Personal Information

- Gender : Female Age : 63 years old
- Chief complaint :
  - left adrenal tumor accidently found by CT at 6 months ago

What's Happened on Earth?

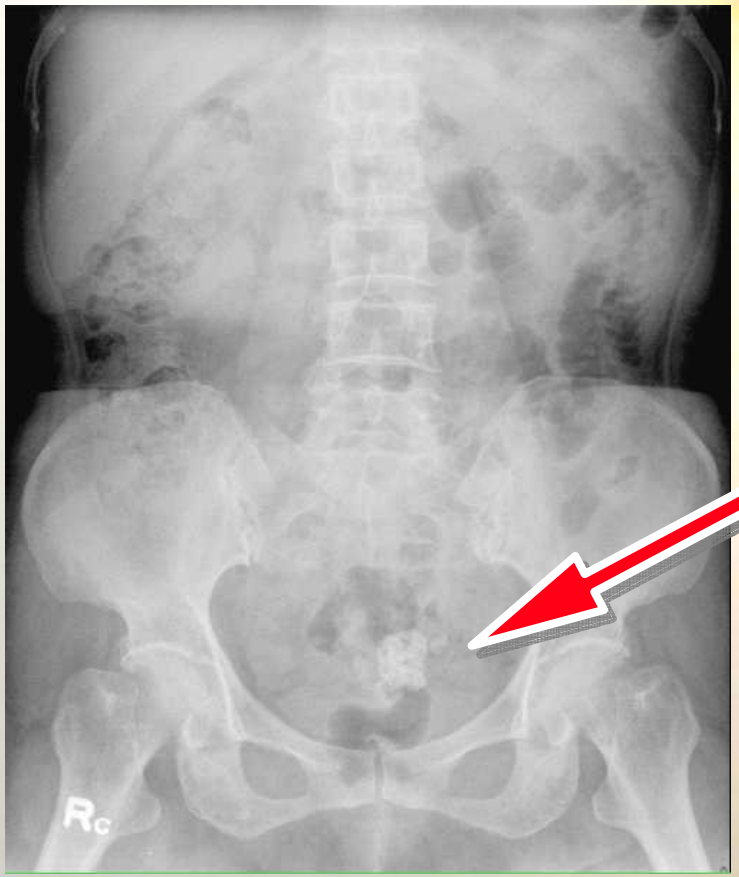
- She came to 和信 hospital for epigastric pain 6 months ago.
- Because of abnormal liver function was noted in lab data, abdominal ultrasonography and CT was performed.
- A 3.5 cm tumor in left adrenal area was noted accidentally
- She was transferred to our hospital for second opinion and further management

Abnormal Findings

- Physical Exams : no specific finding
- Laboratory Tests
  - Hypercholesterolemia (239 mg/dl)
  - Decreased level of
    - ACTH (AM:7.36 pg/dl, PM:5.37 pg/dl)
    - Cortisol (AM:1.21 μg/dl, PM:1.37 μg/dl)
  - VAM (24 hr urine) : 8.85

