



Round : Radiology

Group no : A4

Done By : Batool ALzubaidi

Urinary system

Dr. Jehad Fataftah
Interventional Radiology

✦ Imaging techniques used for renal system: 1. X-ray 2. Ultrasound 3. CT 4. MRI

✦ مهم حفظ الترتيب عشان تعرفوا ال next step شو بدكم تعملوا و بتمشوا على هاد الترتيب

✦ كلنا بنعرف انه ال radiation خطيرة ليش؟ لانها بتعمل cancer عن طريق انها تعمل mutation ف بتادي ل abnormal proliferation of cells الي بتادي ل cancer

✦ بالوضع الطبيعي لو صار في mutation ال immune system بسيطر على الموضوع بس في حالة الواحد اخذ radiation بفترات متقاربة و جرعات عالية راح يصير في mutation ب اماكن مختلفة بنفس الوقت و الجسم ما بلحق يسيطر عليهم كلهم

✦ تاثير ال radiation يعتمد على كثير عوامل منها انه المريض male or female, ال age ، كيف ال immunity تاعته .. لو جينا نحكي عن ال adult شو اكثر اشفي بصير فيه division هو ال bone marrow عشان هيك ال most common cancer caused by radiation is leukemia و كمان ال lymphoma و ال testis and ovaries و اقل اشفي انقسام nervous system

✦ صورة ال CT الوحدة تعادل 70 صورة X-ray .. ف لازم دايما تحاول تعمل limitation لل exposure

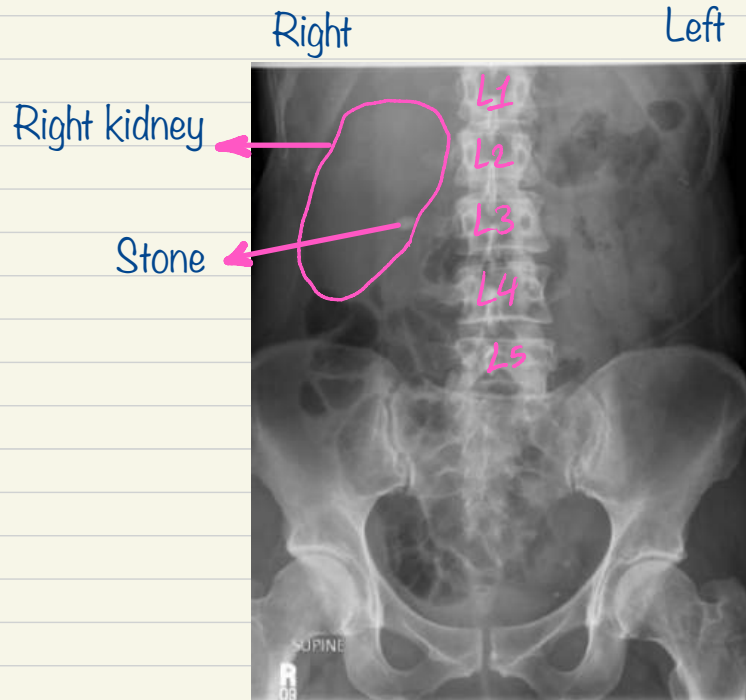
Urinary tract investigation

kidney, ureter, bladder اختصار ل KUB ال .. control film, X-ray film, KUB الها اسماء كثير زي ✚

Plain film:

- ❑ Renal calculi or calcification
- ❑ Stones in the ureters
- ❑ Bladder calcifications and calculi
- ❑ Bone abnormality or metastasis





♥ Type of imaging » KUB

♥ Level of kidney » L1- L3 .. Level of hilum » L2

♥ ال ureter بطلع من L2 level و بنزل ل يوصل ال bladder

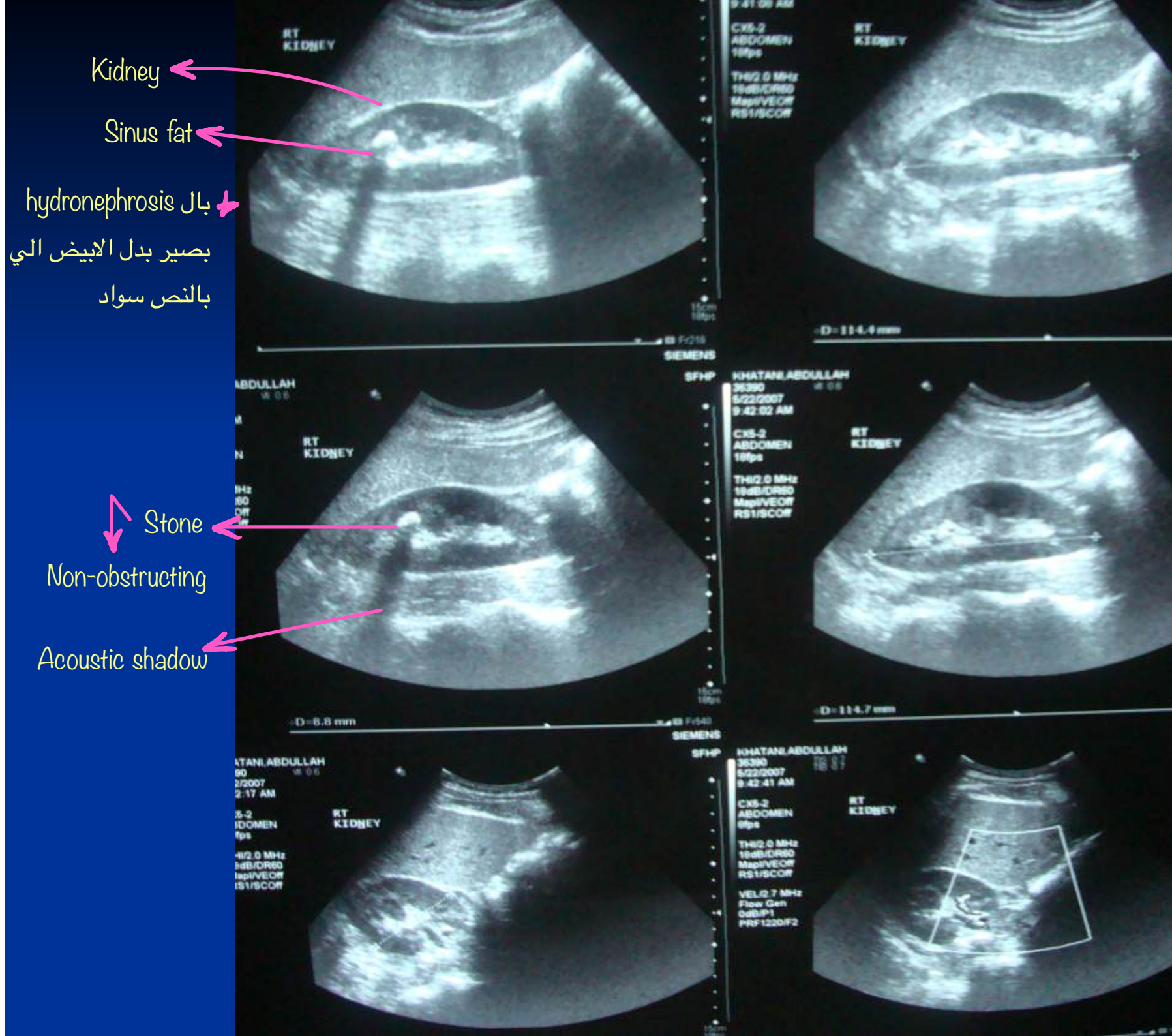
♥ اكثر مكانين بتطلع بتكون فيهم stones هم pelvic-uretric junction and uretro-vesical junction
الي هم اضيق الاماكن

