of all cancers
- **Pathology:** highly lethal tumor.
- Unrespectable Usually at presentation.
- The average survival: only 5 to 8 months.
- Ⓜ **CT:** by rapid bolus contrast injection & thin slices.
- **Hypodense mass** → distorts pancreatic contour.
- Associated findings :
 - Obstruction of **CBD** and **pancreatic duct**.
 - **Atrophy** of pancreatic tissue beyond the tumor.



Biliary Obst. & Mass

– **Metastases:** commonly go to regional **Nodes**, **Liver**, & **Peritoneal cavity**.

– **Tumor recurrence**

– : following the **Whipple procedure** is best detected with MDCT.

→ **Surgical resection** is the only hope of cure → Radiographic assessment of resectability is critical.

– **Signs of potential respectability:**

- Isolated pancreatic mass +/- dilation of the bile or pancreatic ducts.

SUMMARY OF PANCREAS IMAGING

— **Signs of unresectability:** Only 10% to 15% are potentially resectable using these criteria.

Resectability and vessel ingrowth

Fat plane	Resectable.
Vessel surrounded < 180°	Doubtful resectable.
Vessel surrounded > 180° or Occlusion	Not resectable.

- (1) Tumor extension beyond the margins of the pancreas,
- (2) Tumor involvement of adjacent organs,
- (3) Enlarged regional lymph nodes (**>15 mm**),
- (4) Encasement or obstruction of peripancreatic arteries or veins.
- (5) **Hepatic Metastases.**
- (6) **Peritoneal carcinomatosis.**

Ⓡ **Image-guided biopsy:** → confirm diagnosis when expecting unresectable tumors.

Ⓡ **MR** : *postcontrast T1WI* : **low-signal** infiltrative **tumor**, surrounded by **high-signal** enhanced parenchyma.

Ⓡ **MRCP:** ductal dilatation proximal to the tumor.

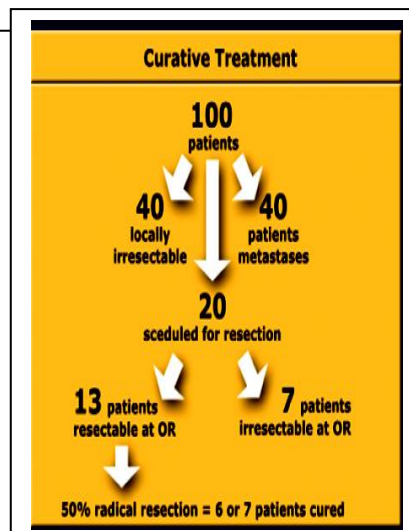
Ⓡ **MRA and MR venography:** excellent in identifying vascular involvement by tumor.

→ **D.D.:** Mass due to **Chronic pancreatitis** → mimics carcinoma, **but**

— **Pancreatic duct** **Beaded dilatation** → characteristic of chronic pancreatitis / **smooth dilatation** is most frequent with carcinoma.

— **Calcifications** : **common** with chronic pancreatitis / **very rare** with **adenocarcinoma** **but** more **common** in **Islet cell tumors**

— **Image-guided biopsy:** for definitive diagnosis. (**14%** of **adenocarcinoma** cases have **chronic pancreatitis** also).



ISLET CELL TUMORS

- **Pathology:** * Functioning islet cell tumors → clinical syndromes → usually present while the tumors are small.
- **Insulinomas** "70 %" → hypoglycemia.
"Over all incidence 0.0003 %" – Small <2cm / Hypervascular / Can Be multiple
- **Gastrinomas** "20 %" → peptic ulcers, or **ZOLLINGER-ELLISON SYNDROME**.
- **Glucagonoma** → (diabetes mellitus and painful glossitis),
- **Somatostatinoma** → (diabetes and steatorrhea),
- **VIPoma** → (massive watery diarrhea).

— **size** vary from 0.4 to 4.0 cm

— **Malignant potential** of Functioning tumors vary : "Malignant Lesions are larger"

↘ , Insulinoma 10%

↘ gastrinoma 60%

↘ glucagonoma 80%.