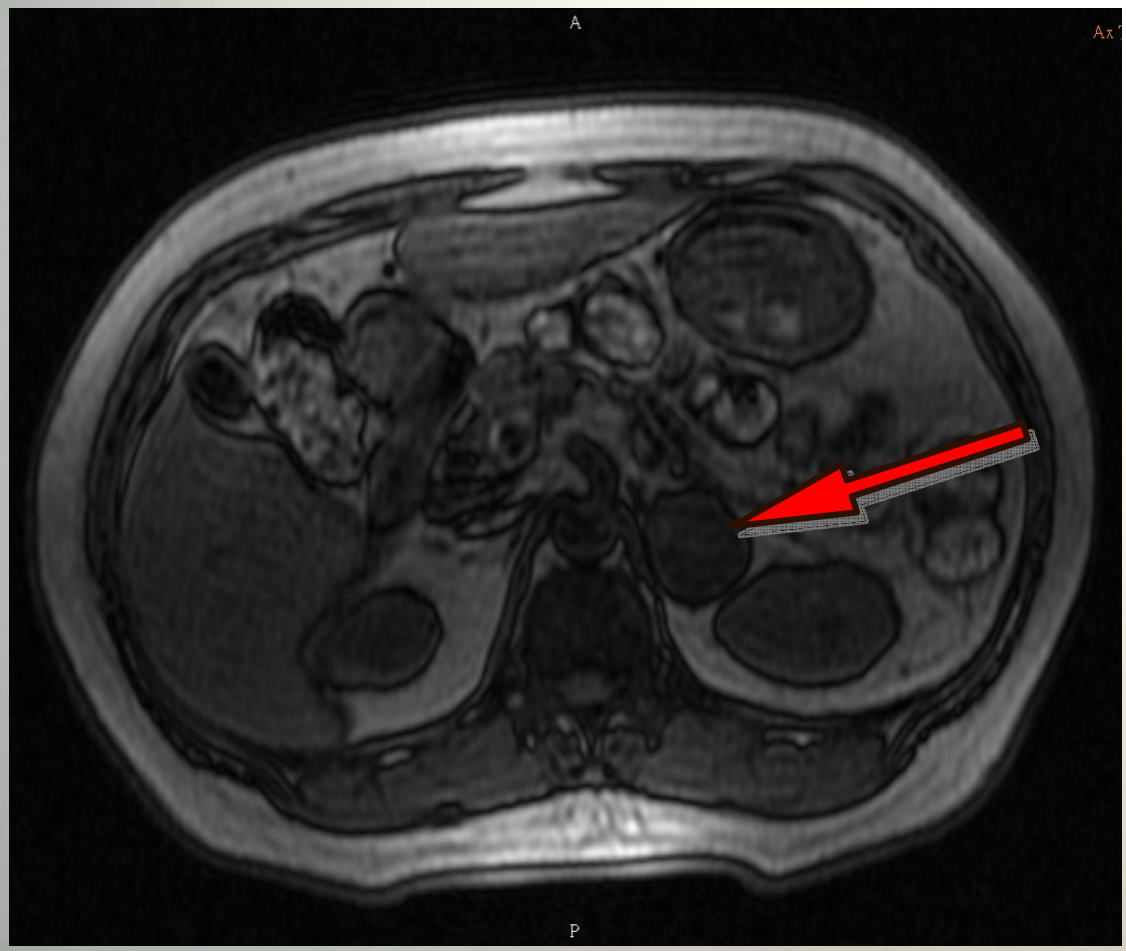
Imaging Studies

CXR and KUB



- No specific finding in CXR
- Calcified pelvic mass probably uterine myoma

MRI - Ax T1 fSPFR dual Echo



a well-defined 4x3.5x2.8 cm in size mass found in the left adrenal region

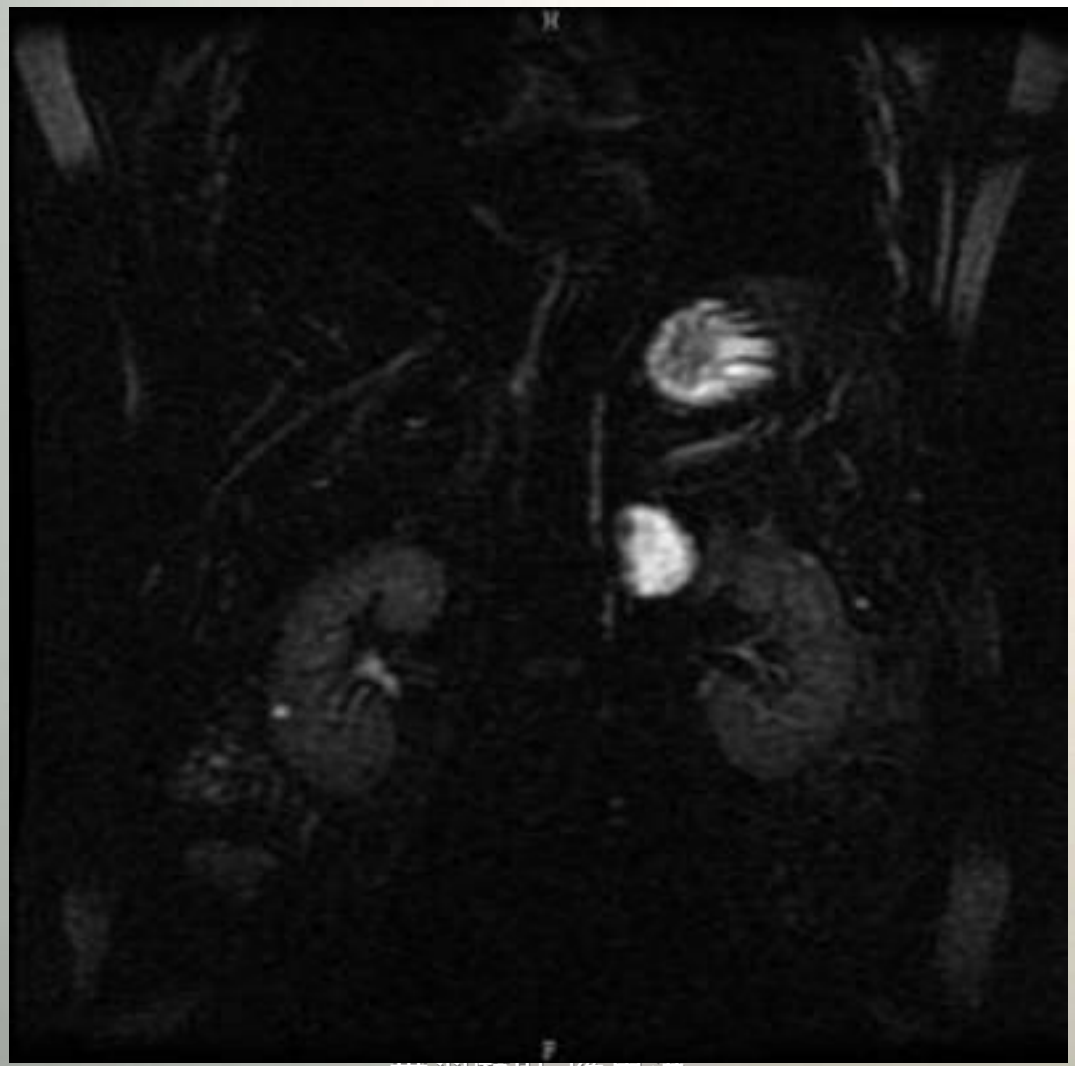
- hypointense on T1W images

MR - Ax T2 FRFSE Resp Trig Fat SAT

- hyperintense T2W images

MR - Cor T1 fSPGR

MR - CROSSFSE 90 TE



Differential Diagnosis

Differential Diagnosis

- Adrenal Myelolipoma
- Pheochromocytoma
- Adrenal Adenoma
- Adrenal Carcinoma
- Adrenal Metastases
- Adrenal Hemorrhage

Plain Radiographs

- nonspecific and not part of the imaging workup of these lesions
- mass effect would be noted, but no role in diagnosis
- Calcification would be noted, but it’s rare and too hard to be detected in plain film

MRI Images – Adrenal Myelolipona

- The nonuniform admixture of fat and marrow elements also may result in a heterogeneous appearance on T2-weighted sequences.
- Explicit fat-saturated T1-weighted sequences show a focal loss of signal intensity in the fatty part of the mass.
- The presence of myeloid tissue or hemorrhage results in persistent areas of increased signal intensity on fat-suppressed images.
- Adrenal myelolipomas enhance after gadolinium administration as a result of the presence of hematopoietic tissue.

MRI Images – Pheochromocytoma

- usually hypointense or isointense relative to the liver on T1-weighted spin-echo (SE) images, while they are highly intense on T2-weighted SE images.
- The use of flow-sensitive sequences is helpful in demonstrating the presence of intracaval extension of the tumor.
- contrast enhancement rarely provides additional information.

MRI Images – Adrenal Adenoma

- Adrenal cortical adenomas are well-circumscribed mass lesions that have homogeneous in signal intensity and enhancement patterns.
- T1-weighted and T2-weighted signal intensity characteristics of benign adrenal adenomas and adrenal metastases are not specific and overlap significantly.