♥ لما اشوف انه في stone اهم سؤال هل هي obstructing or not لانه في فرق هائل بينهم بالعلاج .. لو كانت obstructing لازم اتدخل ب اني اركب nephroscopy، كل ما كانت الكلية مسكرة لمدة اطول يعني ال pressure بال kidney راح يكون اعلى و بتصير تخسر ال function تاعتها (الوقت = ساعات)

♥ كيف بدى اعرف اذا هي obstructing or not؟ بتبين على ال US, CT, MRI فشو بتطلب للمريض ؟
ultrasound .. يعني لو اجت هاي الصورة بالامتحان و سال what's your next step بتجاوب
ultrasound to rule out hydronephrosis

Ultrasound of the urinary tract

- ❑ Ultrasound is one of the most valuable investigations of the urinary tract and the investigation of choice in children.
- ❑ It is very effective in evaluating renal size, masses, renal obstruction, bladder residual volume and prostatic size.



مش دائما ممكن نشوف ال stone ممكن ما بنوشفها بس نشوف تاثيرها
يعني زي الصورة شايفين hydronephrosis بس مش شايفين ال stone



Obstructing stone » hydronephrosis (black)

→ Finger like projections

→ Stone is in the ureter



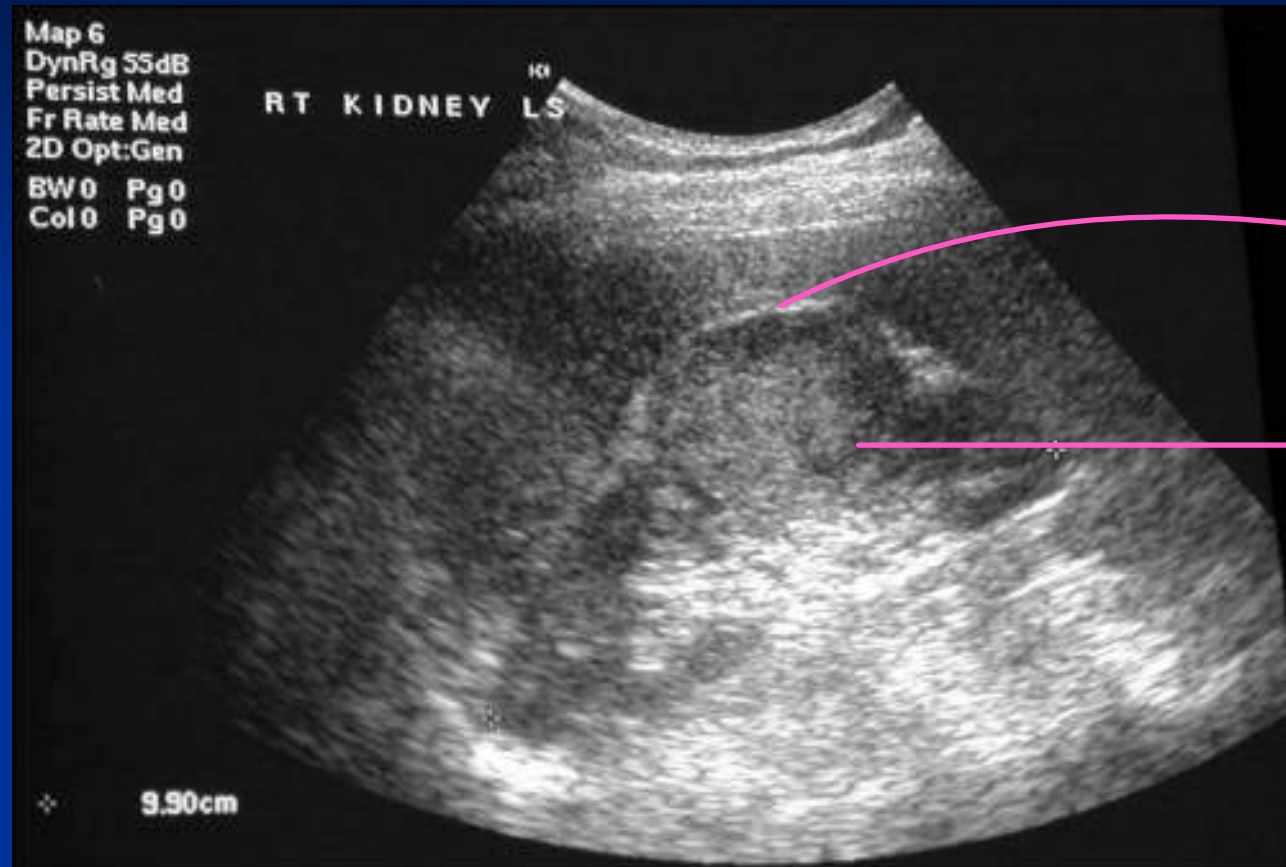
Hydro-uretero nephritis

Ureter is also dilated » stone in the pelvis

Round circumscribed » cyst



Fat



→ Buldge

→ Renal cell carcinoma

↓
Grey in color » tissue



Urinary bladder



Prostate » enlarged and calcified

CT of the urinary tract

:CT is excellent modality for assessment of

- Renal masses.
- Obstruction.
- Retroperitoneal disease.
- Staging of renal and bladder neoplasms.
- Tumor invasion into the renal vein or IVC
- Evaluation after trauma or surgery.

When should MRI be used to ?evaluate the kidneys

- ❑ When a renal mass or abscess is suspected but intravenous contrast cannot be administered, because of either contrast allergy or abnormal renal function, in this case MRI can be performed.
- ❑ Gadolinium, the contrast agent for MRI, can be safely administered in such circumstances.
- ❑ In the last few years, some studies reported that gadolinium might cause nephrogenic systemic fibrosis in patients with renal failure.

