Radiology
Team 438

Urogenital tract imaging interactive lecture

Lecture 9

Reviewed By
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Objectives

" اللهم لا سهل إلا ما جعلته سهلا وأنت تجعل الحزن إذا شئت سهلا "

Color Index: Important · Doctor's Notes · Extra · Female slides · male slides

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★ Case 1

- **Young Adult presented with right loin pain and microscopic hematuria. Ultrasound Exam was performed. Which of the following is the likely finding?**

A. Hydronephrosis.
B. Normal.
C. Renal mass.
D. Upper pole renal stone.

★ Case 1

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a- Hydronephrosis.
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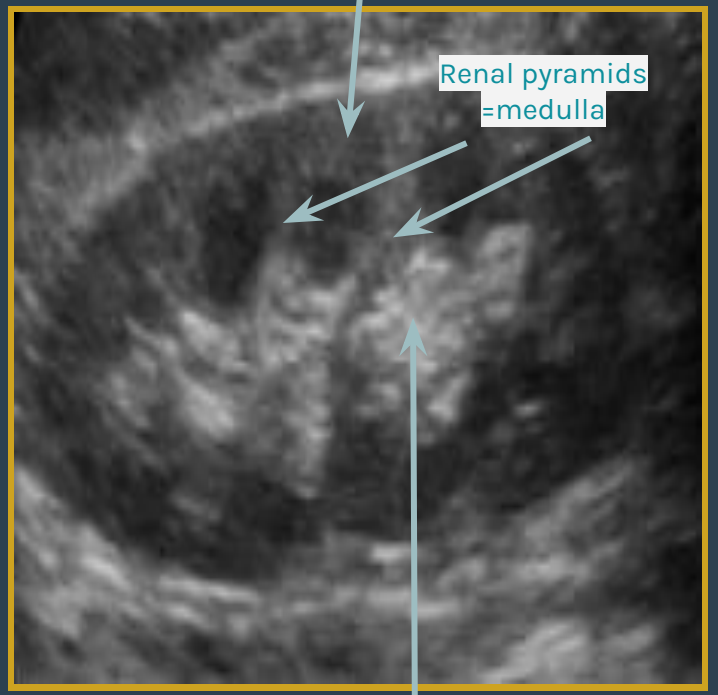
c- Renal mass.
d- Upper pole renal stone.

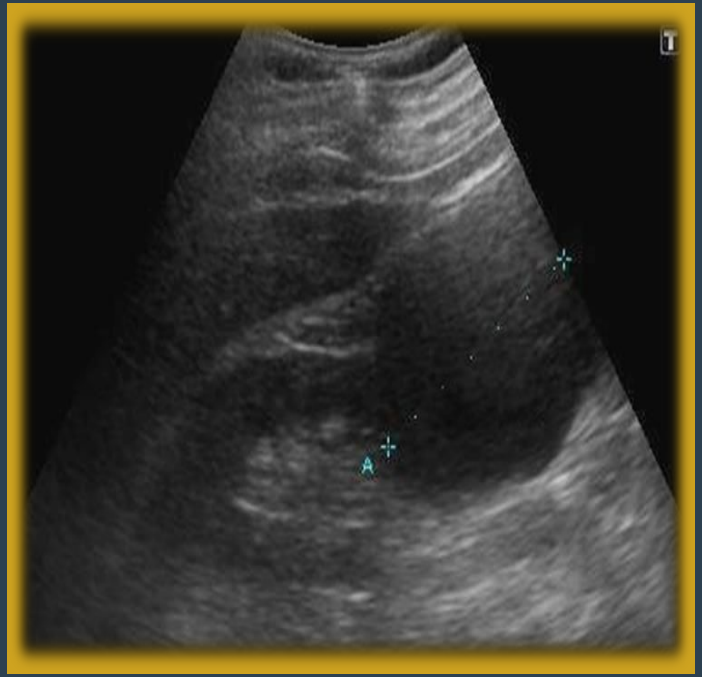


- There is good corticomedullary differentiation (we can tell that this is the cortex and this is the medulla).

Case 2

- Young Adult presented with right loin pain. Ultrasound exam was performed. Which of the following is the likely finding?

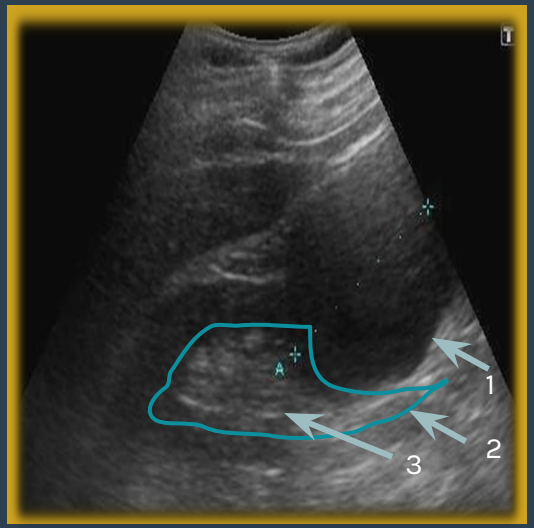
A. Normal
B. Hydronephrosis
C. Renal cyst
D. Lower pole renal stone



Case 2

- **Young Adult presented with right loin pain.**
  Ultrasound exam was performed.
  Which of the following is the likely finding?

A. Normal
B. Hydronephrosis
C. Renal cyst
D. Lower pole renal stone

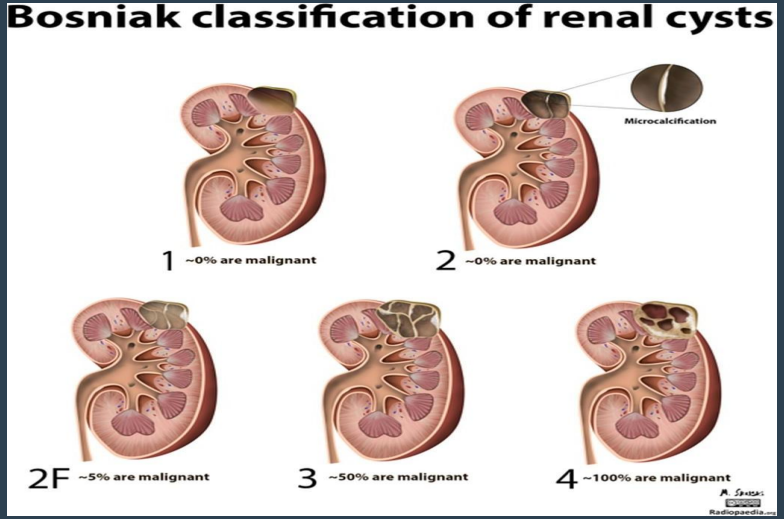


US sagittal section of kidney showing mass in lower part of kidney with no separation no thickening of the wall and no calcification

437 notes

- Any black circle (anechoic) and well demarcated without any irregularity and calcification is renal cyst.
- Why couldn't be dilatation? In dilatation it will be diffuse and in the calyces but here is solitary anechoic dark structure In the cortex.
- the blue dots on previous pic represent the cyst.
- This cyst is simple not complex.
- How to locate the kidney demarcation is to know that you should see the kidney borders which is usually white (hyperechoic), and the cortex which is black (hypoechoic) and in the middle of it there is the collecting system which white (hyperechoic).
- Why the collecting system is hyperechoic? because the nature of the calyx tissue.

Case 2



Class 1: is a benign cyst which we usually see. it is round with thin walls, spherical, no interseptiation, no thickening and no calcification.

Class 2: there is only one septation or microcalcification and it is not malignant also.

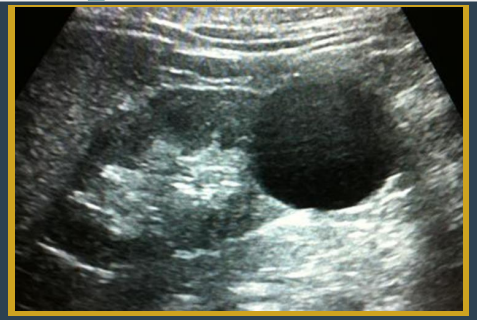
Class 2F: more than one septation or calcification, and 5% are malignant.

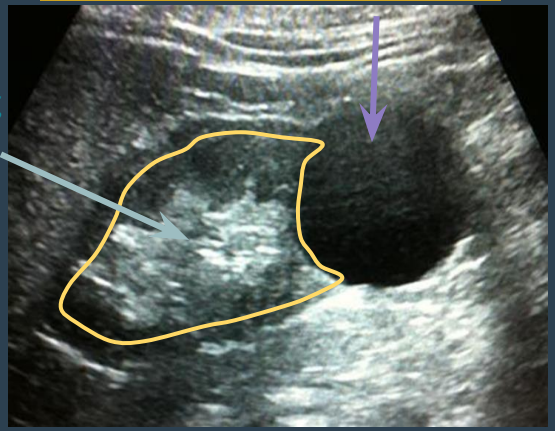
Class 3: when you see multiple septation and some of them are thickening, about 50% are malignant.

Class 4: thickened and necrotic, 100% are malignant.

Renal cysts (Thin borders)

In a CT image showing round hypodense mass not taking contrast and no thickening

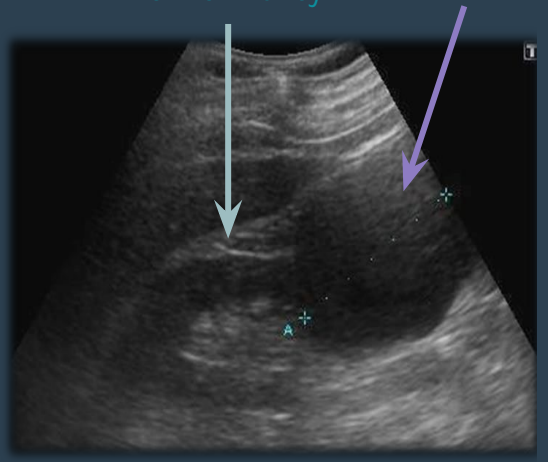




In ultrasound image, showing round cyst occupying lower pole of the kidney
no further investigations required

purple arrow is the simple cyst

Normal kidney



-Simple cyst occupying distal third of kidney (lower pole)

Case 3

29 y/o female presented to the ER c/o sudden acute left flank pain radiated to the groin associated with hematuria.
What is the name of the exam presented?

a. IVU.
b. KUB.
c. Double contrast exam.
d. Single contrast exam.

29 y/o female presented to the ER c/o sudden acute left flank pain radiates to the groin associated with hematuria.
What is the major finding?

A. Renal mass.
B. Renal cyst.
C. Renal stone.
D. Renal hemorrhage.

Case 3

29 y/o female presented to the ER c/o sudden acute left flank pain radiates to the groin associated with hematuria.
What is the name of the exam presented?

a. IVU.
b. KUB .shows Natural contrast of calcification=renal stone
c. Double contrast exam.
d. Single contrast exam.