- A decrease of 20% in the signal intensity on out-of-phase images relative to that on in-phase images is diagnostic.
- MRI cannot be used to definitively characterize lipid-poor adenomas.

MRI Images – Adrenal Carcinoma

- MRI often demonstrates a large mass with lower signal intensity than the liver on T1-weighted images and higher signal intensity than the liver on T2-weighted images.
- Since the mass usually does not contain any significant intracellular lipid, it will not lose signal on out-of-phase imaging.
- Coronal and sagittal images may be helpful in determining adrenal origin of the mass

MRI Images – Adrenal Metastasis

- Adrenal metastases are usually hypointense on T1-weighted images and relatively hyperintense on T2-weighted images
- The exception is metastatic melanoma, which may be bright on T1-weighted images
- Occasionally, lesions may remain hyperintense on long echo time T2-weighted images, mimicking pheochromocytomas
- in-phase and out-of-phase imaging techniques is used in detecting the presence of intracellular lipid within adrenal gland lesions to exclude metastatic disease

MRI Images – Adrenal Hemorrhage

- MRI is quite sensitive for identifying a mass on the adrenal, but cannot reliably differentiate adrenal hemorrhage from a hemorrhagic tumor.
- MRI is very specific in its ability to stage hemorrhage from any cause.
  - In the acute stages (<7 d) adrenal hemorrhage is iso-slightly low signal on T1-weighted images and markedly low signal on T2-weighted images.
  - During the subacute phase (1-8 wk), the clot begins to evolve. On T1-weighted images, initial rim hyperintense signal is observed, which gradually shrinks and fills in the mass over a period of weeks.
  - In the chronic phase, both hemosiderin and calcification result in low signal on T1- and T2-weighted images. Calcification is often eggshell or rimlike, and the characteristic dark ring is identifiable.