بشكل عام احنا عنا نوعين من ال contrast الي هي oral and IV ال بتنعطى بالوريد بعدين بتروح على القلب و بضخها لكل الجسم بحيث لو كان في اي leakage راح يبين بالاضافة انه بحالات ال tumor لانه بصيرله vascularisation بالتالي راح ياخذ contrast زيادة و يكون ضاوي و هاد الي بسميه ال enhancing lesions

اما ال oral contrast بتشربه و بتخرجه طبيعي ف بالعادة ما بصير فيه مشاكل، ال IV contrast هي الي الها سيئتين رئيسيات الي هم allergic reaction and nephrotoxicity .. ال contrast تاعت ال CT اسمها non ionic و تاعت ال MRI اسمها gadolinium

بدنا نحكي عن ال renal toxicity و نقسم الناس ل ٣ فئات: اولاً young healthy adult او اعطيناهم اي وحدة منهم ما باثر (التاثير يكون subclinical) لانه التاثير عشان يظهر لازم تخسر كمية كبيرة من ال nephrons

الفئة الثانية من الناس الي هم مرضى ال renal failure هيك هيك الكلى عندهم خرابانة فبنعطيهم عادي و بنعملهم بعدها غسيل، اذا اعطيناهم non ionic contrast عادي بتطلع ب dialysis اما ال gadolinium ما بتطلع بال dialysis و بعمل شغلة اسمها nephrogenic systemic fibrosis راح يترسب بالمفاصل ف اياك تعطيهم اياه

الفئة الثالثة من الناس الي يكونوا على ال border line هذول لو اعطيتهم contrast زي الي بتدفشه يفوت ب renal failure عشان هيك اذا اعطيناهم نحاول نقلل جرعة ال contrast لل minimum و اعطي good hydration قبل و بعد عشان تعمل dilution قدر المستطاع و اذا بدك تختار بين نوعين ال contrast اختار ال gadolinium لانها اقل nephrotoxic

موضوع ال allergy كثير مهم عنا بالاردن اي حدا عنده allergy بتحضره قبل ٢٤ ساعة بتعطي ٣ جرعات cortisone لانه اهم اشئ تحمي حالك

Urinary tract calculi

- ❑ The majority of renal stones are composed of calcium (about 90 %) and are visible on plain film (radio-opaque) . كل انواع ال stones بتبين على ال CT
- ❑ Stones composed of uric acid are not visible on plain film (radiolucent) . اول اشي بتصوره US بعدين CT
- ❑ Stones composed of cystine are minimally dense on plain film (semi-opaque) .

Urinary tract calculi /2

What is the initial imaging test usually ordered
?to find urinary tract stones

- ✓ Plain radiograph (KUB), because the majority of stones are radio-opaque
- ✓ Other calcifications may be confused with urinary tract stones such as a phlebolith in the pelvis , which is a venous calcification , often with a lucent center .



لما بدك تصور اي

صورة عشان stones

بتبلش اول اشني بدون

contrast لانه التتين

لونهم ابيض راح يطلع

و ما راح تميز



Non obstructing

Contrast





✚ Bilateral stores



Stone in the ureter



Intravenous urography (IVU)

Intravenous pyelography (IVP)

X-ray & contrast

Is a radiological procedure used to **visualized abnormalities of the urinary system**, including the kidneys, ureters, and bladder by using intravenous contrast.

Indication

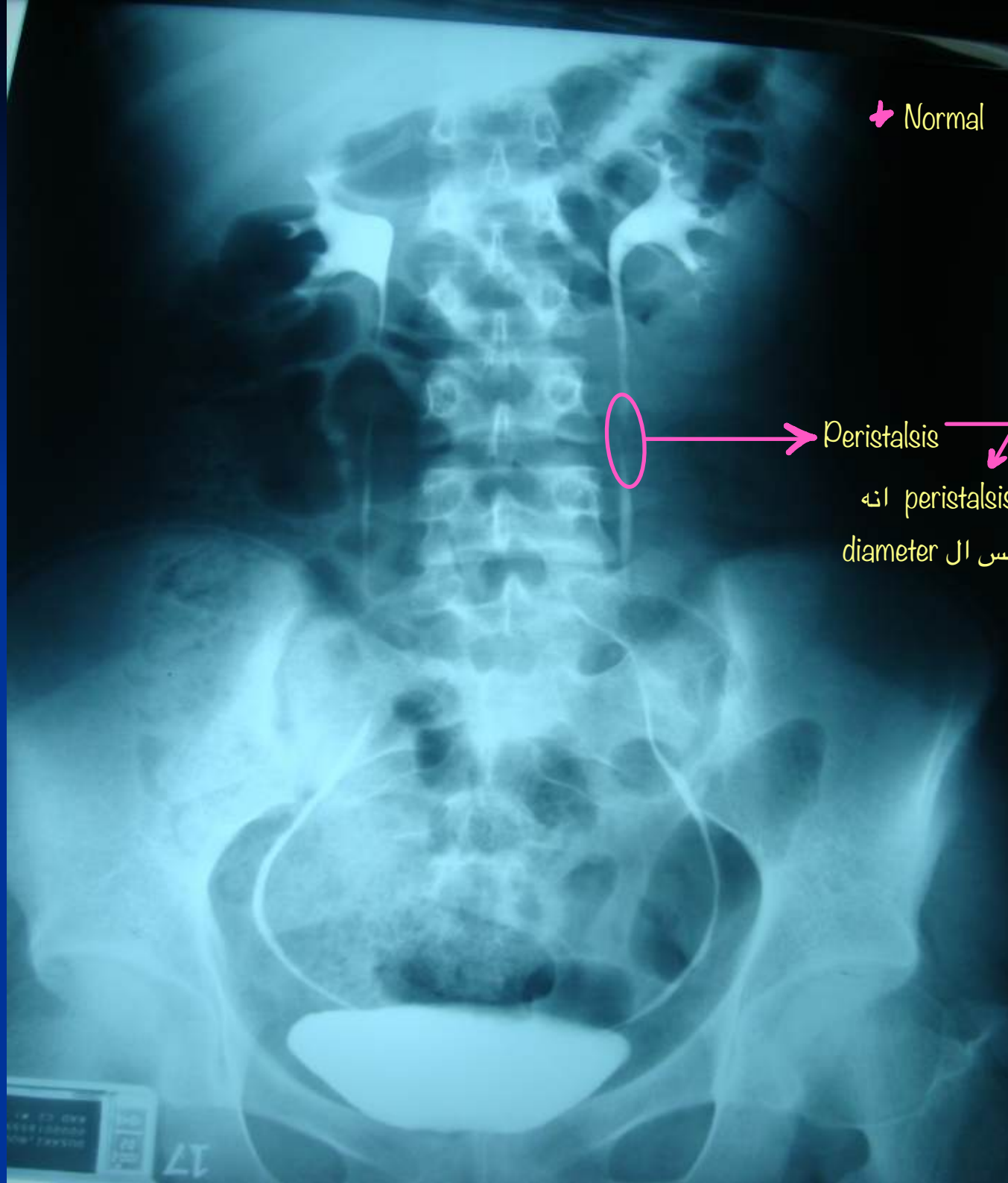
✚ اول اشني بتصور المريض صورة سادة بدون contrast بعدين بتعطيه ال renal artery بال contrast و ببلش يصيرله excretion و بتصوره كل ٥ دقائق

- ❖ Haematuria
- ❖ Renal colic or calculi
- ❖ Suspected stone in the ureters
- ❖ Renal trauma

IVU /continuation

- After a preliminary control film of the abdomen, ~~50ml of contrast~~ medium is injected intravenously.
بال adults يعطي cc one لكل كغ بس السقف تاك ١٠٠ cc اما الاطفال يعطي 1.5
- Contrast is excreted by glomerular filtration.
- Films after 5, 10, and 15 minutes are taken and reveal contrast in the pelvi-calyceal systems, ureters, and in the bladder.
- Post-micturition film is taken to assess bladder residual volume.
- Renal obstruction may require a delayed films.