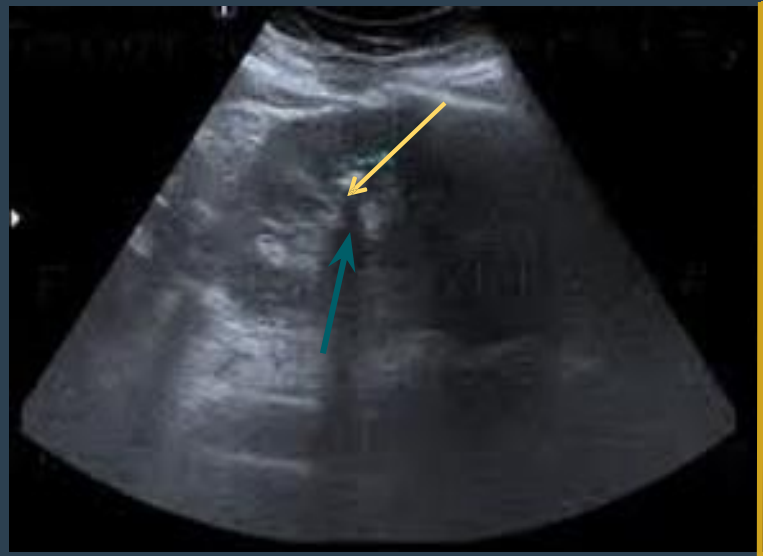
29 y/o female presented to the ER c/o sudden acute left flank pain radiates to the groin associated with hematuria.
What is the major finding?

A. Renal mass.
B. Renal cyst.
C. Renal stone. Multiple in left kidney
D. Renal hemorrhage.

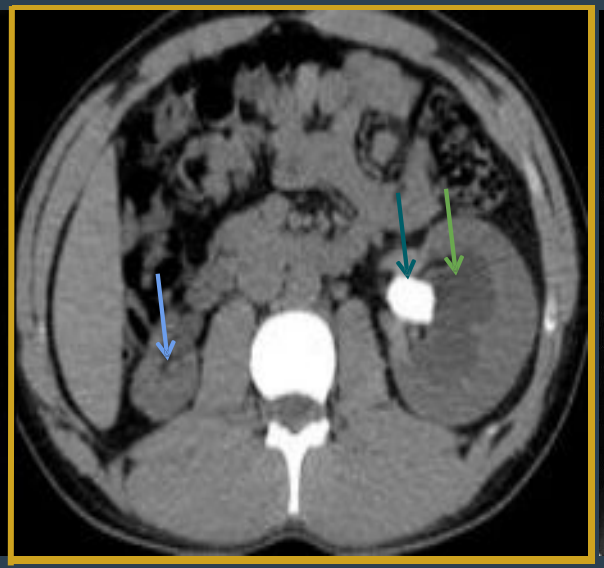
437 notes

- The first imaging exam in ER is KUB.
- In general, we use KUB in ER, US in stone and obstruction and hydronephrosis, and CT for everything!
- We can see multiple stones in the left kidney.
- We can't see the kidney shadow that's why it is preferred to do CT without contrast to see if there is obstruction, if we want to see if there is dilatation we will start with US.
- **In US we can't see the ureters.**
- If we want to see the stone clearly we will do CT without contrast.

Stones in different modalities



The stone in US appears like hyperechoic structure with **shadow behind**, it is not obstructive because we don't see dilatation.



CT Without contrast, large calcification **(Stone)** is in the left kidney in ureteropelvic junction (common site), with a clear obstruction, Dilatation of collecting system(hydronephrosis), atrophic R. kidney

Staghorn stone it is chronic infected stone Which takes the morphology of the collecting renal system

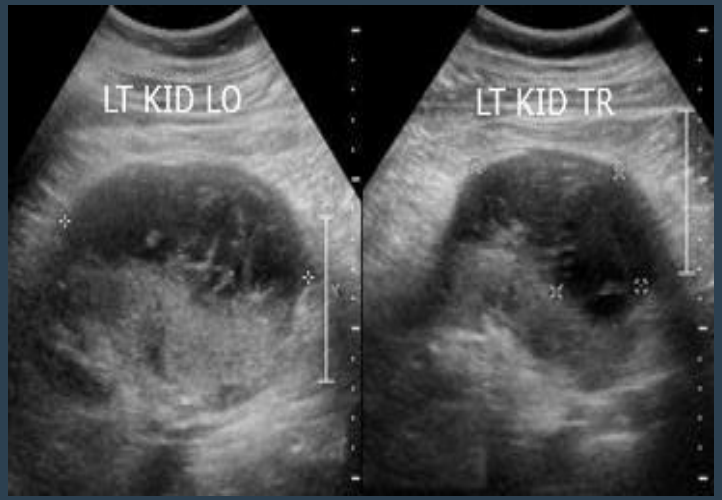
Obstructing vs. Non-Obstructing Stones:
Kidney stones that block the flow of urine from the kidney or down the ureter are called obstructive kidney stones. Depending on stone size and location the blockage can be complete or partial. Non-obstructing stones do not block urine flow but can also cause symptoms that are commonly associated with kidney stones. A non-obstructive kidney stone may at some point start moving and become obstructive.

Case 4

36 y/o male presented to the ER c/o acute sudden left flank pain radiates to the groin associated with hematuria post RTA (road traffic accident). US was performed.

What is the major finding?

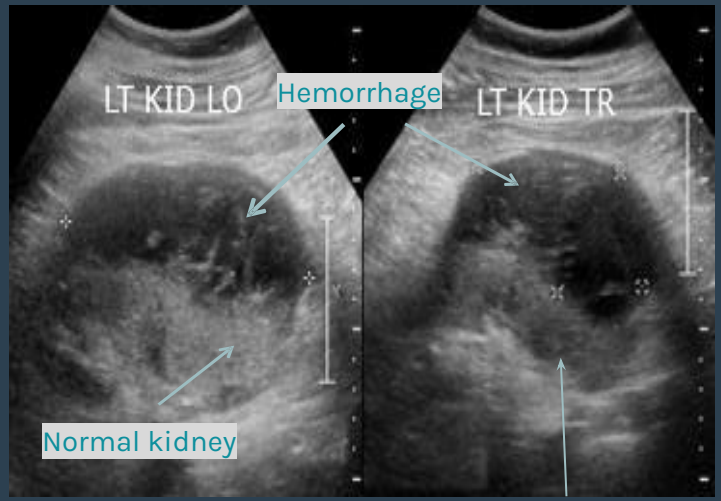
a. Renal mass.
b. Renal cyst.
c. Renal abscess.
d. Renal hemorrhage.



Case 4

36 y/o male presented to the ER c/o acute sudden left flank pain radiates to the groin associated with hematuria post RTA (road traffic accident). US was performed.
What is the major finding?

a. Renal mass.
b. Renal cyst.
c. Renal abscess.
d. Renal hemorrhage. (subcapsular renal hematoma)



Normal kidney

437 notes

- We should first describe it as “collection” because we can’t know if it’s blood or abscess except based on the clinical scenario.

RTA: Road Traffic Accident, so you should suspect haemorrhage secondary to Trauma.
Always you have to correlate with the clinical scenario:

- The ***black area*** in the US image represent the haemorrhage.
- The blood is the hypoechoic part because it is fresh blood, if it is coagulated it will be heterogeneous and hyperechoic.

Subcapsular renal hematoma

- **CT with contrast** was done, shows normal right kidney and a subcapsular renal haematoma located in the left kidney which is compressing renal cortex.
- If we leave it, it will lead to renal failure

Types of renal injury

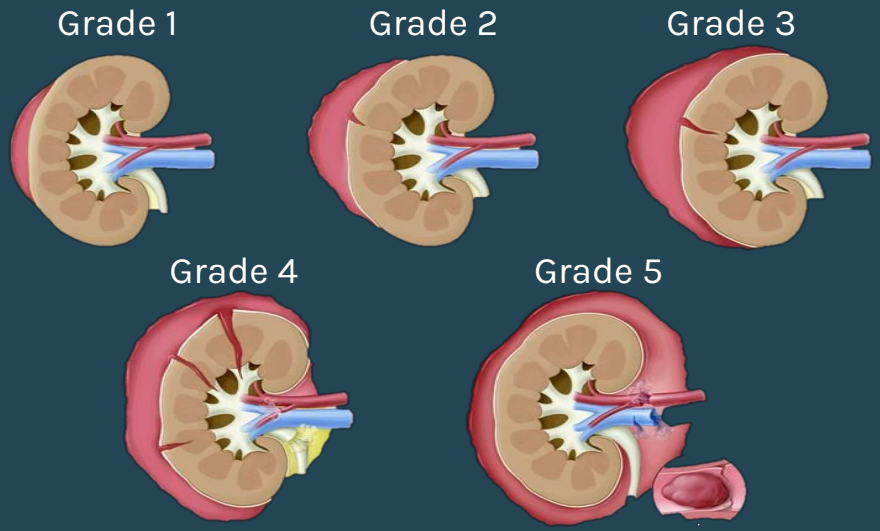


Table 11. Renal Injury Grades

Grade	Extent of renal injury
1	Contusion: microscopic or gross hematuria, no depiction of injury with any imaging method Hematoma: subscapular hematoma with no parenchymal laceration
2	Nonexpanding perirenal hematoma or cortical laceration less than 1 cm deep with no urinary extravasation
3	Parenchymal laceration extending greater than 1 cm into the cortex with no urinary extravasation
4	Parenchymal laceration extending through the cortico-medullary junction and into the collecting system
5	Multiple major lacerations resulting in a shattered kidney or avulsion of renal hilum that devascularizes the kidney

Grade 1	Subcapsular hematoma, only contusion (a bruise) of the kidney
Grade 2	Laceration in the cortex <1cm
Grade 3	>1cm but not extending into collecting system
Grade 4	Laceration with hematoma Extend to pelvicalyceal system the patient will have hematuria
Grade 5	Shattered kidney completely around the kidney

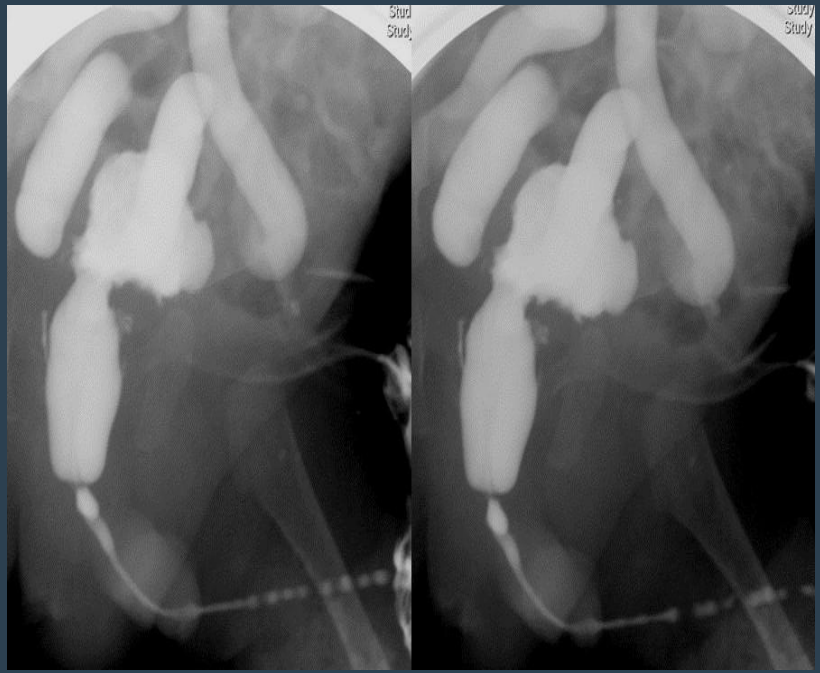
Case 5

One month old boy with recurrent UTI. What type of imaging is this?

a. Intravenous urography (IVU)
b. CT with IV contrast.
c. Voiding cystourethrogram.
d. Scintigraphy.