Impression & Interventions

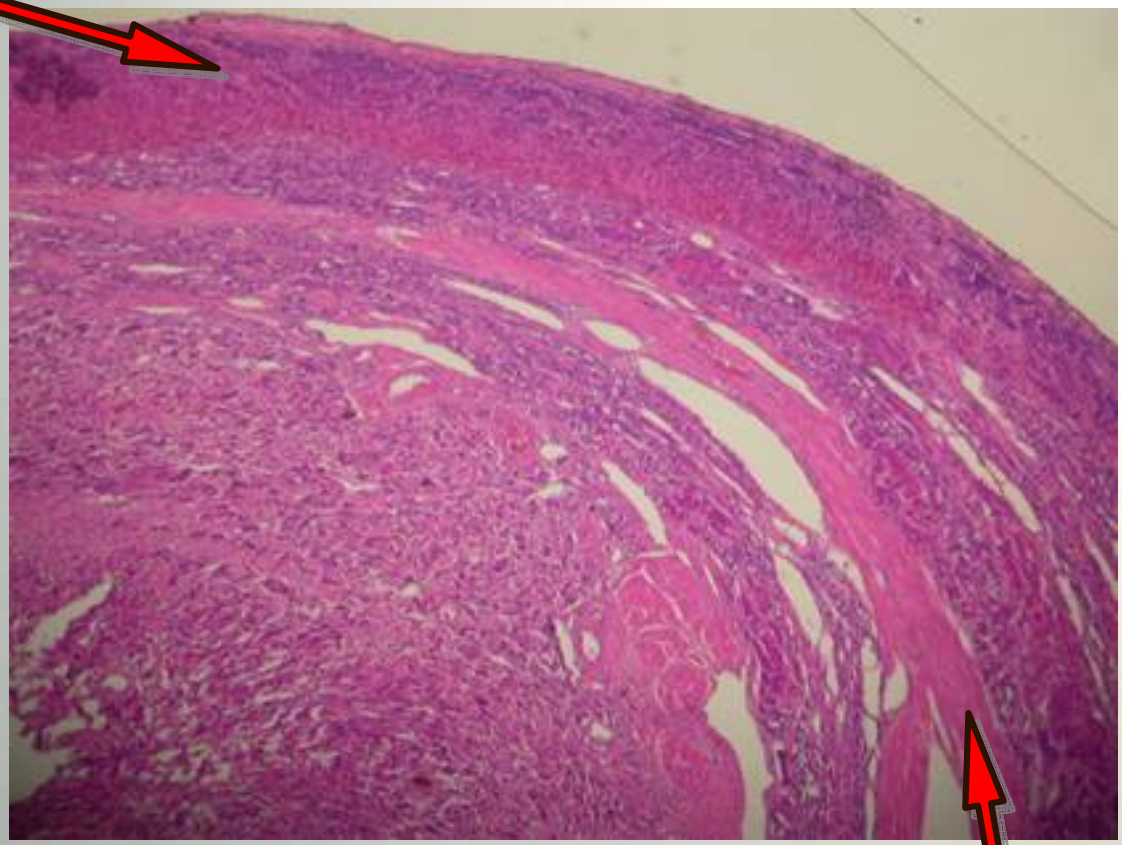
- Left adrenal mass, consistent with adenomyelipoma
- Left laparoscopic adrenalectomy