✚ Normal

Peristalsis

كيف بميز انها peristalsis انه
قبلها و بعدها نفس ال diameter



Scale 43% o.p.
W 1602
C 2129
CONTROL
H

KV 81.0
mAs 21.69
SHAREEF, ALI NAIF
133453
M, 47Y
12/08/07
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5 MINUTES
H

Security Forces Hospital



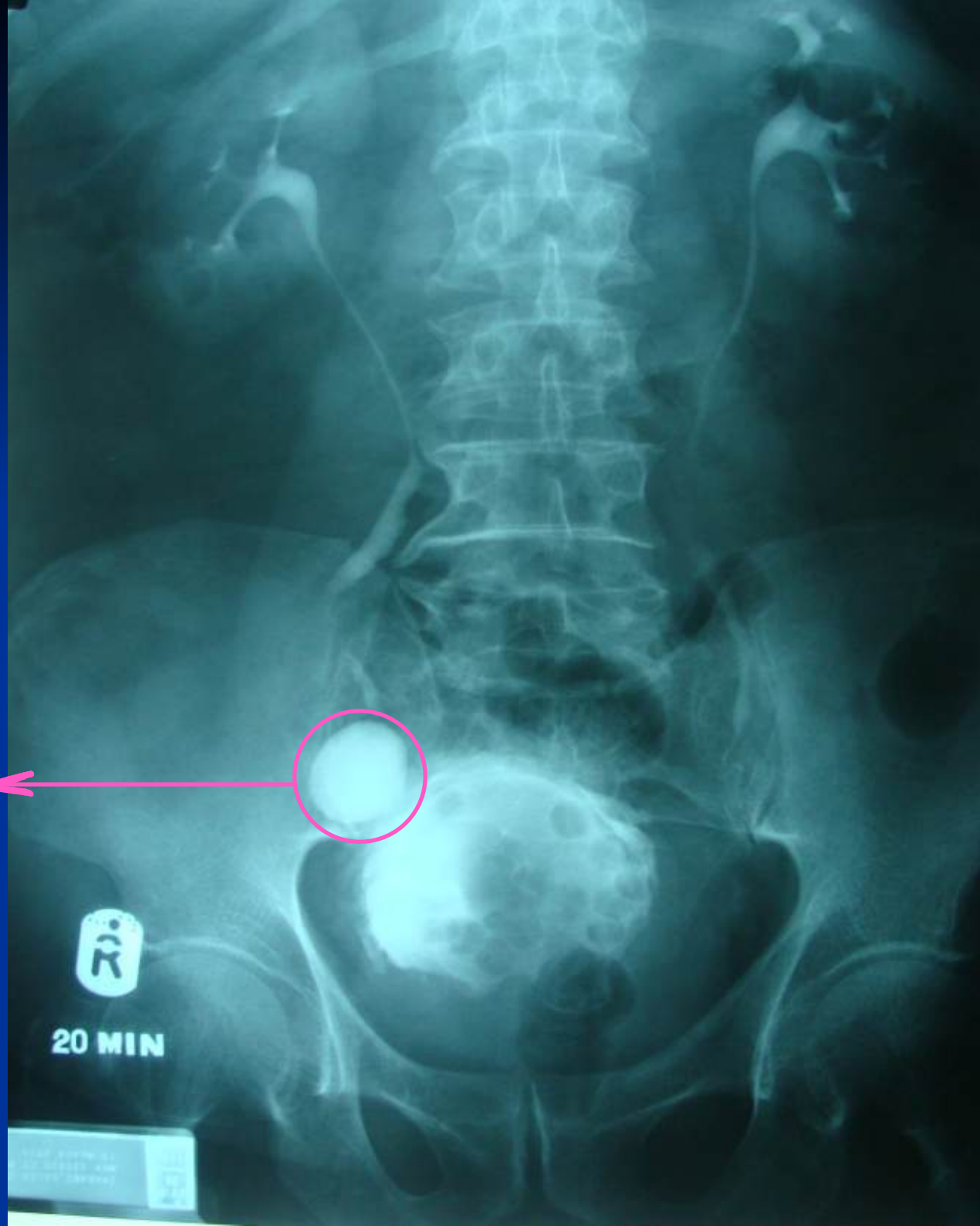
✦ لما نتطلع على
هاد النوع من
التصوير بتتفرج
على كل الصورة
مع بعض ما
بتحكي انه
abnormal
تشوف
defect
فيهم
كلهم





عدد ال stones بال ➡
urinary bladder مش
شرط يكونوا قد الي انا
شايفهم بال US لانه
بنشوفهم حسب مكانهم
وين بالنص ولا قريبين من
ال wall اما على ال CT
بتقدر تشوفهم كلهم

Diverticula



Micturating cystogram = MCUG

- ❖ Is the study of the urinary bladder and urethra with contrast medium.
- ❖ The bladder is filled with contrast via a urethral catheter. Films of the bladder are obtained.
- ❖ After removal of the catheter, patient is asked to void and films are taken during micturation to assess the bladder neck and urethra, as well as reflux.
- ❖ Examination of the urethra in oblique position is necessary, particularly in suspected posterior urethral valves in infants and small children, as they are usually only demonstrated during micturation.