One month old boy with recurrent UTI. What is the abnormality seen?

a. Normal VCUG.
b. Vesico-colonic fistula.
c. Beaded urethral strictures.
d. Vesicoureteric reflux.



Case 5

fistula is too advanced for your level. i'm not gonna ask about it.

One month old boy with recurrent UTI. What type of imaging is this?

a. Intravenous urography (IVU)
b. CT with IV contrast.
c. Voiding cystourethrogram.
d. Scintigraphy.

One month old boy with recurrent UTI. What is the abnormality seen?

a. Normal VCUG.
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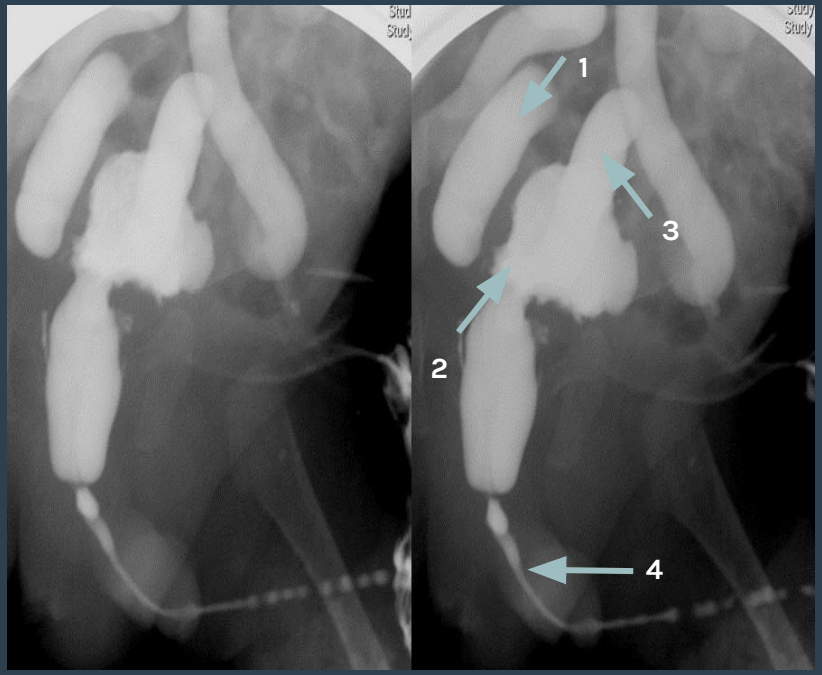
1)Right ureter. 2)Bladder. 3)Left ureter. 4) Catheter.



- Tortuous ureter, and dilated, > grade 5 vesicoureteral reflux.
- there is a test for **pediatric** age group called voiding cystourethrogram.
- what happen is: we inject contrast via the catheter inserted in urethra and then goes to the bladder of the child and wait until he/she voids urine. we do it when we suspect vesicoureteric reflux.
- normally: we see filled bladder only with prominent contour, we don't expect urine to back up into ureters, and when the child is voiding you observe the contrast voiding as well
- but in this disease: urine back up into ureters and you can observe a very dilated and large ureters.
- There is dilatation because of refluxed urine.

Case 6

31 y/o pregnant patient came to ER with high grade fever, right flank pain and vomiting. In addition, she has urinary frequency since 3 days.
What is the most likely diagnosis?

What is this imaging modality?

a. MRI with contrast.
b. MRI without contrast.
c. CT with contrast.
d. CT without contrast.

How do you describe this abnormality?

a. cortical mass.
b. pelvicalyceal dilatation.
c. hypoperfused lesion.
d. perirenal hematoma.

Case 6

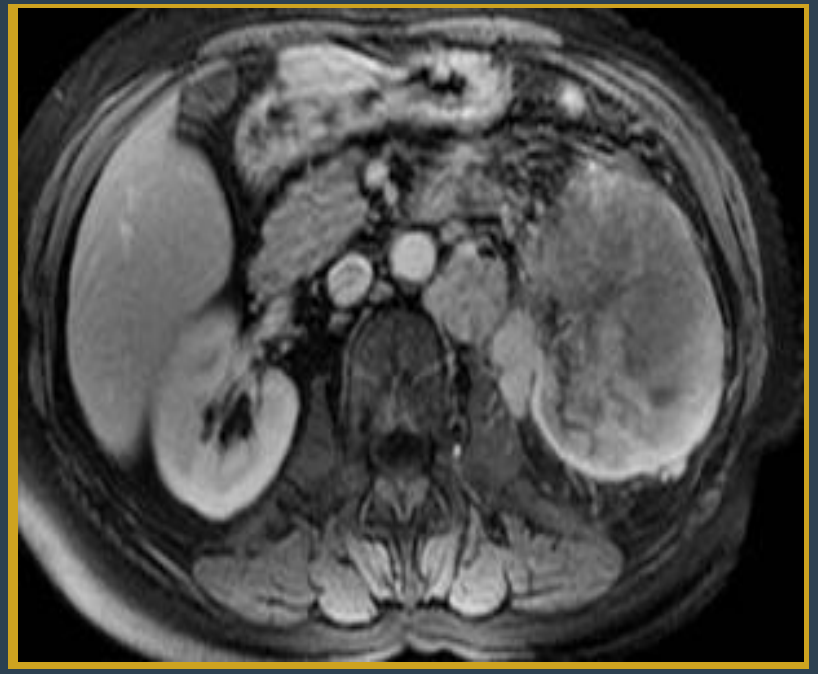
31 y/o pregnant patient came to ER with high grade fever, right flank pain and vomiting. In addition, she has urinary frequency since 3 days.
What is the most likely diagnosis?
pyelonephritis

What is this imaging modality?
a. MRI with contrast.
b. MRI without contrast.
c. CT with contrast. With contrast because we can see enhanced aorta.
d. CT without contrast.

How do you describe this abnormality?
a. cortical mass.
b. pelvicalyceal dilatation.
c. hypoperfused lesion. There is pyelonephritis, which is sub-functional and did not take the contrast
d. perirenal hematoma.

Case 7

76 y/o male patient presented with painless hematuria and weight loss. How do you describe this lesion?



What is the most likely diagnosis?

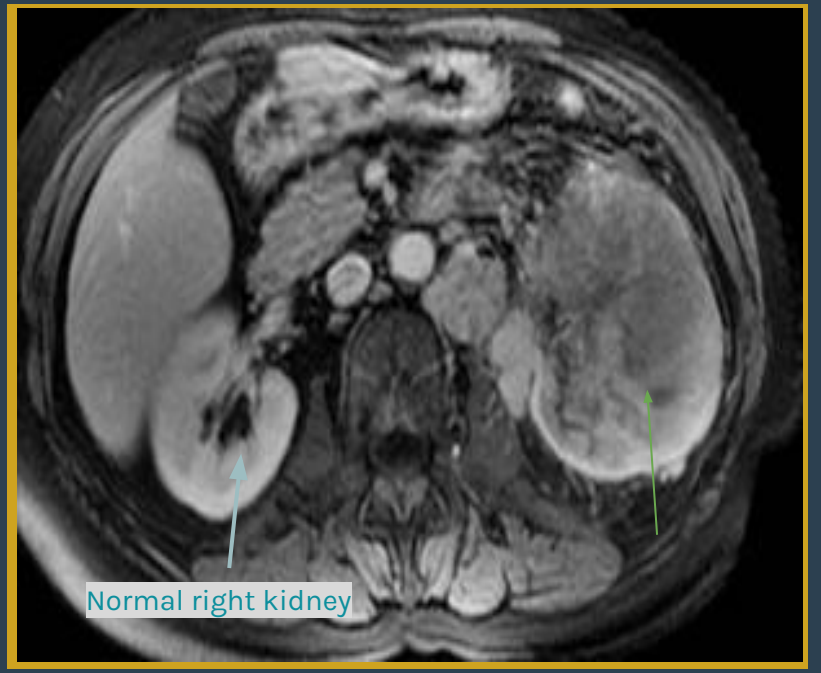
a. Pyelonephritis.
b. Renal adenocarcinoma.
c. Transitional cell carcinoma.
d. Angiomyolipoma.

Case 7

76 y/o male patient presented with painless hematuria and weight loss. How do you describe this lesion?

Large heterogeneous mass with enlarged lymph nodes and fat stranding, the right kidney is normal

We can see the difference between normal right kidney which is regular with clear pelvis and vessels, while it is distorted in the left



- MRI (T1, + contrast).
- We know it's MRI because the bone (vertebra) isn't white as in CT.

What is the most likely diagnosis?

a. Pyelonephritis.
b. Renal adenocarcinoma.
c. Transitional cell carcinoma.
d. Angiomyolipoma.

437 notes

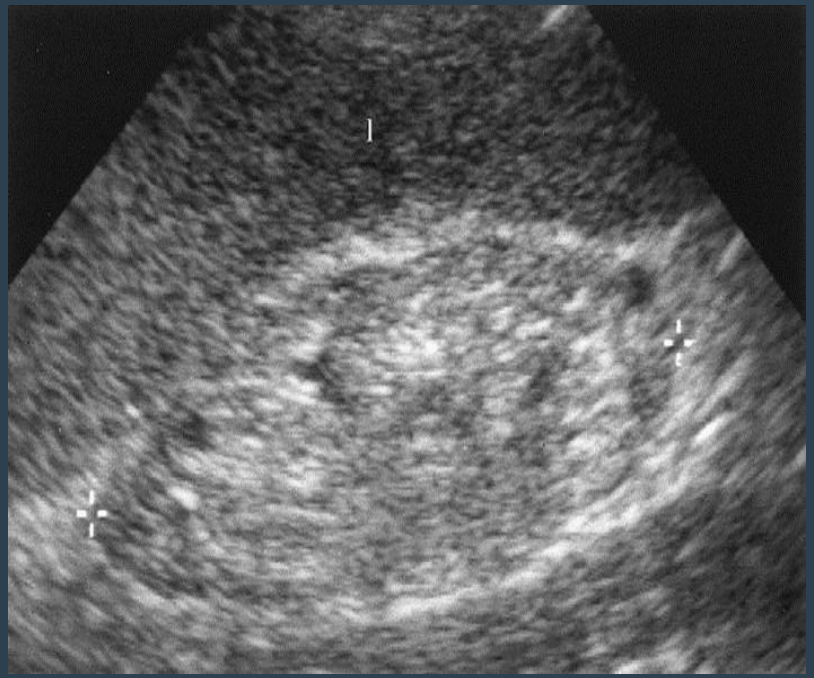
* Black patchy means necrosis in the centre (not taking the contrast).