圖片提供：伊利沙伯醫院婦產科網站
（http://www.ha.org.hk/qeh/og_ges_c.html）

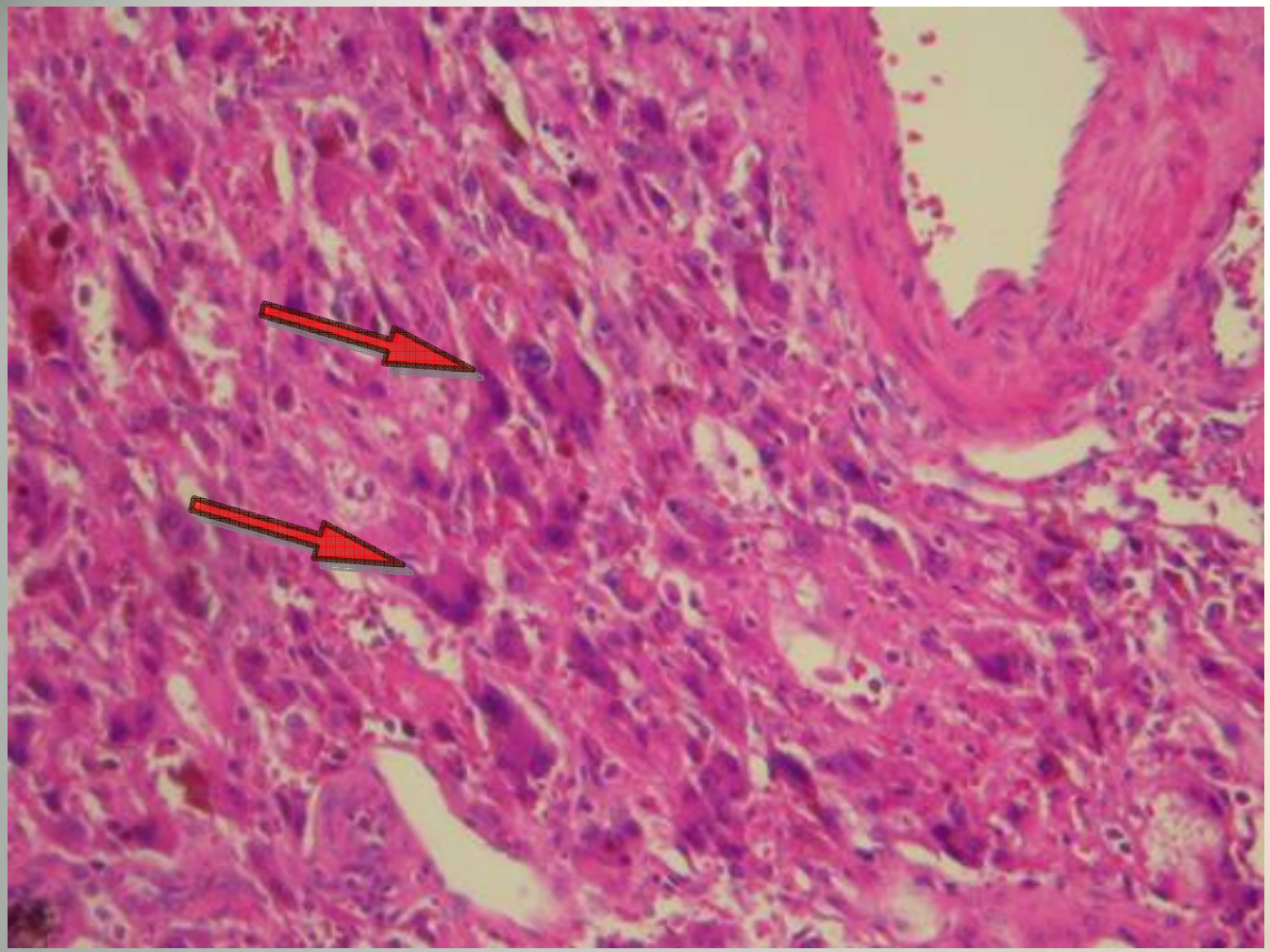
Pathology Report

- the adrenal gland measures 6 x 5.7 x 1.8 cm. in size and weighs 10.8 gm
- An opened and collapsed cystic lesion measuring 3.7 x 3.7 x 0.8 cm. in size
- dark brown and soft tissue on inner wall of the adrenal cyst is noted

The adrenal cortex is compressed and atrophic in area



The cyst is partly walled by fibrous tissue with tumor tissue in deep layer of fibrous wall.



Marked nuclear pleomorphism and atypia of tumor cells

Finally

- Diagnosis :

  pheochromocytoma, left
- Operation was smooth post-OP condition was well
- discharged 3 days after operation and kept follow up in OPD

Discussion

About Pheochromocytoma

Back Ground

- In 1912, a pathologist named pick coined the term pheochromocytoma to describe the chromaffin reaction seen in adrenal medullary tumors
  - *phaios*, meaning dark or dusky
  - *chroma*, meaning color
- Chromaffin cell tumors
  - pheochromocytoma
  - Paragangliomas, chemodectomas or extra-adrenal pheochromocytoma

Frequency

- occur in 0.05-0.2% of hypertensive individuals
- A retrospective study from the Mayo Clinic revealed that in 50% of cases, the diagnosis was made at autopsy
- About 10% of pheochromocytomas are discovered incidentally.

Symptoms & Signs

- Headache
- Diaphoresis
- Palpitations
- Tremor
- Nausea
- Weakness
- Anxiety, sense of doom
- Epigastric pain
- Flank pain
- Constipation
- Weight loss

- Hypertension (paroxysmal in 50% of cases)
- Postural hypotension - resulting from volume contraction
- Hypertensive retinopathy
- Weight loss
- Pallor
- Fever
- Tremor
- Neurofibromas
- Cafe au lait spots
- Tachyarrhythmias
- Pulmonary edema
- Cardiomyopathy
- Ileus

Laboratory Features

- Hyperglycemia
- Hypercalcemia
- Erythrocytosis

Precipitants of a Hypertensive Crisis

- Anesthesia induction
- Opiates
- Dopamine antagonists
- Cold medications
- Radiographic contrast media
- Drugs that inhibit catecholamine reuptake, such as tricyclic antidepressants and cocaine
- Childbirth

Diagnosis Tools - Lab studies

- A 24-hour urine collection for creatinine, total catecholamines, vanillylmandelic acid (VMA), and metanephrines
- Be careful of the false elevations of the metanephrines
- Provocative testing, although utilized in the past, rarely is needed.