***Nonfunctioning islet cell tumors** :

- clinically silent until → symptoms of a growing, → **large mass**.
- **Size** : 6 to 20 cm diameter
- Up to **80%** are malignant.

Ⓡ **Precontrast CT**: Most small islet cell tumors cannot be identified.

Ⓡ **Post-contrast CT**:

- **No specific CT features** "Small lesion tend to be hypervascular"
- **Calcium** may be seen [almost never occur in Adenocarcinomas]
- Most of these tumors are of small size
 - Discovered by clinical and lab findings
 - Metastatic deposits "of malignant"
- Accurate detection is usually by intraoperative ultrasound

Ⓡ **Scintigraphy**: **Octreotide** is a somatostatin analogue used for detection of islet cell tumors.

MR: most islet cell tumors are

- T1WIs → hypointense
- T2WIs → hyperintense
- Dynamic postcontrast T1WIs → bright arterial enhancement.

Insulinoma :

- 100% clinically Diagnosed "**Whipple's Triade**"
- Most cases imaging cannot detect
- **intra operative US** is used to detect it →
- Prope is directly on the pancrease

"Whipple's Triade"

- ↘ Fasting Hypoglycemia < 50 mg/dl
- ↘ Hypoglycemia induced Catecholamines
- ↘ IV Glucose relieve symptoms

METASTASES TO THE PANCREAS

- **Pathology:** most frequent with **renal cell** carcinoma and **bronchogenic carcinoma**.
 - any portion of the pancreas.
- Ⓜ **CT:** Lesions may be:
 - **S**olitary, **w**ell-defined, **H**eterogeneously enhancing mass,
 - Diffuse heterogeneous **E**nlargement of the pancreas,
 - or as **M**ultiple Nodules.
- Ⓜ **MR:** most lesions are T1WIs → low signal & T2WIs → high signal.
 - **Melanoma metastases** → characteristically hyperintense on T1WIs ← paramagnetic properties of melanin.

LYMPHOMA

- **Pathology:** - pancreas as a primary site (rare) or - direct extension from disease in the retroperitoneum.
- Ⓜ **CT:** most lesions → Lesions may be a *localized, well-defined* mass, or they may be *infiltrating diffusely enlarging or replacing* the gland
- Ⓜ **H**omogeneous, **L**ower attenuation < muscle, and **L**imited enhancement.
- Ⓜ Attenuation may be so low → appear cystic.

CYSTIC LESIONS OF THE PANCREAS

I. Pseudo cysts

- **Most common pancreatic cystic lesions**
- *resulting from pancreatitis.* – 44% Resolve Spontaneously
- They are of **fluid density** and have a *definable fibrous wall* that may be *calcified*.
- Internal **septations** and multiple **loculations** : common.
- After 6 weeks → Capsule developed → for Drainage
 - ↳ D.D. "Cystic Tumors" :
 - ✓ C.P & Hiostry
 - ✓ Serum Amylase
 - ✓ Aspiration → Cytology



II. Abscess

- Any patient → cystic pancreatic lesion + fever → Abscess must be considered.
- Usually as a complication of pancreatitis.
- Ⓜ Most abscesses → *indistinct walls* and contain *fluid* and *debris*.
- Ⓜ **Gas bubbles** in cystic lesion → good evidence for abscess.
- Ⓜ Value of CT
 - Confirms the clinical diagnosis
 - Demonstrates the full extent and spread
 - Guides the interventional procedures
 - Post therapeutic follow up



III. True pancreatic cysts,

- **Incidence: 10%** of patients with autosomal-dominant polycystic disease,
- 30% of patients with von Hippel-Lindau syndrome, & some patients with cystic fibrosis.
- **Pathology:** A true cyst with epithelial lining,
They appear as well-defined, fluid-filled masses with walls of variable thickness.

CYSTIC TUMORS

- **Incidence:** Relative uncommon (5% to 15% of pancreatic cysts).

- **Pathology:**

→ **ISLET CELL TUMORS** → extensive necrosis → appear cystic.

→ **CYSTIC TERATOMAS:** rare in pancreas, usually have characteristic hair, fat, calcifications, and cystic + solid components.