We can correlate it with a clinical scenario which is painless hematuria. more than 90% of renal tumors are renal cell adenocarcinoma. the transitional cell carcinoma are more in collecting system, and here we see the kidney itself and its cortex

Case 8

81 y/o female diabetic patient came to clinic with general fatigue, itching, loss of appetite and easy bruising. Initial lab works show a creatinine level of 180 Umol/L. What does US show?

a. normal kidney.
b. hyperechogenic kidney.
c. atrophic undifferentiated kidney.
d. atrophic kidney with normal corticomedullary differentiation.



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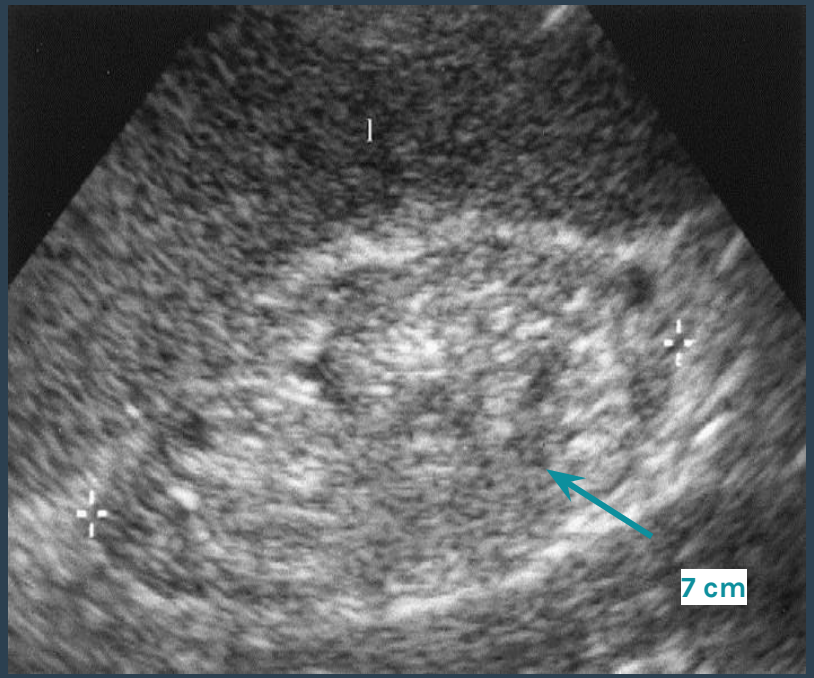

- There is no corticomedullary differentiation.
- Collecting system is not clearly seen.

There is a kidney of 7 cm in longitudinal which is less than 9 cm so it is atrophic kidney.

Case 9

67 y/o male patient came to ER with worsening hematuria. What is this exam?

a. KUB.
b. IVP.
c. CT: coronal section.
d. Scintigraphy.

That is the major finding?

a. Normal.
b. Left pelvicalyceal dilatation.
c. Right ureteral dilatation.
d. Filling defect in urinary bladder.

Case 9

67 y/o male patient came to ER with worsening hematuria. What is this exam?

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That is the major finding?

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c. Right ureteral dilatation.
d. Filling defect in urinary bladder.

Usually bladder cancer (mass)

Case 9

This US shows echogenic mass, penetrating into the lumen of the urinary bladder indicating urinary bladder tumor

Case 10

73 y/o female came with painless hematuria & general fatigue. What is the major finding?

a. Bosniak type II renal cyst.
b. Malignant tumor.
c. Focus of pyelonephritis.
d. Normal.

What other secondary finding do you observe?

a. Perirenal hemorrhage.
b. Mass effect on pancreas.
c. Renal vein filling defect.
d. Pelvicalyceal dilatation.

Case 10

73 y/o female came with painless hematuria & general fatigue. What is the major finding?

a. Bosniak type II renal cyst.
b. Malignant tumor.
c. Focus of pyelonephritis.
d. Normal.

can not be A, because type 2 has only one septiation
can not be C, because there is no hypoperfused area.

What other secondary finding do you observe?

a. Perirenal hemorrhage.
b. Mass effect on pancreas.
c. Renal vein filling defect.
d. Pelvicalyceal dilatation.

Renal vein should be enhanced completely, so the filling defect is caused by a thrombus complication

(red outline is an approximation)

Right kidney is normal,left kidney shows round mass occupying anterior part of the left kidney with multiple necrotic Foci and the mass is taking contrast in a heterogenous way.

Case 11

Middle aged diabetic male patient came to ER with a history of worsening fever and right abdominal pain since 2 weeks.
How do you describe the lesion in right kidney?

What is the most likely diagnosis in the right kidney?

a. Pyelonephritis.
b. Renal abscess.
c. Simple cyst.
d. Pelvicalyceal dilatation.

Perirenal fat :
RK: appear stranding fat <-stranding usually is a sign of inflammation in any organ in general
.LK: clear black with no strnding

Case 11

Middle aged diabetic male patient came to ER with a history of worsening fever and right abdominal pain since 2 weeks.
How do you describe the lesion in right kidney?

Congested kidney with mass occupying the right kidney, and central necrosis with thickened walls

What is the most likely diagnosis in the right kidney?

a. Pyelonephritis.
b. Renal abscess.
c. Simple cyst.
d. Pelvicalyceal dilatation.

Neglected case of pyelonephritis will develop into renal abscess and diabetics are prone to infection

The yellow circles represents the abscess wall.
Cyst = non-infected collection.
Abscess = infected cyst.

Dr's MCQs

Q1: The first preliminary imaging modality in emergency department for a renal colic patient to generally assess renal stones is one of the following:

a. Intravenous urography (IVU).
b. Plain X-ray (KUB).
c. CT scan.
d. Ultrasound.

Q2: One of the following is a common site of urinary stone obstruction:

A- proximal ureter.
B- mid ureter.
C- junction of mid-distal ureter.
D- vesico-ureteric junction.

Extra from Team 436

Q3: One of the following is a relative contraindication for CT with contrast:

a. Intracranial aneurysm clip.
b. Renal failure.
c. Cardiac pacemaker.
d. High grade fever.

Q4: One of the following is an absolute contraindication for MRI:

a. Claustrophobia.
b. Cardiac pacemaker.
c. Pregnancy.
d. Uncontrollable movement.

Q5: Which imaging modality is used to measure the renal split function?

a. Ultrasound.
b. Magnetic resonance imaging.
c. Scintigraphy.
d. Voiding cystourethrogram.

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b. Plain X-ray (KUB).
c. CT scan.
d. Ultrasound.

CT without contrast is also acceptable to we will not bring a question like this in the exam

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Q5: Which imaging modality is used to measure the renal split function?

a. Ultrasound.
b. Magnetic resonance imaging.
c. Scintigraphy.
d. Voiding cystourethrogram.

Describe what you see

Describe what you see

This is a fecal matter in the colon

this is the left kidney pushed by the mass

1. Heterogenous **mass** occupying left kidney
2. If add that he is a 6 year old boy. what's most likely the diagnosis ?
   you should answer Wilms tumor.

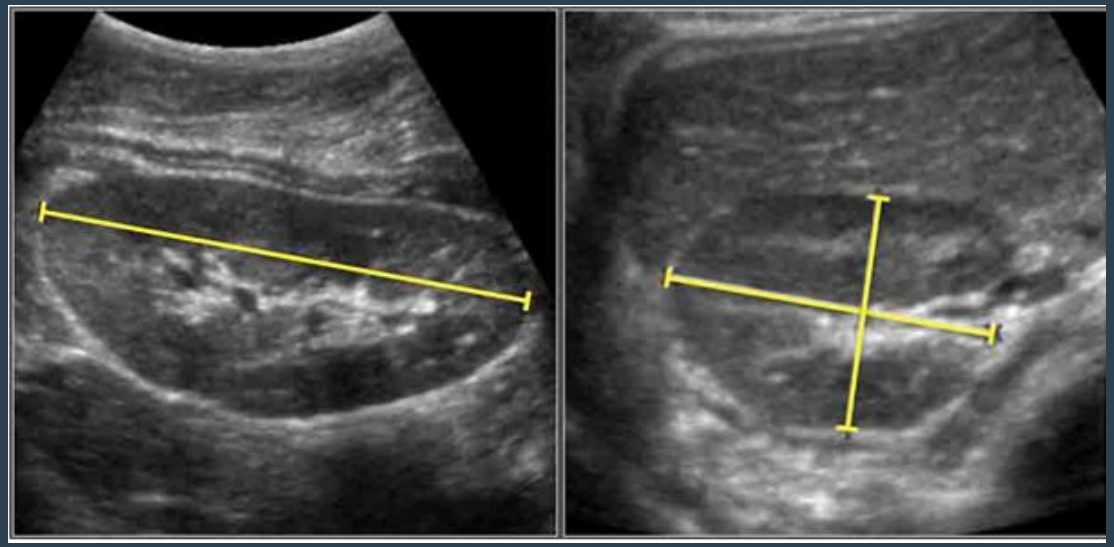
Describe what you see

Describe what you see

Normal kidney

Cortex is hypoechoic showing well differentiated medulla Cornec and collecting system