Diagnosis Tools - Imaging studies

- X-ray
- Computed tomography
- MRI
- Ultrasound
- Nuclear medicine
- Angiography

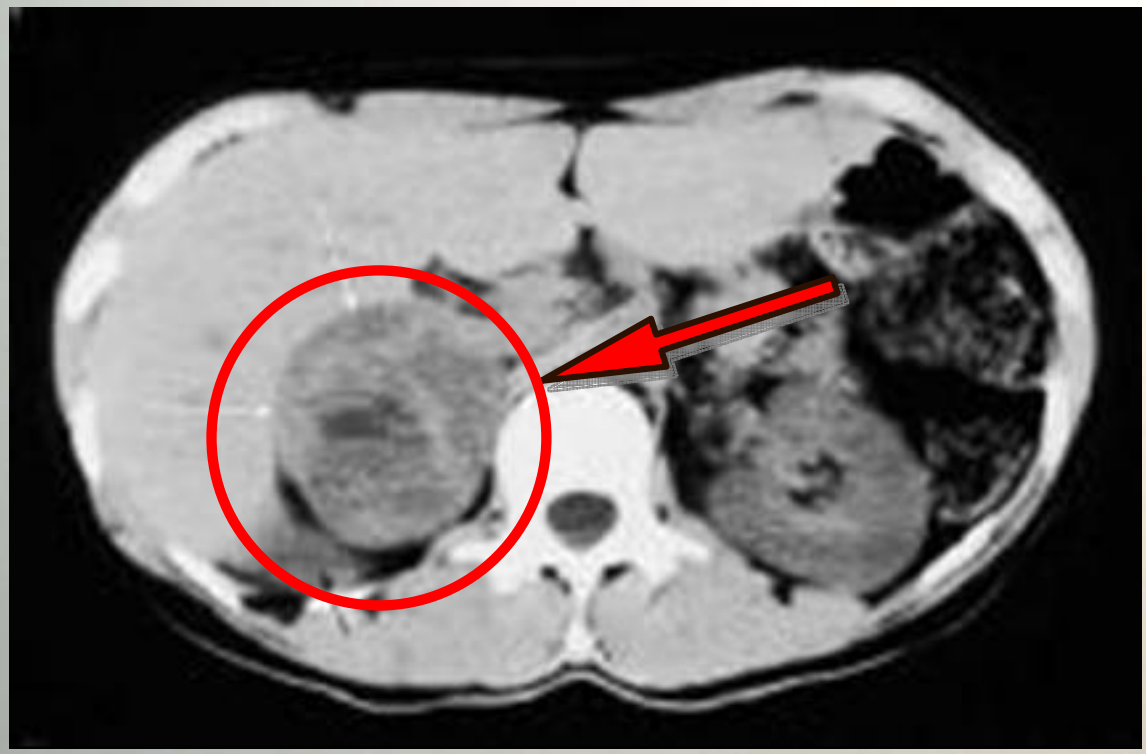
X-ray

- Radiography has limited value, compared with other available modalities.
- Large adrenal masses may compress and deform the upper pole of the kidney; these may be discovered incidentally on intravenous urograms.

CT Images

- Pheochromocytomas are large tumors (often >3 cm), and they are usually round or oval masses with an attenuation similar to that of the liver
- contrast material is not essential for their detection for its large size
- some authors believe that the administration of the contrast agent may precipitate a hypertensive crisis in an unmedicated patient
- When contrast media was administered, the tumor demonstrates varying degrees of enhancement.

Sample of CT



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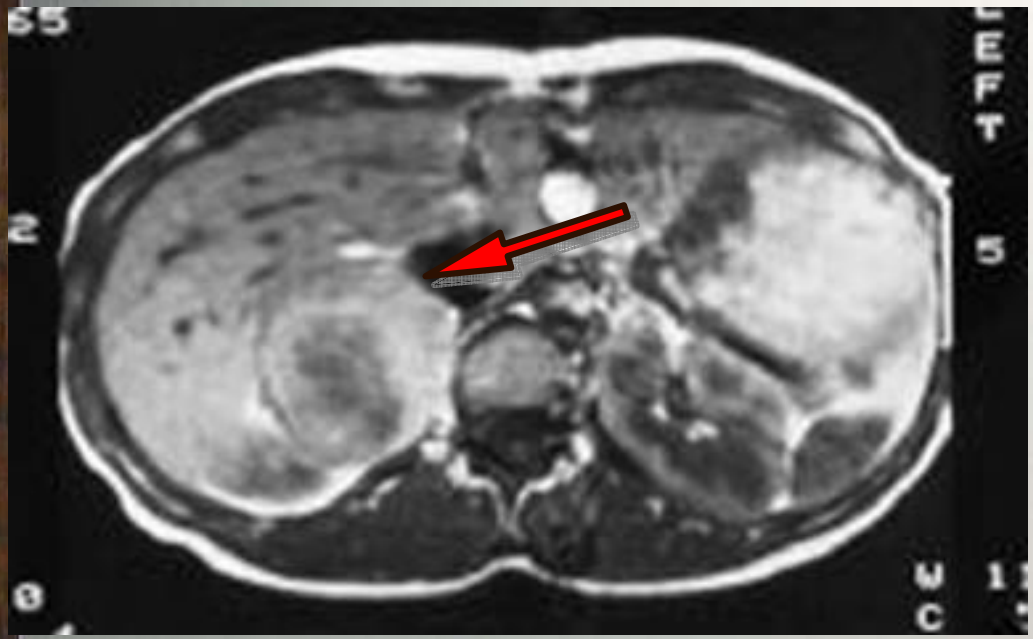
Samples of MRI image