→ **MICROCYSTIC ADENOMA** (serous cystadenoma):

is a benign, *innumerable small cysts 1 mm : 2 cm* in size.

— The lining epithelium are rich in glycogen, → alternate name of glycogen-rich cystadenoma.

— The cysts may be so small → appears as a solid lesion on imaging studies.

Ⓡ **Noncontrast CT** → *well-defined mass with low attenuation near water density*.

Ⓡ **Contrast enhancement** → marked, with demonstration of *multiple internal septations* → honeycomb appearance.

Ⓡ **US** → *echogenic mass*, with only a few of the larger cysts visible.

→ **MACROCYSTIC SEROUS CYSTADENOMA:**

— *unilocular or biocular cyst > 2 cm*,

— Most are smaller than **5 cm**.

Differentiation between benign and malignant forms of this lesion is difficult unless signs of malignancy are present.

→ **MUCINOUS CYSTIC NEOPLASM:**

— Also known as *macrocytic adenoma* or *mucinous cystadenoma* *cystadenocarcinoma*.

— Women - 40 : 60 y

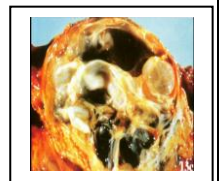
— **Size** : 2 to 30 cm.

— **Consist** of a *mucin-filled cyst*, thick *fibrous capsule* lined by *mucin-producing cells*.

— Metastases → liver, tend to be cystic.

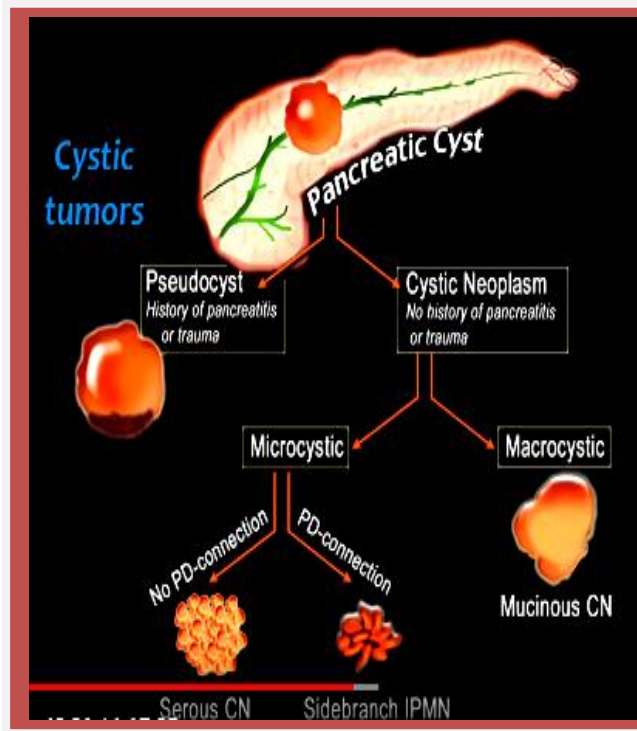
Ⓡ **CT:**

- *Occur mostly in the body and tail of pancreas*
- *Usually large > 2cm*
- *Cystic multi-locular [locules more than 6 is typical]*
- *Cyst wall : thin or thick, may enhance +/- calcium*
- **Cystadenocarcinoma** a sizable solid component should be present



Ⓡ **MR** with contrast enhancement → optimal detail of the structure inside the cyst.

ALL MUCINOUS TUMORS CARRY A RISK OF MALIGNANCY → SURGICAL RESECTION IS THE TREATMENT OF CHOICE.



Differential diagnosis

- **Micro cystic adenomas** affect older women and are characterized by multiple small cysts and thin septa with a central scar, which is eventually calcified.
- **Mucinous cystic adenomas** are typically large cystic multilocular lesions with thin septations; calcification as well as marginal nodulations may also be present.
- **Non-functioning islet cell tumors** are typically hyper vascular, usually large in size with necrotic areas at the time of diagnosis. They exhibit a typical enhancement on arterial phase dynamic imaging.
- **Hemorrhagic pseudo cysts** do not contain solid components; the clinical history and imaging findings of pancreatitis provide the clues for the correct diagnosis.