Describe what you see



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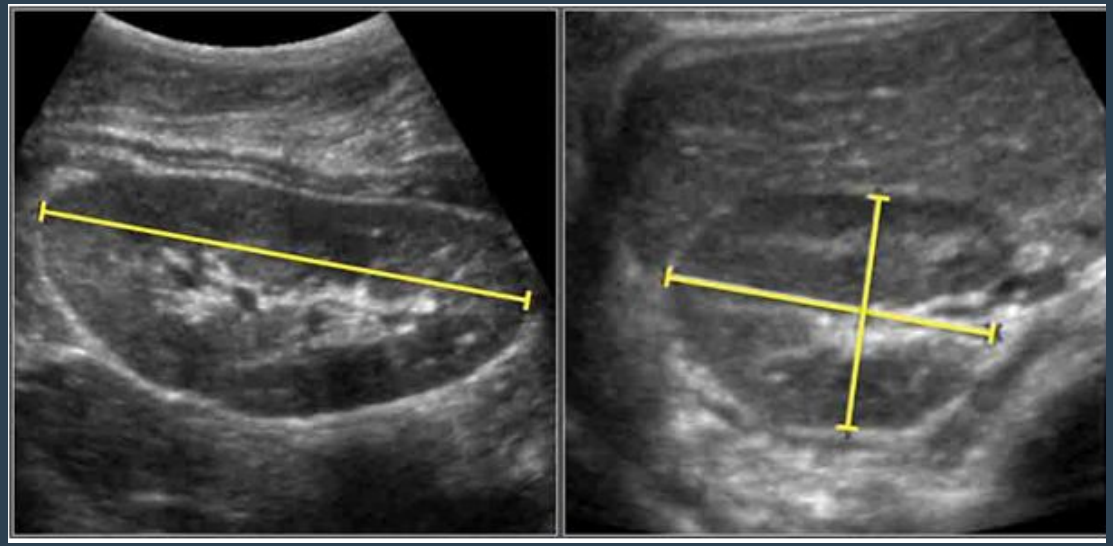
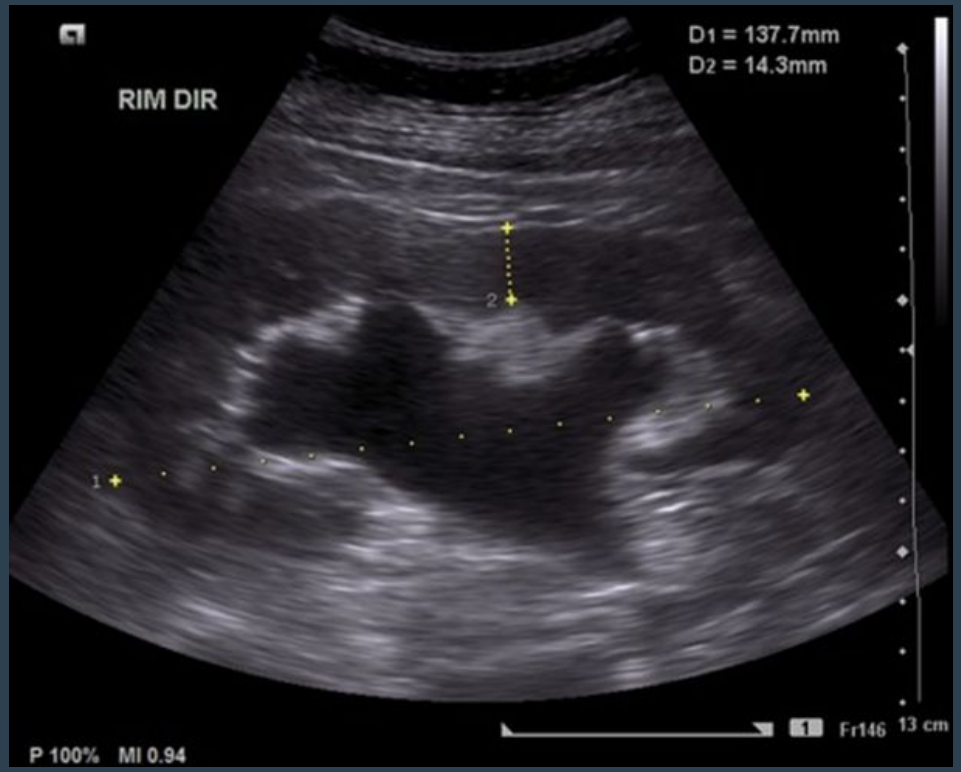


Normal kidney

Describe what you see



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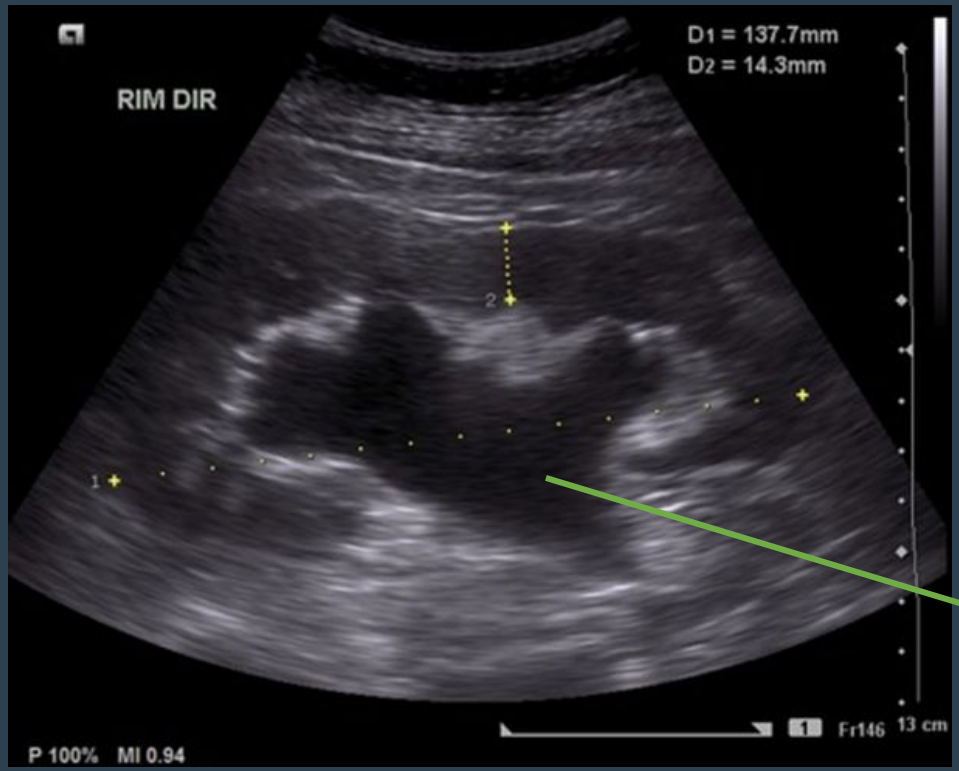


Irregular border mainly hydronephrosis showing dilated calyces

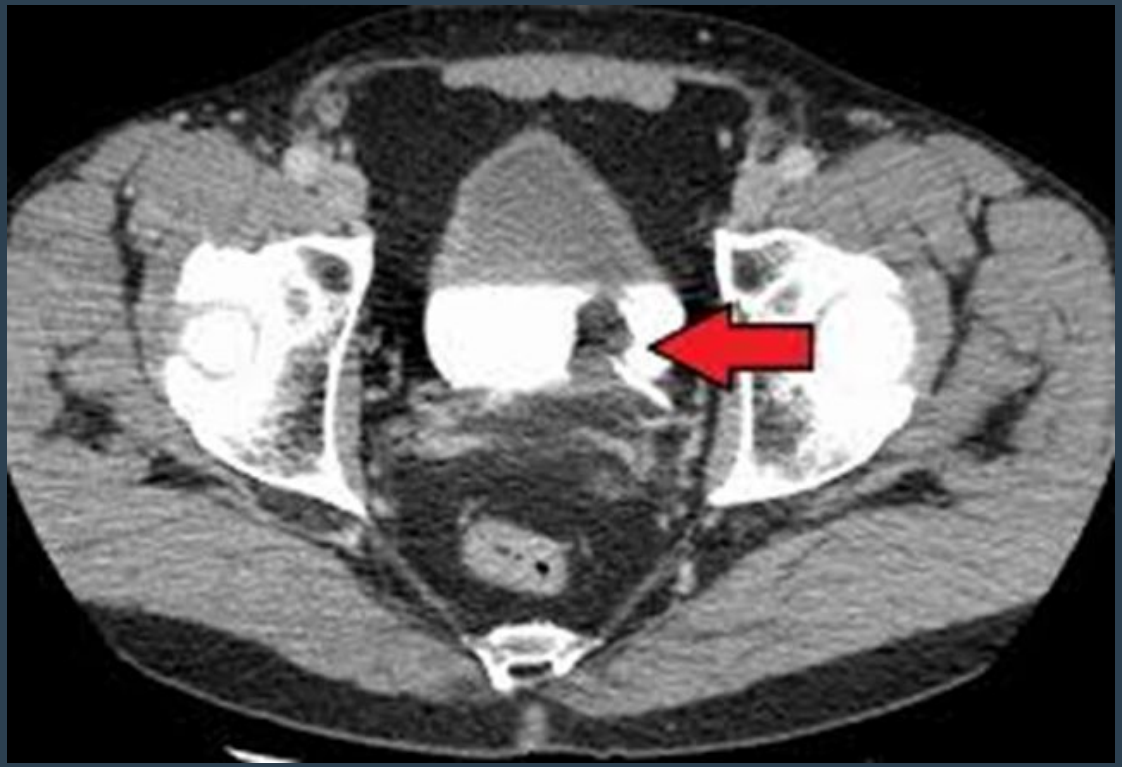
here we can see the urine and it is unchoic . We see it because there is an obstruction

Describe what you see

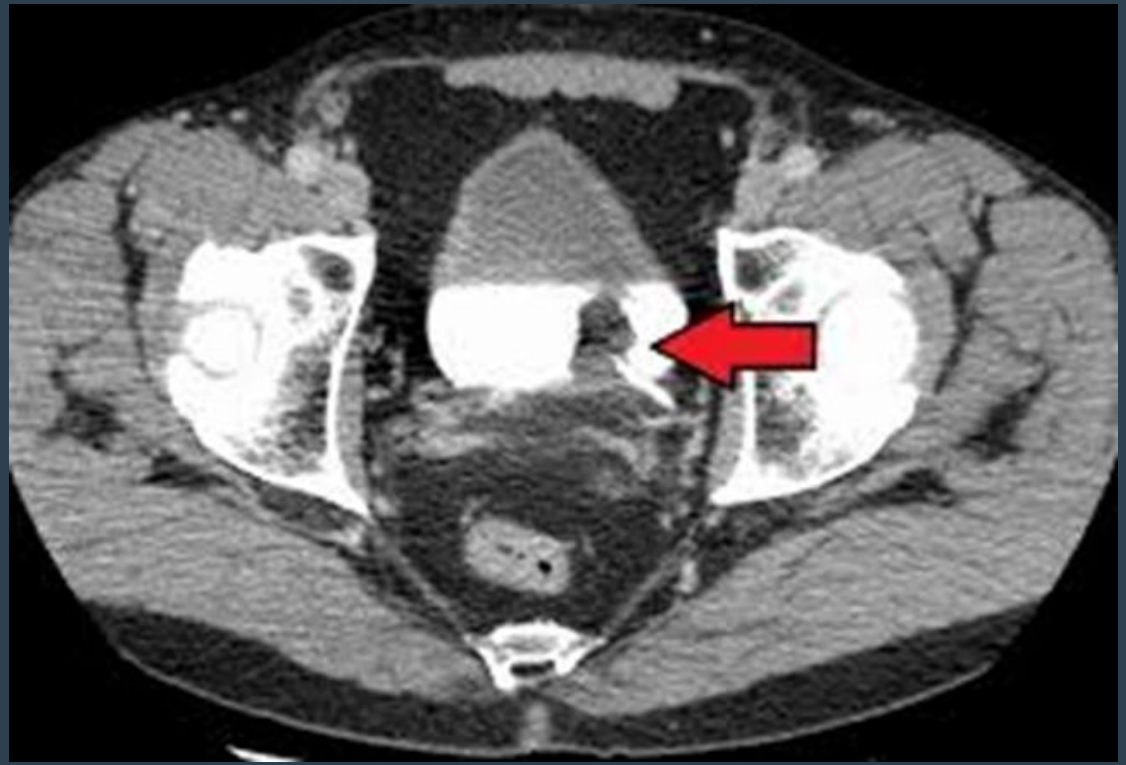
Describe what you see

dilatation of pelvicalyceal system. reflecting obstruction.(hydronephrosis)