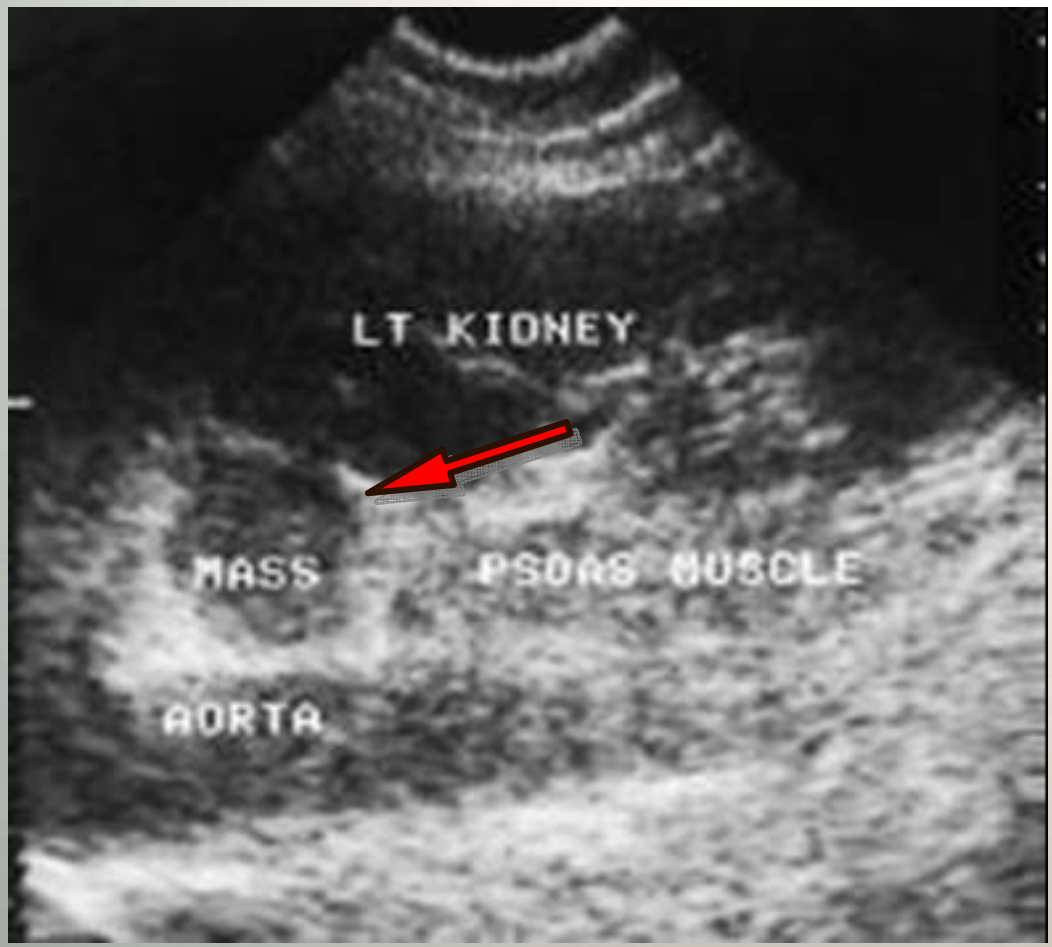
T1 weighted

T2 weighted

Ultrasonography

- Ultrasonography has largely been replaced by CT and MRI, and it is limited as a result of the effects of overlying bowel gas, especially in the assessment of the left adrenal gland
- the use of ultrasonography is limited to differentiating cystic lesions from solid lesions in the adrenal gland
- Even in the pediatric population, MRI is the preferred imaging modality.