❖ يستخدمه عشان اقيس ال competence of uretro-vesical valve خصوصا عن

الاطفال .. مش لازم ال urine يصيرله reflux و يرجع من ال bladder لل ureters



CONTROL



لو جاب هاي الصور بالامتحان راح يجيبهم sequence
لانه صعب تميز من وحدة هل هي IV ولا MCUG



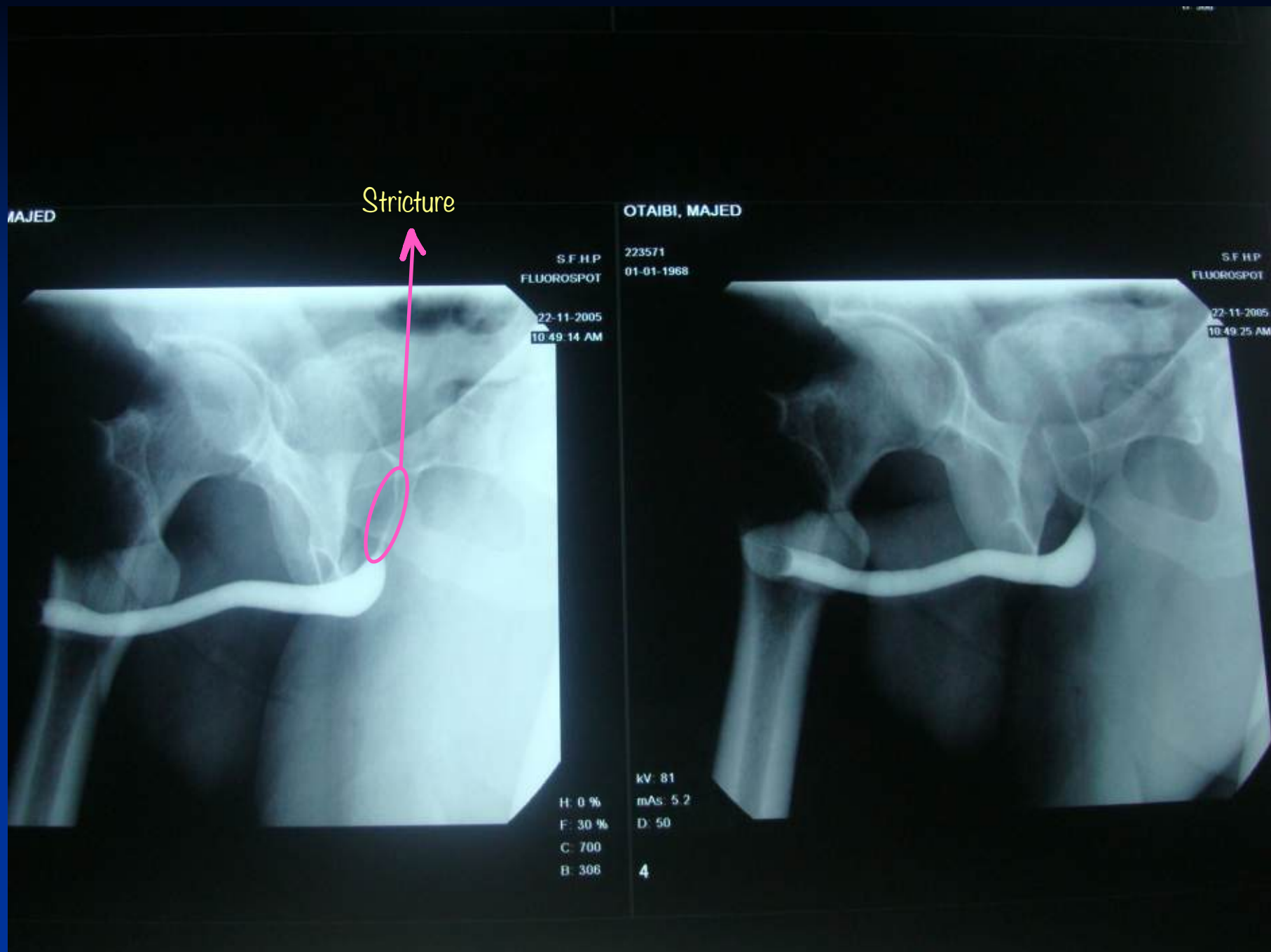
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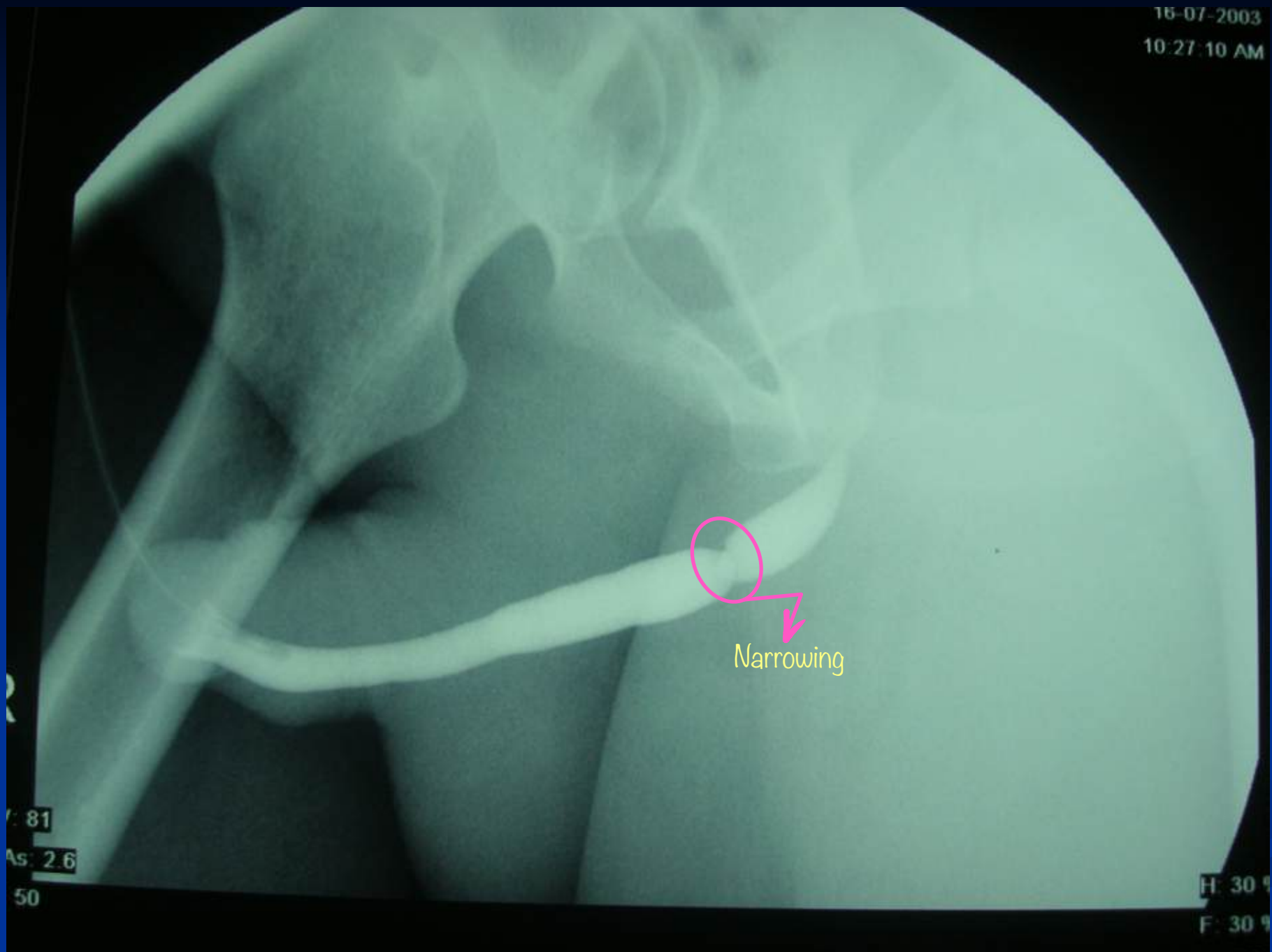
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F: 30 % D: 50