Describe what you see



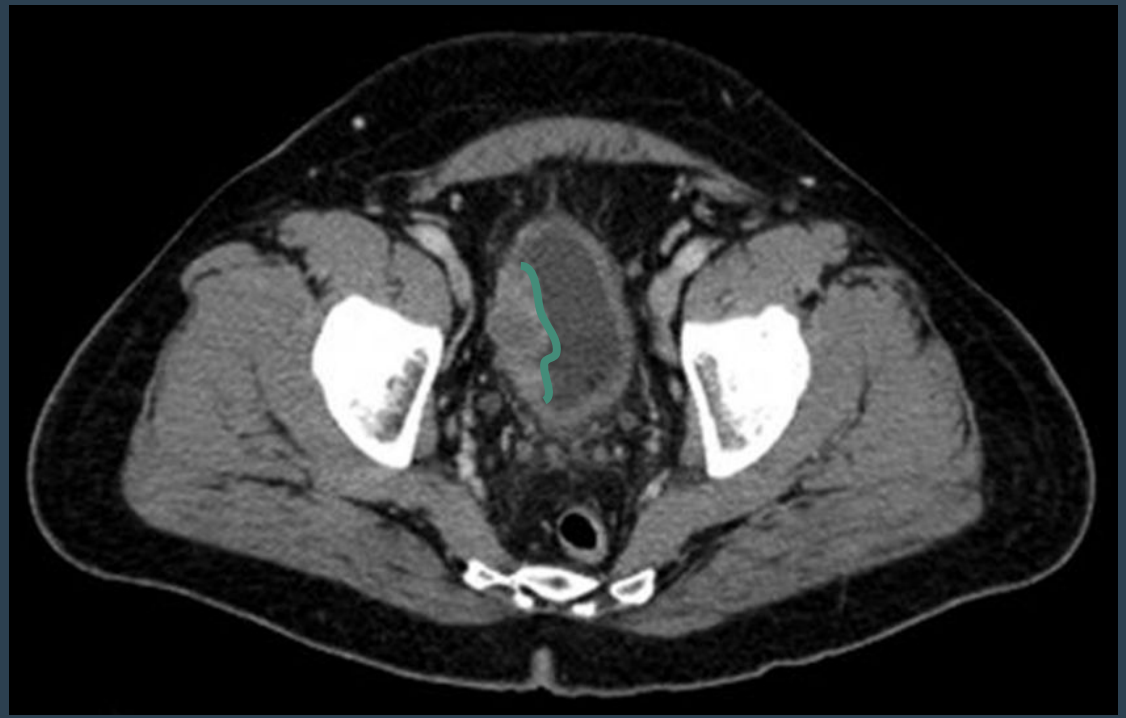
Describe what you see



- this picture shows CT scan + contrast. Excretory phase.
- **Filling defect** in posterior wall of the bladder.
    a. **Urinary bladder tumor**

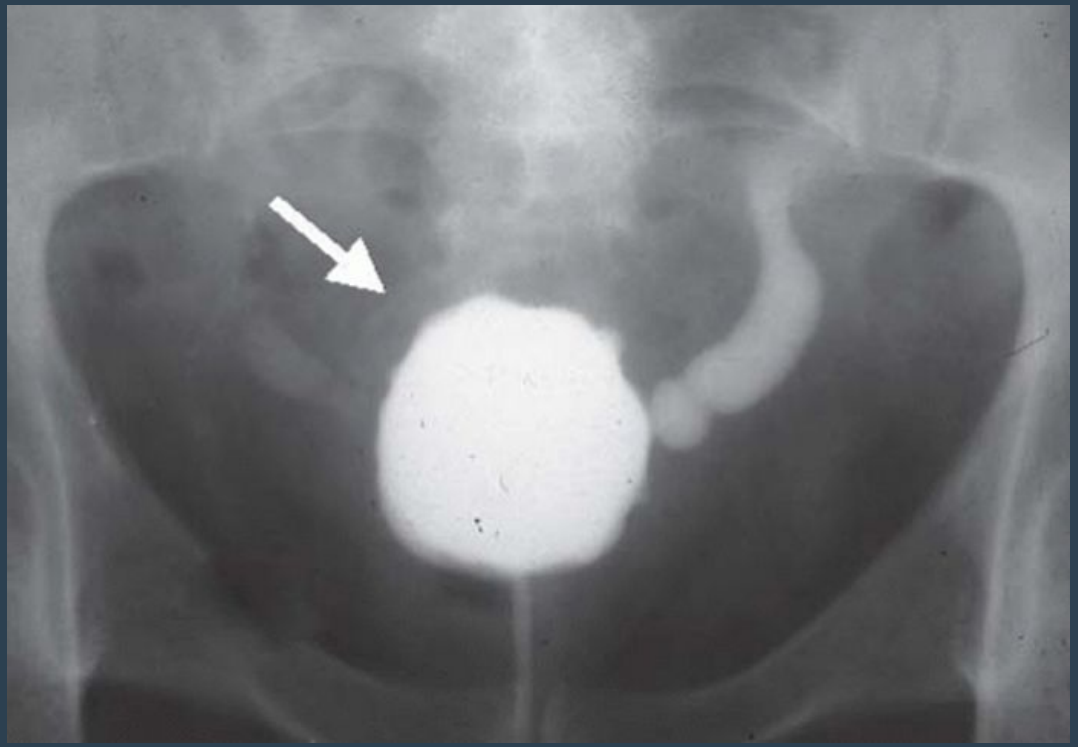
Describe what you see

Describe what you see

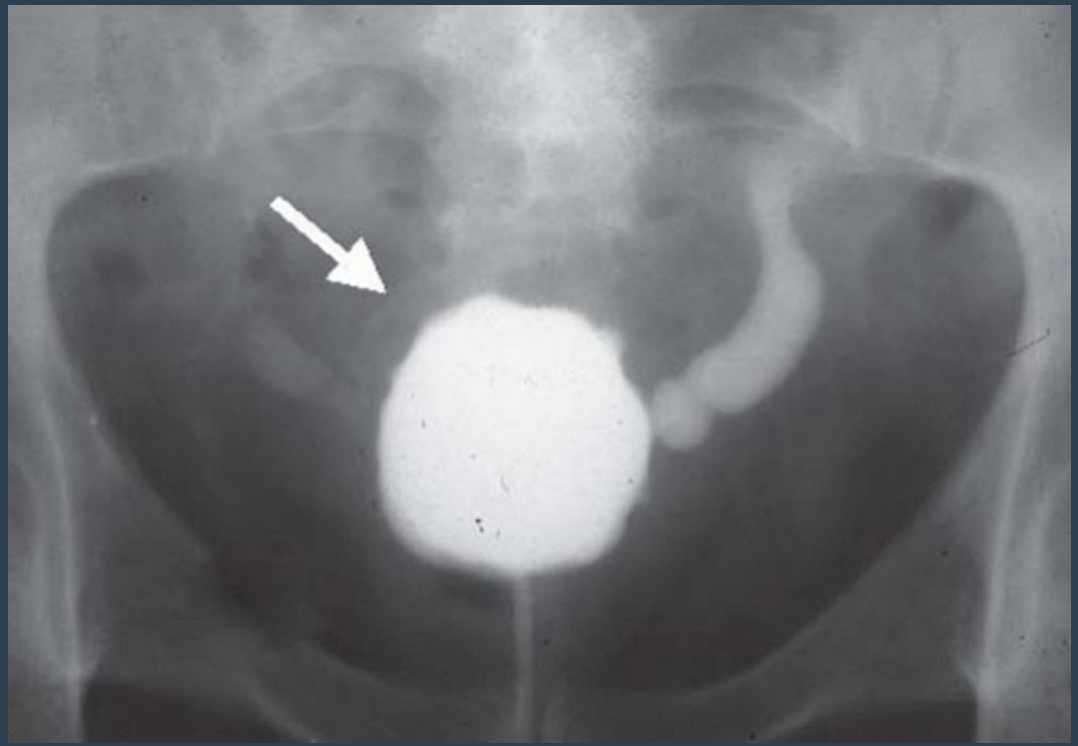


Irregular focal thickening of the right bladder wall indicating bladder mass. If it was cystitis it would show whole thickening of the wall not focal

Describe what you see



Describe what you see

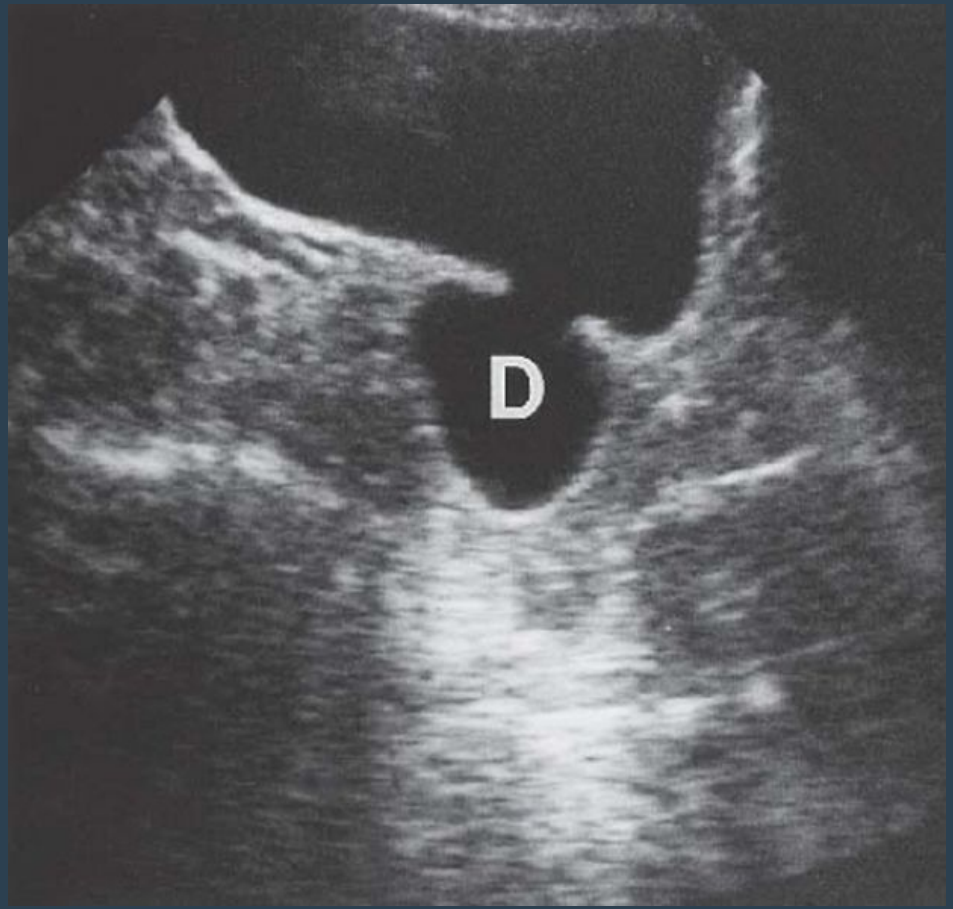


- **Image:** Voiding cystourethrogram.
- **Finding:** Vesicoureteral reflux.