➔ **INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM (IPMN):**

- Pancreatic tumors that produce an excessive amount of mucin, ➔ *marked dilatation* of the *pancreatic duct* and *cystic enlargement* of the *branch ducts*.
- Ⓡ **ERCP**: demonstrates a *bulging papilla* with *mucin* protruding from the orifice + Only a thin rim of atrophic pancreatic parenchyma.
- IPMN of the branch duct type ➔ *focal group* of *small cysts* (1 to 2 cm in diameter) that *intercommunicate through dilated branch ducts*.
- **Most** common in the uncinete process.
- Some lesions consist of a single unilocular cyst.
- Pancreatic parenchyma adjacent to the lesions ➔ atrophies ➔ becomes capsule of cystic mass.

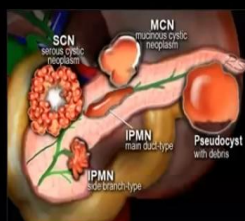
Imaging of the pancreas - Prof Dr. Mamdouh Mahfouz(Cairo 2018)

IPMN

intraductal papillary mucinous neoplasms

Mucin-producing neoplasms which are classified into 3 types

- Side-branch IPMN:
 - Arise in pancreatic duct side branch
 - Carry risk of invasive malignancy of **17%**
- Main duct IPMN:
 - Arise in main pancreatic duct
 - Carry high risk of malignancy **58%**
- Combined type IPMN:
 - Both side branch and main duct IPMN
 - Prognosis similar to main duct IPMN



Cyst with or without nodularity, septations, calcifications communicating with pancreatic duct

Solid and papillary epithelial neoplasm

SPEN

F 14Y



Frantz's tumor

- A rare non-ductal low grade malignancy
- Almost exclusively affecting **young women**
- Potentially **curable** with surgical resection
- Hepatic and peritoneal spreads are possible
- Local and distant recurrences are also reported
- Partly cystic and partly solid with **hemorrhage** and possible **calcification**

Pancreatic Fatty lesions

Similar to those of the liver, include:

- Ⓡ DIFFUSE FATTY INFILTRATION,
- Ⓡ LIPOMA.,
- Ⓡ FOCAL FATTY SPARING,
- Ⓡ FOCAL FATTY INFILTRATION

→ DIFFUSE INFILTRATION:

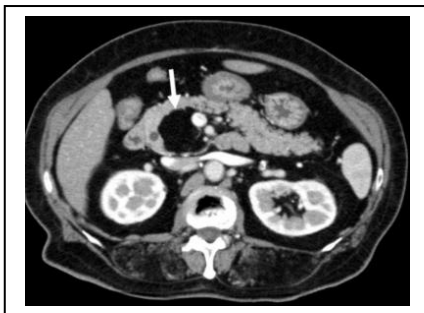
- with Aging , Obesity and pancreatic Atrophy.
- Fat infiltrates between the lobules of pancreatic parenchyma.
- In patients with cystic fibrosis, pancreatic parenchyma → completely replaced by fat.

→ FOCAL FATTY SPARING:

in diffuse infiltration → simulate a pancreatic mass, *esp.* when it involves the *head* or *uncinate* process.

→ FOCAL FATTY INFILTRATION:

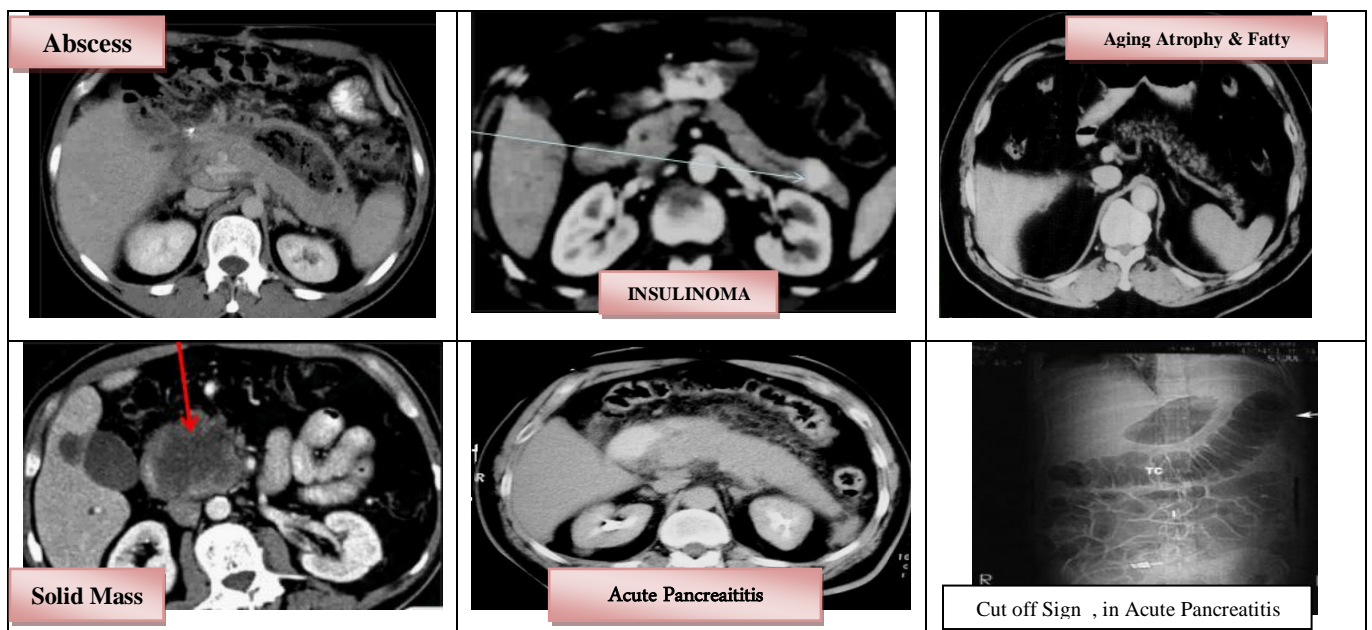
- may involve **any portion** of the pancreas.



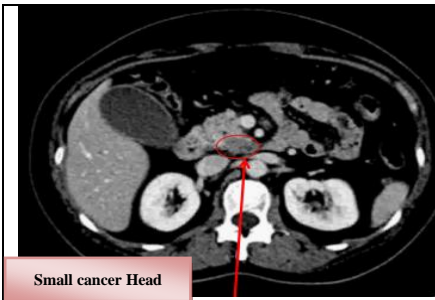
→ LIPOMAS:

- rare,
 - usually incidental findings
- Usually solitary, fat-density masses.
May occasionally obstruct the pancreatic or bile ducts.