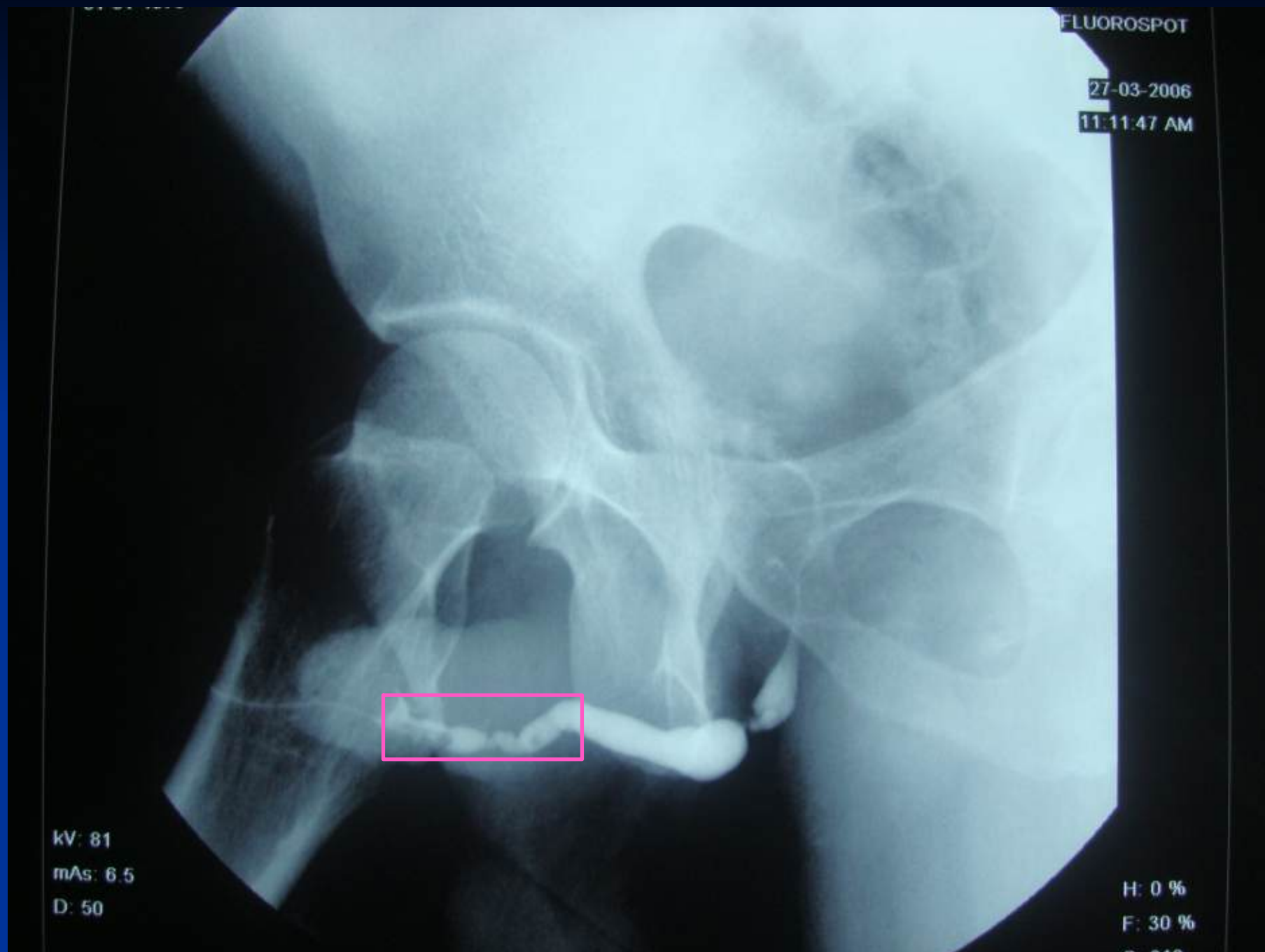


Urethrogram

- ❑ The adult male urethra can be studied by ascending urethrogram.
- ❑ Contrast is injected through foley catheter inserted into the meatus, and its balloon inflated with 1 to 2ml of sterile water placed in the navicular fossa.
- ❑ Films are taken to the urethra in oblique position during contrast injection.
- ❑ The most common indication for urethrogram is **urethral strictures**.