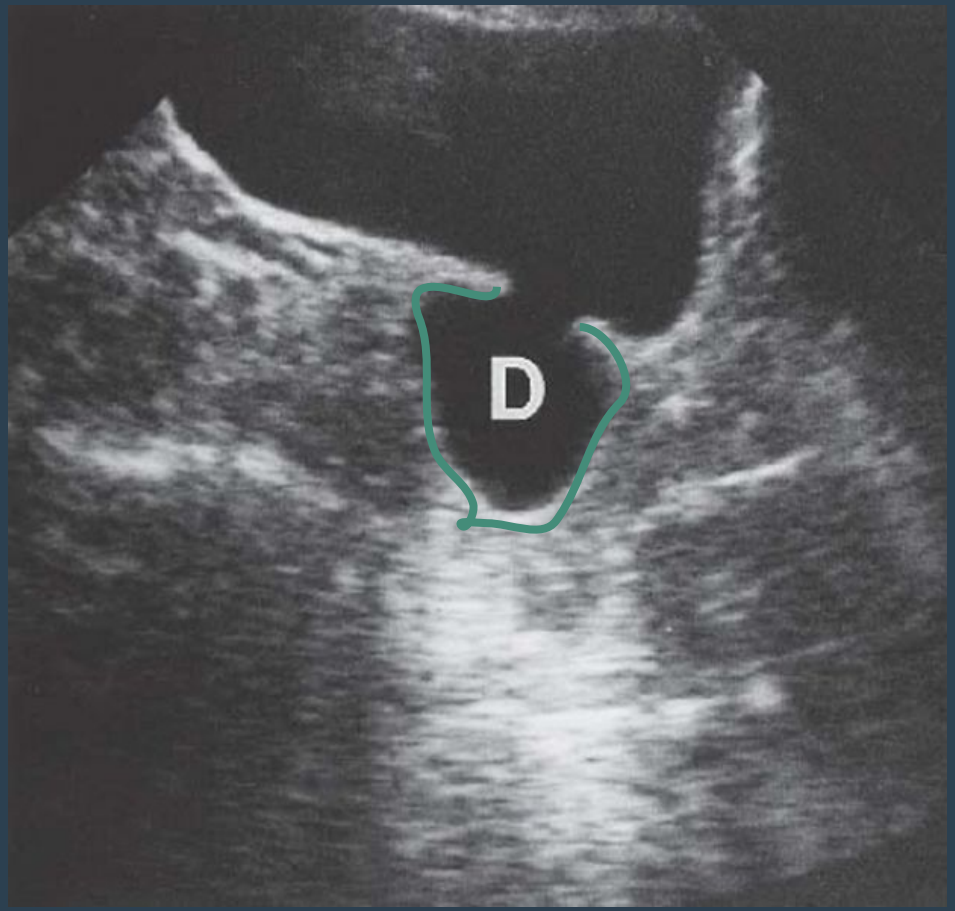
Contrast is refluxing on left ureter and slightly to the right ureter.

- Grade 3,4 on left.
- Grade 1,2 on right

Describe what you see

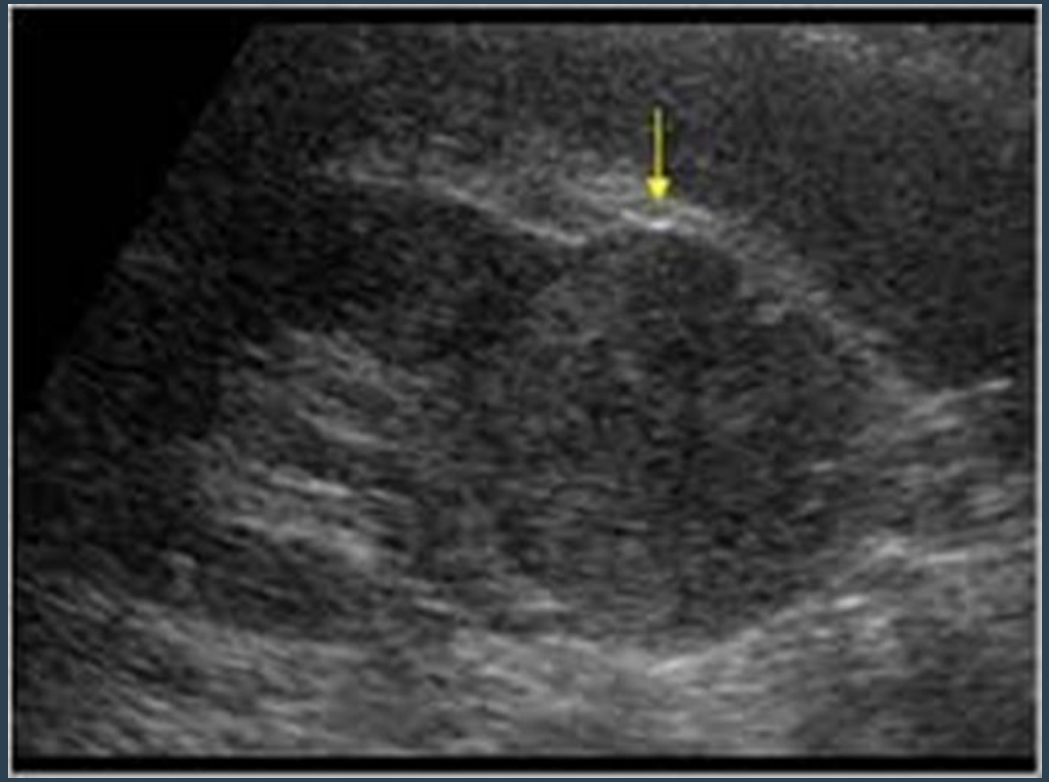


Describe what you see

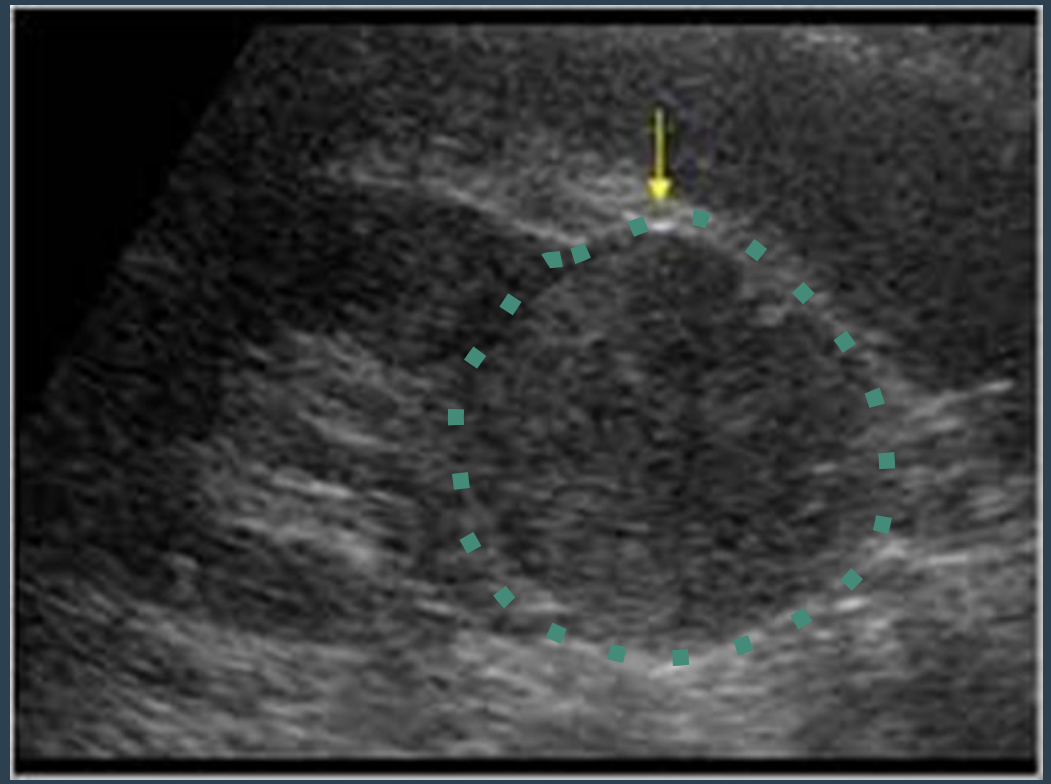


1. US of urinary bladder sagittal section showing **diverticula**

Describe what you see



Describe what you see

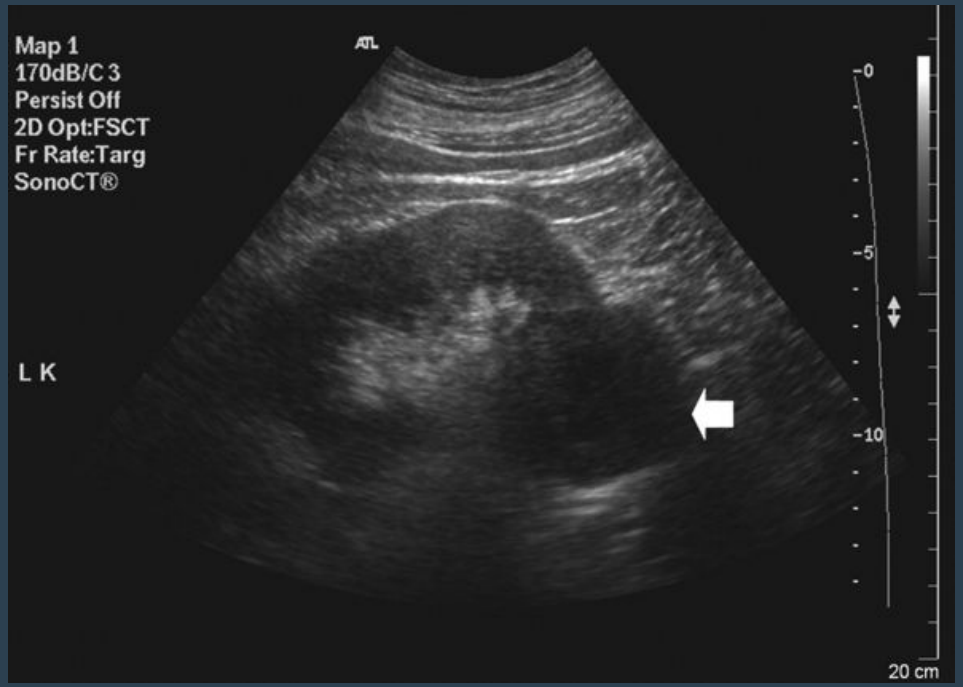


- ultrasound of the kidney showing **renal mass** not a cyst, if it was a cyst it should be More black

Describe what you see

Describe what you see

Fig 1 Ultrasound of the left kidney (not this patient) demonstrating a large solid hypoechoic mass arising from the lower pole (arrow), which is highly suggestive of a renal cell carcinoma.