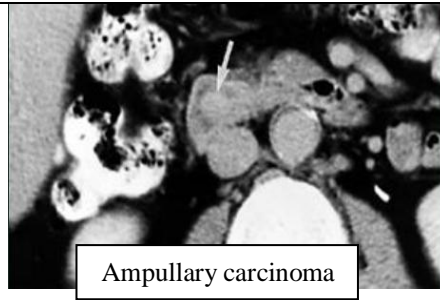
CASES



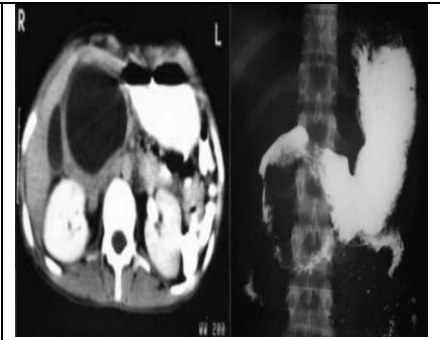
SUMMARY OF PANCREAS IMAGING



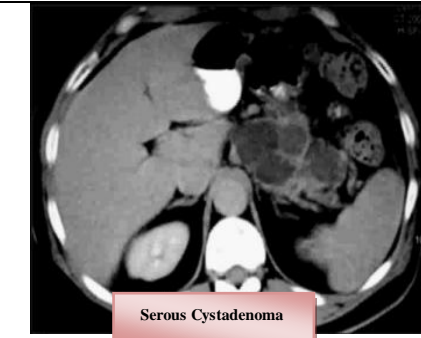
Small cancer Head



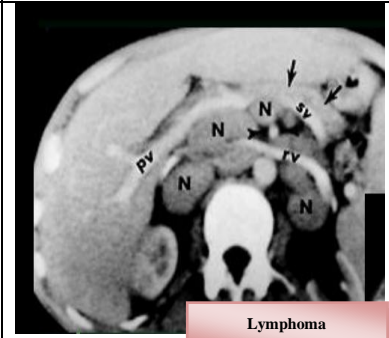
Ampullary carcinoma



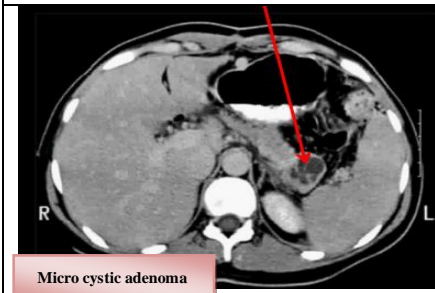
SMV Thrombosis



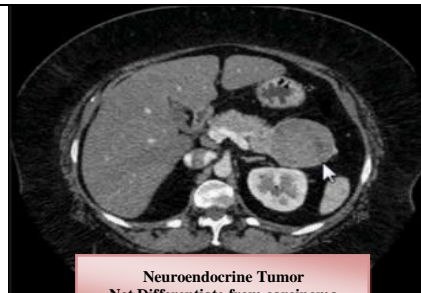
Serous Cystadenoma



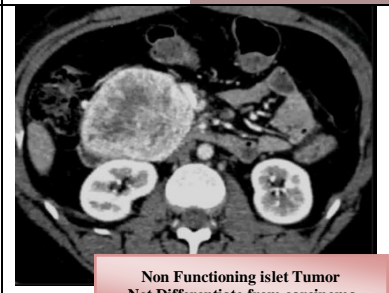
Lymphoma



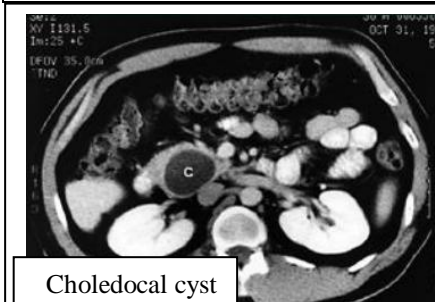
Micro cystic adenoma



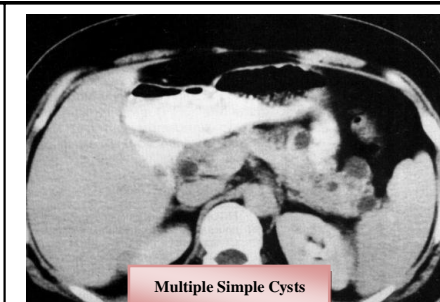
Neuroendocrine Tumor
Not Differentiate from carcinoma



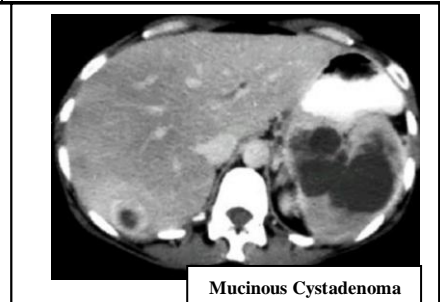
Non Functioning islet Tumor
Not Differentiate from carcinoma



Choledocal cyst



Multiple Simple Cysts



Mucinous Cystadenoma

✓ SOURCES:

- Grainger & Allison's 5th ed. Vol 1 – Ch 37 - - www.ssregypt.com

- Lecture of Prof. Mamdouh Mahfouz : "pdf edit by Mohammad Farghaly"

& <https://www.youtube.com/watch?v=S1Xxgf7vvQ>

- Pancreatic imaging -Meeting With Prince of - Retroperitoneum / Yasser Zakaria Abdel Aziz

- <http://www.radiologyassistant.nl/>

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