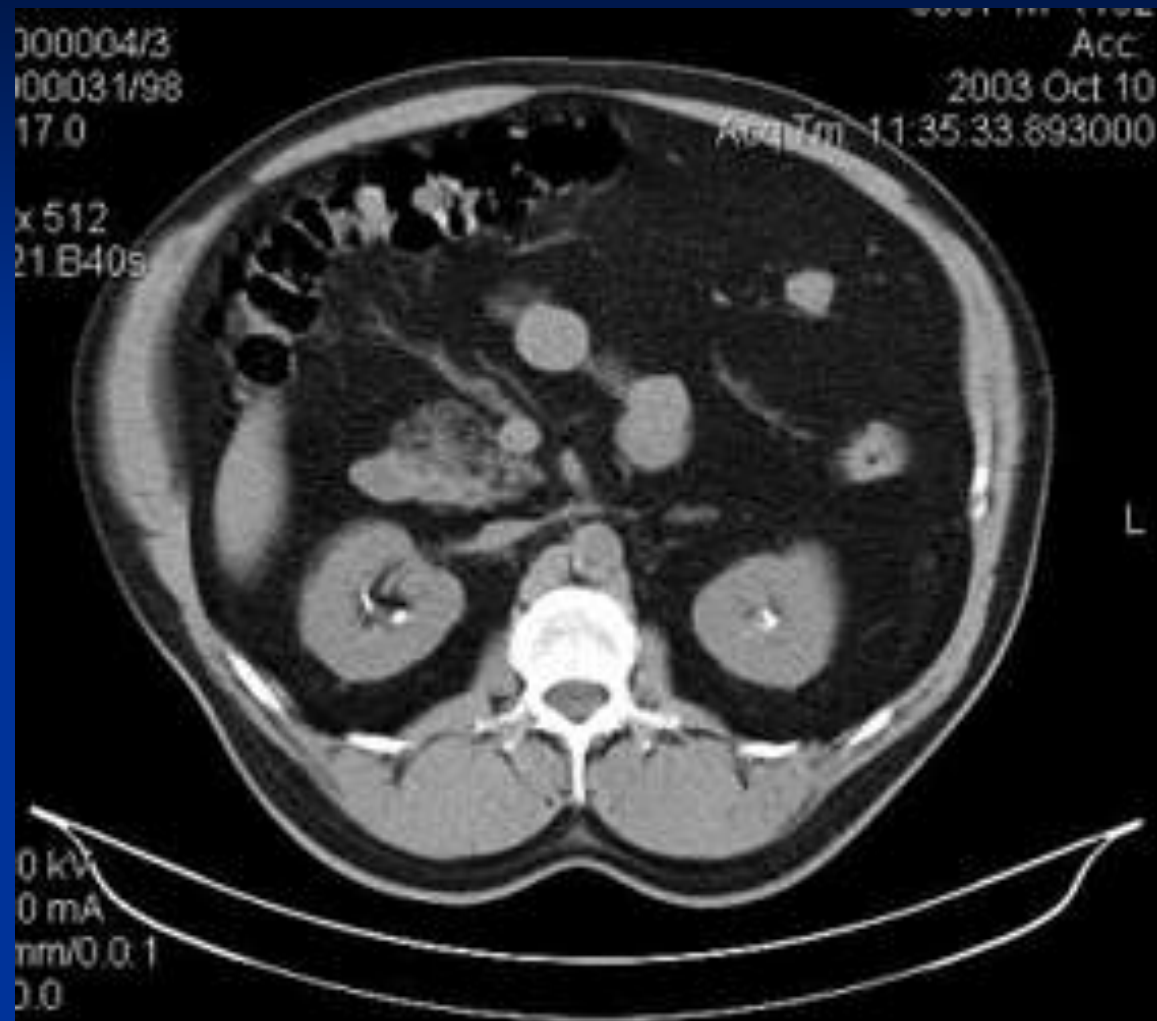
Urinary tract stones and CT

What is the most sensitive radiological test for urinary tract stone

CT, performed without intravenous contrast, is highly sensitive for detecting urinary tract stone

?Are any urinary tract stones radiolucent on CT

No, virtually all urinary tract stones, regardless of their composition are visible on CT



✦ Bilateral renal stones



+ Calcification of
the aorta due to
atherosclerosis

Inferior vena cava

URINARY OBSTRUCTION

- ❖ Obstruction of the renal tract may occur at many sites.
- ❖ The most common causes are:
 - .Urinary tract stones -
 - .Urinary tract strictures -
 - .Urinary tract tumors - -
 - .Prostatic hypertrophy or cancer - -

Urinary obstruction / 2

Why is it important to recognize renal obstruction

Because over time, obstructed kidneys may lose function permanently.

➡ إذا كان نفس السؤال بس لل stones ف الجواب X-ray

What is the best initial imaging test for suspected renal obstruction

Ultrasound. It is relatively inexpensive, save, and effective. The cause of obstruction also may be identified.







Benign renal lesions

?What is the most common renal mass

.The most common mass is a simple cyst

- They are more common in older patients and are found in approximately 50% of the population over 50 years of age.
- They are usually cortical in position and an incidental finding.

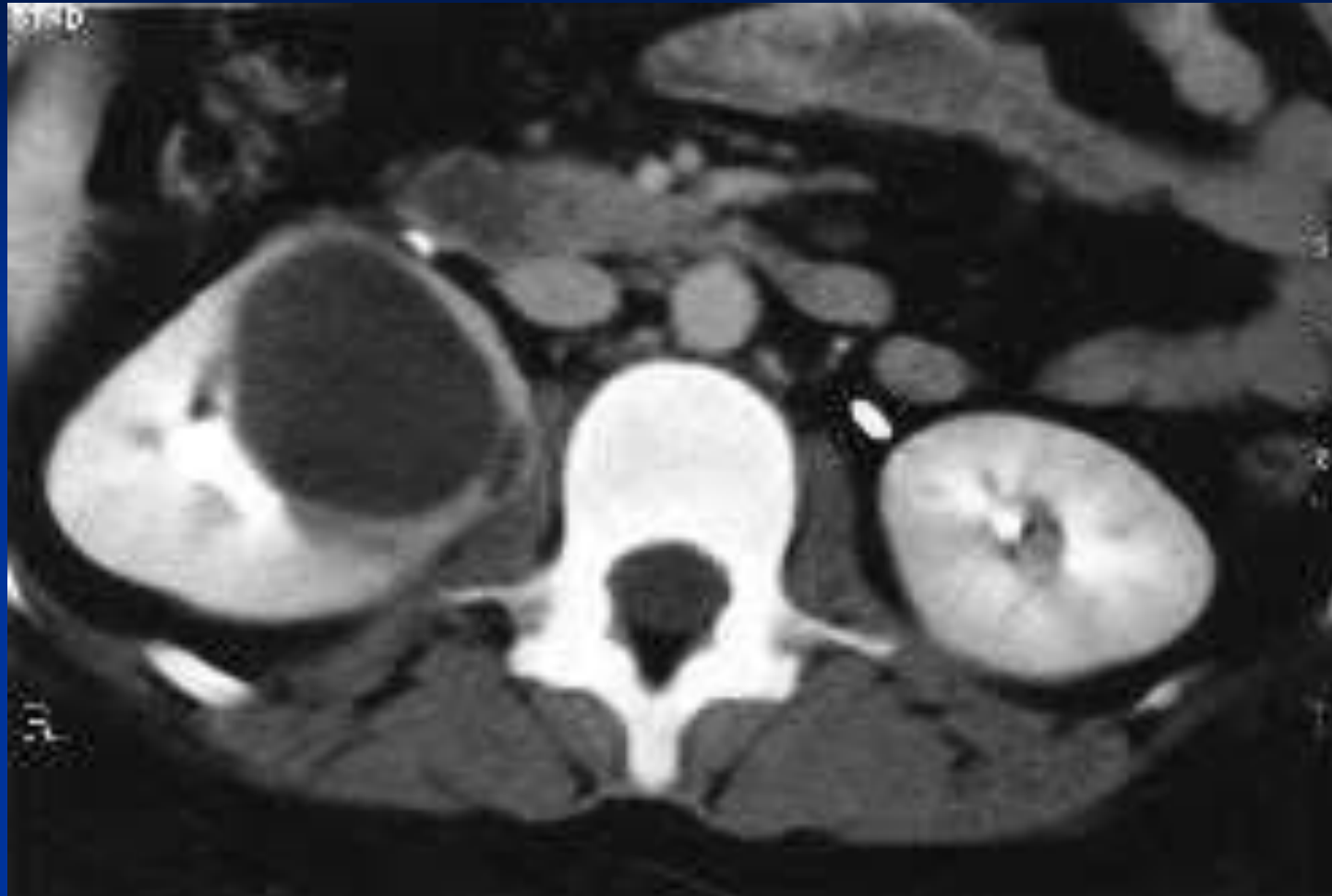
Benign renal lesions /2

What is the best way to confirm that a renal mass is a simple cyst ?

Ultrasound.

- ❑ The ultrasound appearance of a simple cyst is that of a well-defined round mass with very thin wall, smooth margin and no internal echoes.





