



Radiology Team

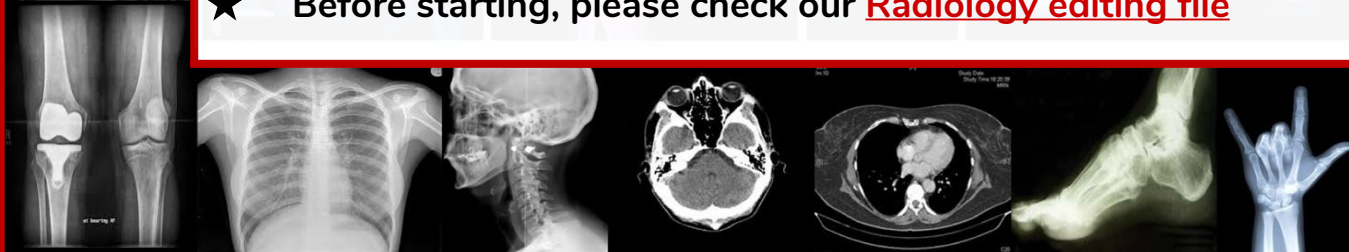
UROGENITAL TRACT IMAGING

Interactive session 2

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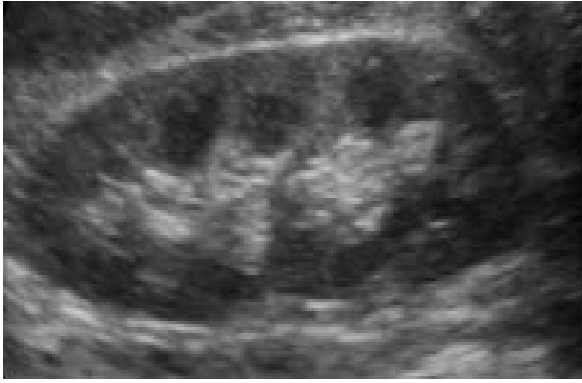
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Color Index:

- **Important**
- **Females' notes**
- **Males' notes**
- **Explanations**

Case 1



Young Adult presented with right loin pain and microscopic hematuria. Ultrasound Exam was performed.

Which of the following is the likely finding?

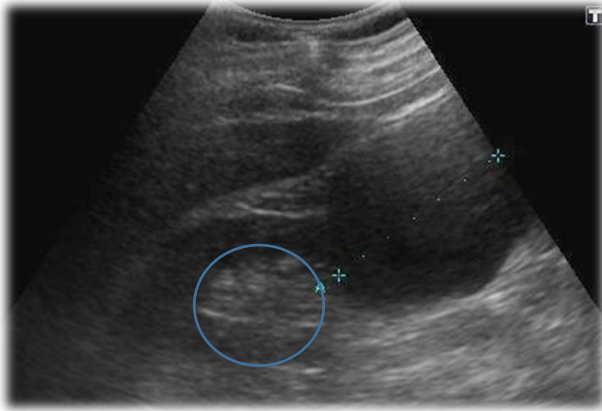
- a- Hydronephrosis
- b- Normal
- c- Renal mass
- d- Upper pole renal stone

NOTES:

- The cortex is normal and we can see the calyces (black) and there is no dilatation.
- There is good corticomedullary differentiation (we can tell that this is the cortex and this is the medulla)
- We can not diagnose microstructural diseases like glomerulonephritis or autoimmune disease using US because there will be no changes that will be clear and appear in US
- Normal US pic does not mean normal kidney but it means the the kidney has normal morphology
- Doppler US can detect the function of the kidney by detecting the blood flow

The correct answer is B

Case 2



Young Adult presented with right loin pain. Ultrasound Exam was performed.

Which of the following is the likely finding?