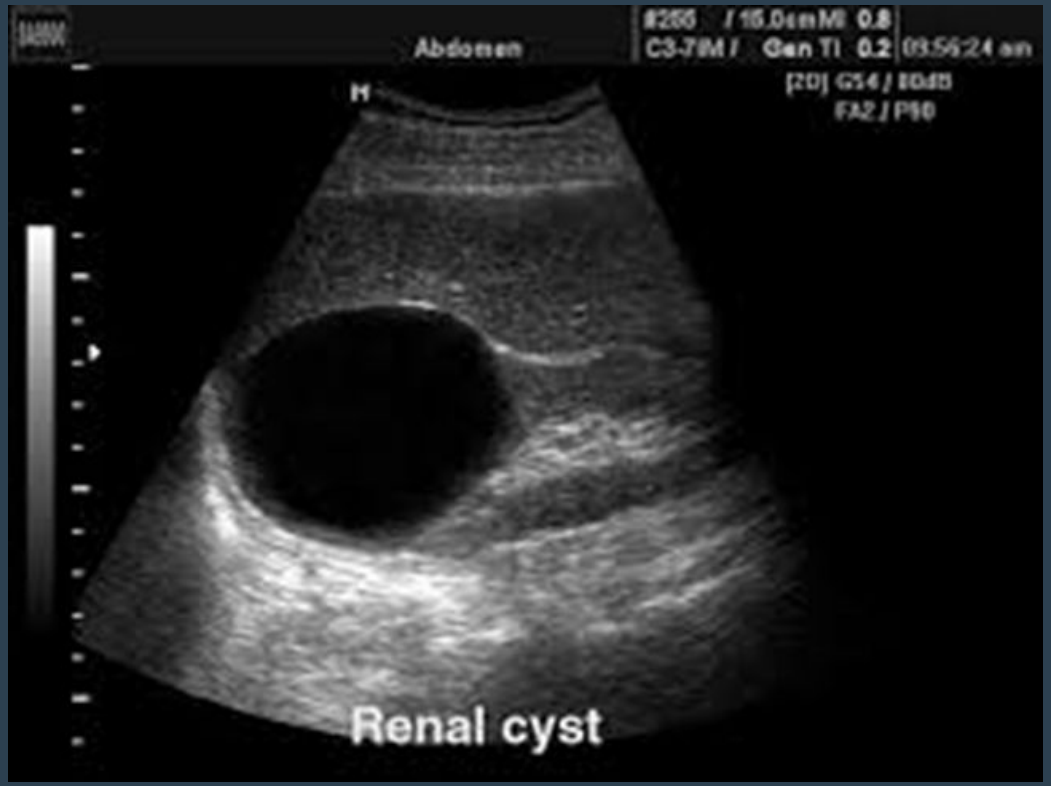
Sylvia A O'Keeffe et al. BMJ 2008;337:bmj.a260

thebmj

Mass.

Describe what you see

Describe what you see



Simple renal Cyst occupying upper pole of kidney

Describe what you see

Describe what you see

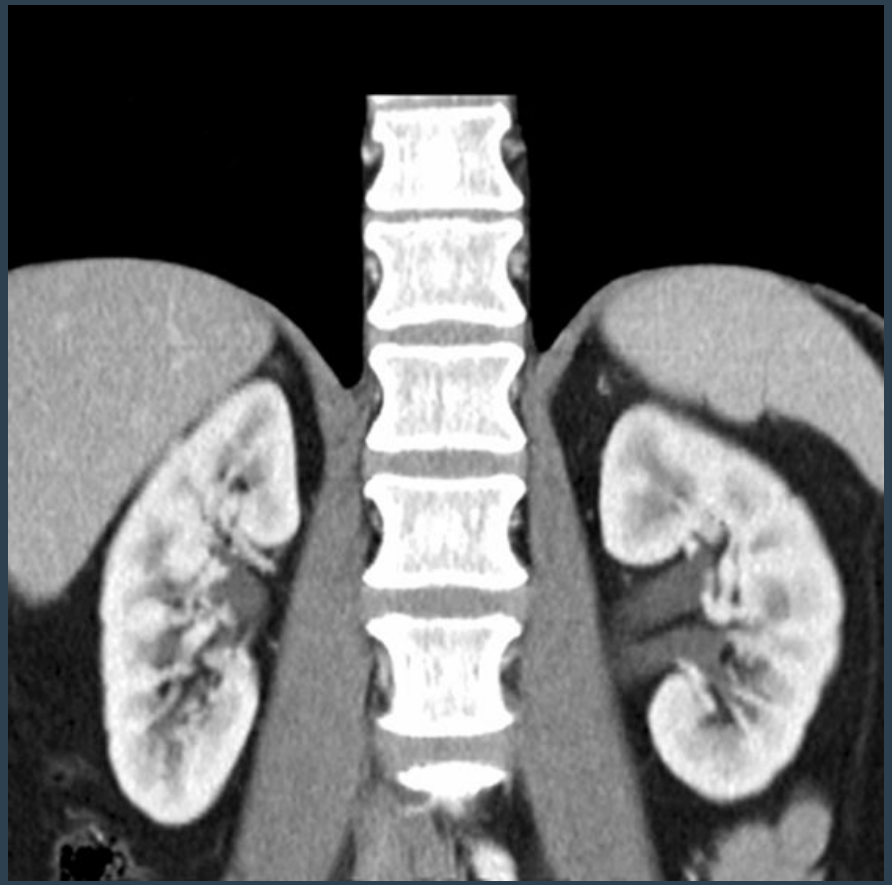
1. Multiple renal cysts.

Describe what you see

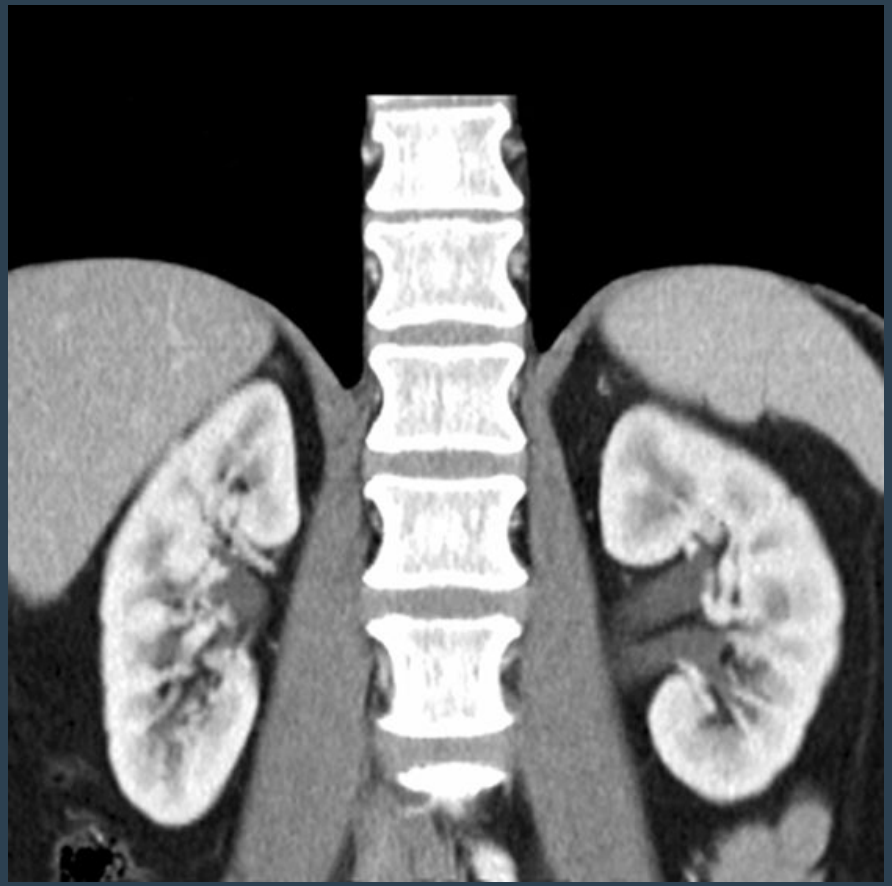
Describe what you see

- Normal kidneys in CT scan with contrast in Excretory phase

Describe what you see



Describe what you see



- Coronal CT with contrast in corticomedullary phase

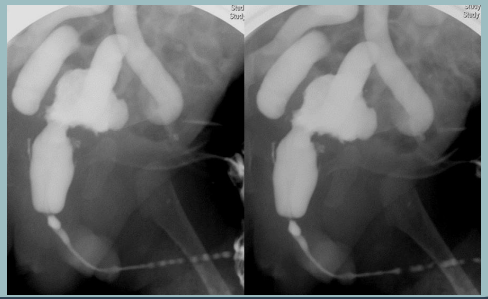
Quiz

1- Young Adult presented with right loin pain and microscopic hematuria. Ultrasound Exam was performed. Which of the following is the likely finding?

a. Hydronephrosis.
b. Normal.
c. Renal mass.
d. Upper pole renal stone.

2-One month old boy with recurrent UTI. What type of imaging is this?

a. Intravenous urography (IVU)
b. CT with IV contrast.
c. Voiding cystourethrogram.
d. Scintigraphy.



3-What is the most likely diagnosis?

a. Pyelonephritis.
b. Renal adenocarcinoma.
c. Transitional cell carcinoma.
d. Angiomyolipoma.

Quiz

4- 67 y/o male patient came to ER with worsening hematuria. What is this exam?

a. KUB.
b. IVP.
c. CT: coronal section.
d. Scintigraphy.

5- 73 y/o female came with painless hematuria & general fatigue. What is the major finding?

a. Bosniak type II renal cyst.
b. Malignant tumor.
c. Focus of pyelonephritis.
d. Normal.

6- One of the following is a common site of urinary stone obstruction:

A- proximal ureter.
B- mid ureter.
C- junction of mid-distal ureter.
D- vesico-ureteric junction.

Answers

1)b
2)c
3)b
4)b
5)b
6)d