Polycystic kidneys disease

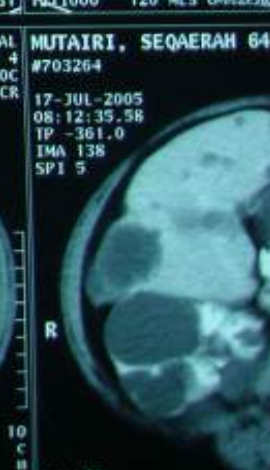
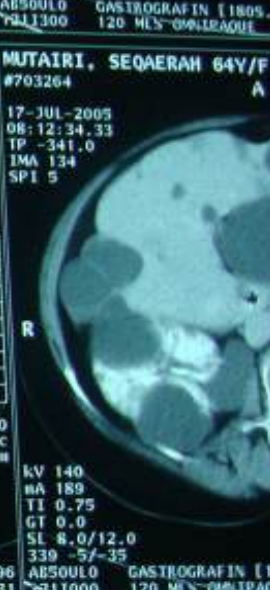
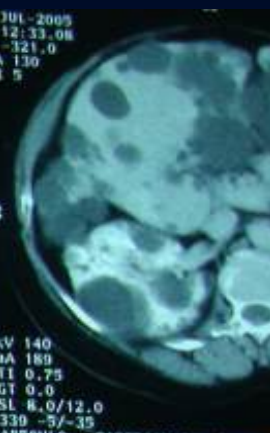
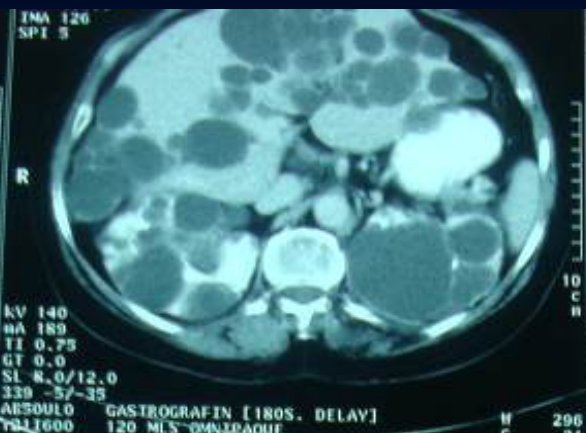
- Adult polycystic kidney disease is a congenital renal parenchymal disorder.
- Usually both kidneys are involved.
- In some cases, there is associated cysts in the liver and more rarely in the spleen and pancreas.

Polycystic kidney disease / 2

:Radiological features on Ultrasound and CT

- Kidneys are enlarged with lobulated contours.
- The renal parenchyma is replaced by multiple cysts of varying size, causing distortion of the collecting system.
- Spontaneous hemorrhage into some of the cysts may occur.





Malignant renal tumors

Von Hippel-Lindau (VHL) syndrome is a rare, autosomal dominant genetic disorder caused by mutations in the VHL tumor suppressor gene on chromosome 3p25-26. It leads to the development of multiple tumors, both benign and malignant, in various organs.

Key Features of VHL Syndrome:

1. Hemangioblastomas (most common feature)
 - Found in the cerebellum, spinal cord, and retina
 - Can cause headaches, ataxia, and vision problems
2. Renal Cell Carcinoma (RCC)
 - Clear cell type is most common
 - Can be bilateral and multifocal
3. Pheochromocytomas
 - Can cause hypertension, palpitations, and sweating

□ Renal cell carcinomas (RCC) or Hypernephroma: account for 85% of renal tumors.

❖ Are bilateral in 4% of cases.

❖ Von Hippel- Lindau disease is associated with RCC in one third to one half of patients.

Sturge-Weber Syndrome (SWS):

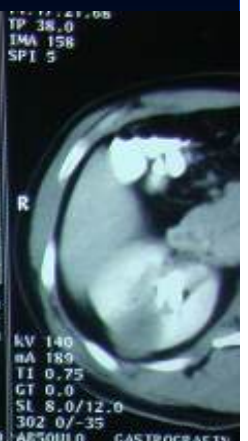
- A rare, congenital neurocutaneous disorder (not inherited)
- Characterized by port-wine stains (facial capillary malformations), leptomeningeal angiomas, and glaucoma
- Associated with seizures, intellectual disability, and stroke-like episodes

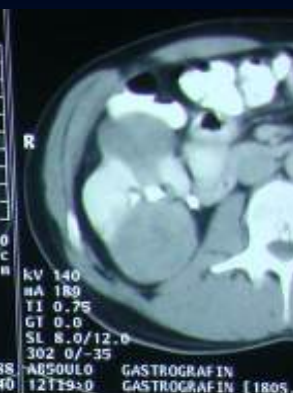
❖ Patients with polycystic kidney disease and chronic renal failure may also be associated with RCC.

□ Transitional cell carcinoma: are relatively rare and represent 7% of all renal tumors.

✚ اذا وصل ال renal vein and IVC stage 4 يعني inoperable





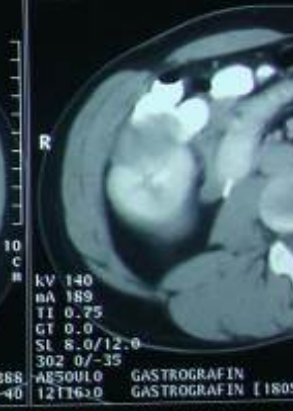


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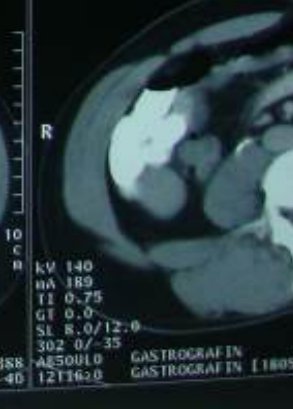
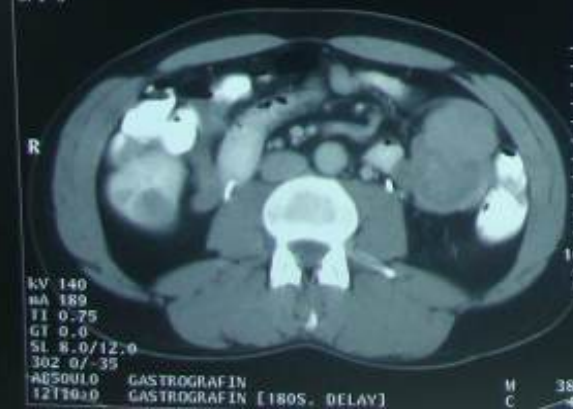


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SOMATOM PLUS 4
VC10C
H-SP-CR





A scenic landscape photograph featuring a large body of water in the foreground, surrounded by dense evergreen forests. In the background, majestic mountains with patches of snow are visible under a clear sky. The scene is framed by dark evergreen branches on the left and right sides. The text "Thank You" is overlaid in the center in a large, red, sans-serif font.

Thank
You