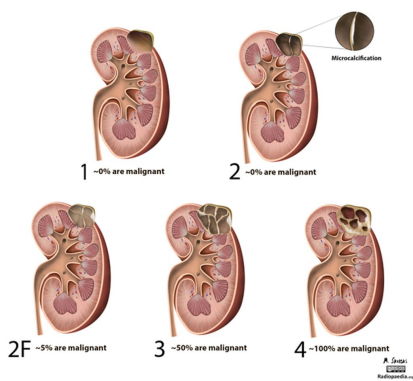
- a- Normal
- b- Hydronephrosis
- c- Renal cyst
- d- Lower pole renal stone

NOTES:

The correct answer is B

- Always in US if it is longitudinal section the upper pole is in the left and the right is in the right
- Any black circle and well demarcated ((منتظمة) 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
- Blue circle is the kidney
- This cyst is simple not complex
- When there is collection of fluid (like here) there will be enhancement below it

Bosniak classification of renal cysts



In a CT image we can see right kidney cyst with a cortex enhanced by a contrast

Why we can't see the left kidney?

Because the left kidney is in an upper level compared to right kidney

As a medical student we only have to know simple cyst (type 1), the other types are advanced.

Case 3

29 y/o female presented to the ER c/o sudden acute left flank pain radiated to the groin associated with hematuria

1-What is the name of the exam presented?

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

2-What is the major finding?

- a- Renal mass
- b- Renal cyst
- c- Renal stone
- d- Renal hemorrhage



NOTES:

The correct answer is 1-B, 2-C

- 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.



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



The stone is in the left kidney in ureteropelvic junction (common site), with a clear obstruction



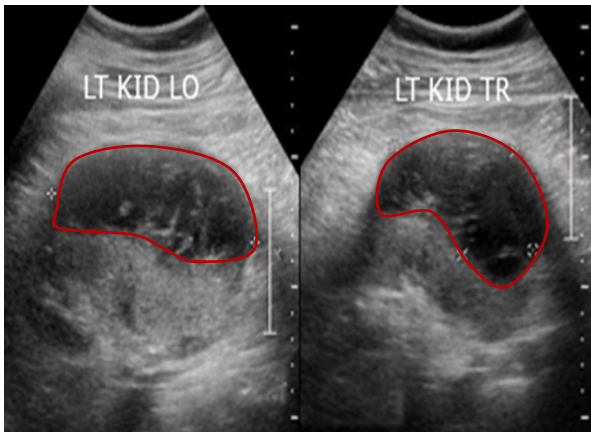
Staghorn stone filling more than 2 calyces

Case 4

36 y/o male presented to the ER c/o acute sudden left flank pain radiated to the groin associated with hematuria post RTA. US was performed.

What is the major finding?

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



NOTES:

The correct answer is D

- Always you have to correlate with the clinical scenario
- The red line in the US image represent the hemorrhage
- The blood is the hypoechoic part because it is fresh blood, if it is coagulated it will be heterogeneous and hyperechoic



CT with contrast showing **SUBCAPSULAR RENAL HAEMATOMA**

We use the contrast to know if there is extravasation of active hemorrhage

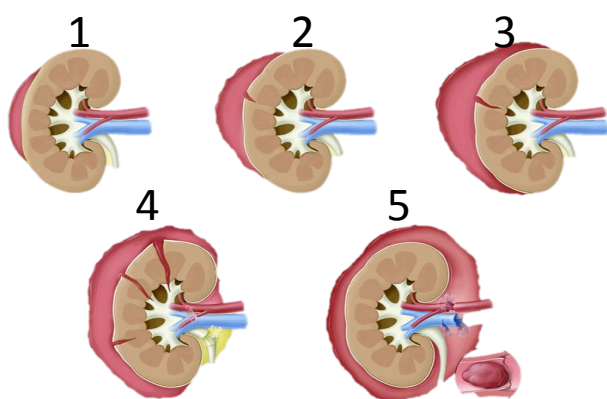
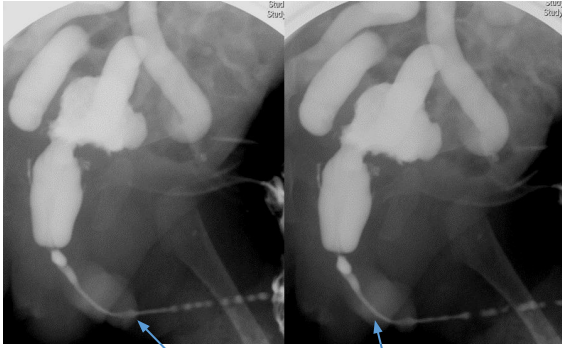