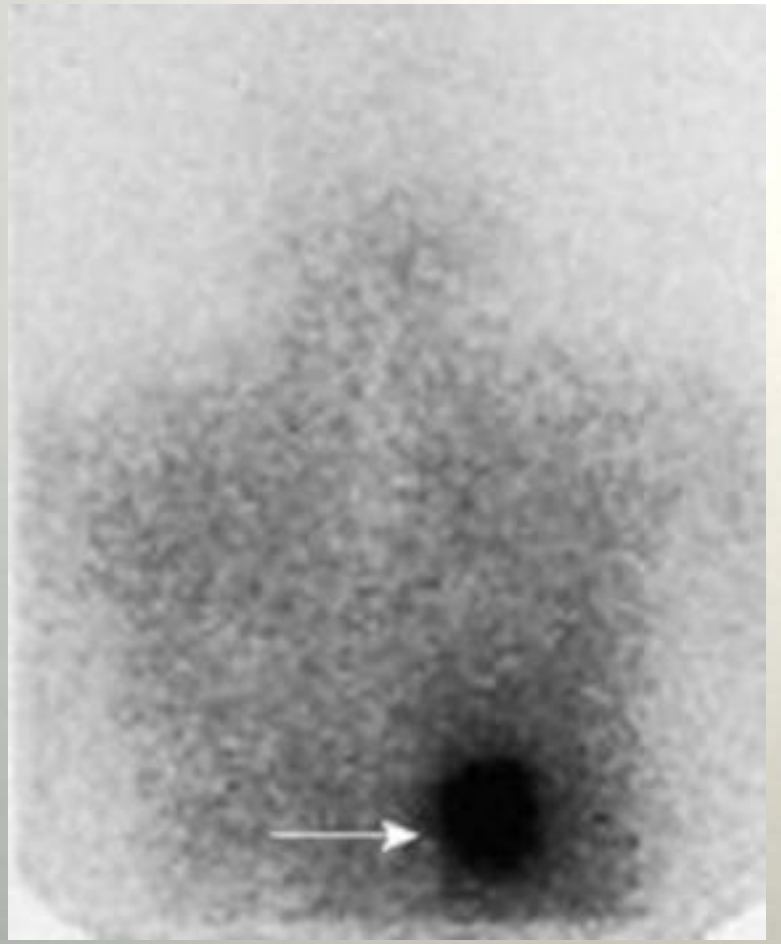
Sample of Ultrasonography



Nuclear Medicine

- 131I-MIBG and 123I-MIBG are concentrated in the sympathomedullary system and then sequestered in neurosecretory granules
- A normal adrenal medulla is seen in approximately 30% of patients, with an uptake less than that of the liver.
- In pheochromocytoma, 131I-MIBG scans show the tumor as a focal area in the adrenal gland that has prolonged increased uptake.
- 123I-MIBG offers better image quality, single photon emission computed tomography (SPECT) capability, lower radiation exposure, and shorter imaging time.

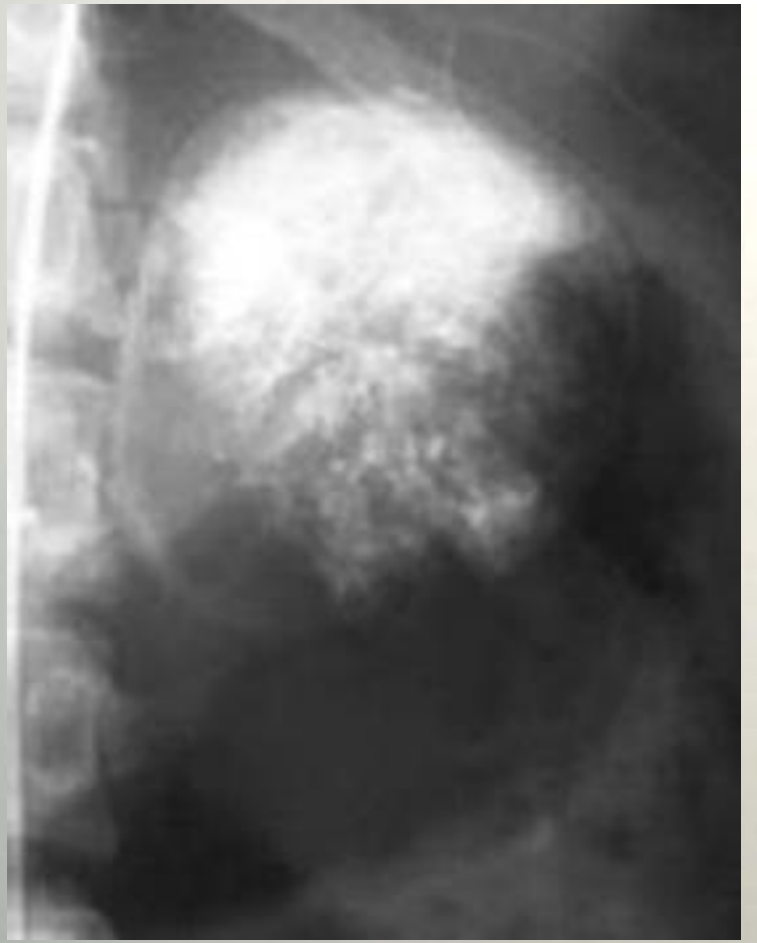
Sample of Nuclear Medicine



Angiography

- Angiography and venous sampling are no longer used because of the higher sensitivity and specificity of other available and noninvasive tests
- hazardous without premedication, and a hypertensive crisis can result
- If performed, angiograms show increased vascularity in the tumors

Sample of Angiography



Treatment - Medical Care

- α blockade with phenoxybenzamine 7-10 days preoperatively
- volume expanded with isotonic sodium chloride
- Initiate a beta-blocker only after adequate alpha blockade
- Administer the last doses of oral alpha- and beta-blockers on the morning of surgery.

Treatment - Surgical Care

- Use an arterial line, cardiac monitor, and Swan-Ganz catheter.
- anterior midline abdominal approach was utilized in the past;