Table 11. Renal Injury Grades

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

Case 5

Dilated ureters



catheter

One month old boy with recurrent UTI.

1-What type of imaging is this?

- a- Intravenous urography (IVU)
- b- CT with IV contrast
- c- Voiding cystourethrogram
- d- scintigraphy

2-What is the abnormality seen?

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

NOTES:

The correct answer is 1-C, 2-D

- Voiding cystourethrogram is used in pediatric age group when recurrent UTI is suspected because of Vesicoureteric reflux
- There are 5 grades of Vesicoureteric reflux
- The bladder looks small because it will not store any urine, there will be reflux of urine.
- The urine might reach to the pelvis that may cause hydronephrosis
- The reflux can be unilateral or bilateral, and in this image it will be bilateral

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.

1-What is this imaging modality?

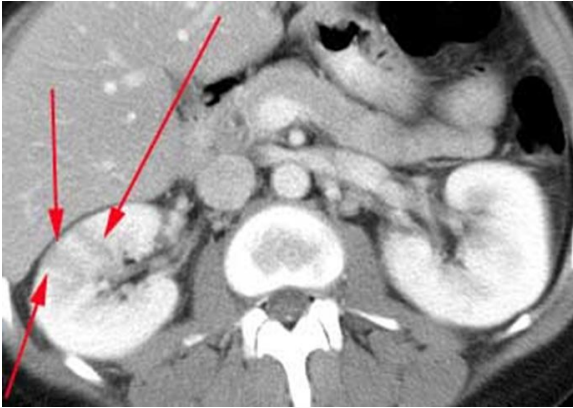
- a- MRI with contrast
- b- MRI without contrast
- c- CT with contrast
- d- CT without contrast

2-How do you describe this abnormality?

- A- cortical mass
- B- pelvicalicial dilatation
- C- hypo perfused lesion
- D- perirenal hematoma

3-What is the most likely diagnosis?

- A- renal carcinoma
- B- pyelonephritis
- C- type I cyst
- D- traumatic lesion



NOTES:

The correct answer is 1-C, 2-C, 3-B

- It is CT with contrast because the kidney is brighter than the liver and you can see the contrast in the liver
- It is clear that part of the right kidney is gray which is hypo perfused
- Pregnancy has a mass effect on the kidney which will cause stasis of urine that lead to pyelonephritis

Case 7

76 y/o smoker male patient presented with painless hematuria and weight loss.

How do you describe this lesion?

ANS: Heterogeneous mass with some areas showing hypoattenuating areas and other areas hyperattenuating, vascularizing heterogeneous way

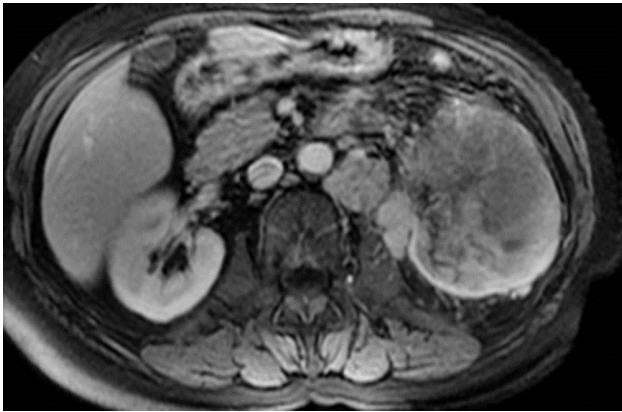
What is the most likely diagnosis?

A- pyelonephritis

B- renal adenocarcinoma

C- transitional cell carcinoma

D- angiomyolipoma

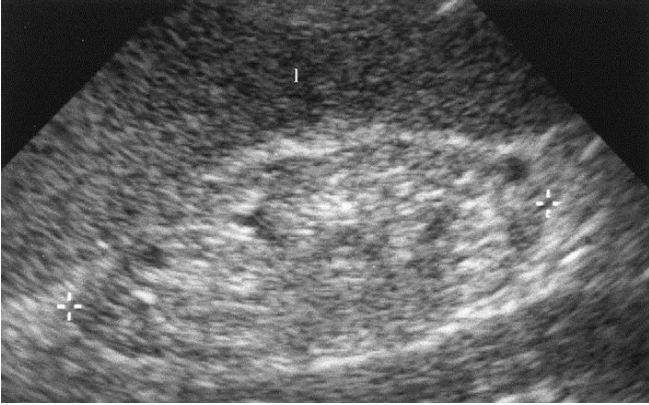


NOTES:

The correct answer is B

- The hyperattenuating areas are the areas that take the contrast
- The hypoattenuating areas are the areas of necrosis and ischemia
- The area that is bright in the left kidney is the area of normal kidney cortex that is enhanced by contrast
- **Why not transitional cell carcinoma (TCC)?** TCC is mostly localized in the bladder, ureter and maybe renal pelvis (collecting system)
- **Why not angiomyolipoma ?** Always correlate with the clinical scenario the presentation of this patient is most likely goes with TCC

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 $\mu\text{mol/L}$.

What does US show?

- A- normal kidney
- B- hypoechoic kidney
- C- atrophic undifferentiated kidney
- D- atrophic kidney with normal cortico-medullary differentiation

NOTES:

The correct answer is C

- Here we can not differentiate cortex from medulla from collecting system all appears as one mass
- There is no dilatation of the cavities (collecting system)

- This is US image of normal kidney, we can see differentiated cortex so we can see it clearly and the borders are well delineated, we can see the collecting system (hyper echogenic) and the pyramid is clear.
- If a patient came with the same presenting symptoms but with normal kidney US, **is it kidney failure or not?** Normal US image does not exclude kidney failure because the US does not examine the kidney function, only morphology. So it is possible to see normal kidney image in renal failure patients.



Case 9



67 y/o male patient came to ER with worsening hematuria.

1- What is this exam?

- A- KUB
- B- IVP
- C- CT: coronal section
- D- scintigraphy

2- What is the major finding?

- A- normal
- B- left pelvicalical dilatation
- C- right ureteral dilatation
- D- filling defect in urinary bladder

NOTES:

The correct answer is 1-B, 2-D

- This is IVP because we can see the contrast filling the ureters, kidney and bladder
- There is filling defect in urinary bladder because the contrast is not enhancing the whole bladder



US shows bladder mass.

Could this be blood clot? Yes it could be blood clot, the only way that we can differentiate between blood clot and tumor in a US image is that the blood clot can move to other place but the tumor don't.

Case 10

73 y/o female came with painless hematuria & general fatigue

1- What is the major finding?

- A- Bosniak type II renal cyst
- B- malignant tumor
- C- focus of pyelonephritis
- D- normal

2- What other secondary finding do you observe?

- A- perirenal hemorrhage
- B- mass effect on pancreas
- C- renal vein filling defect
- D- pelvicalical dilatation



NOTES:

The correct answer is 1-B, 2-C

- It is impossible to be type II renal cyst because this one is thickened with multiple septations and taking the contrast, type II should be thin and doesn't take the contrast so the answer will be malignant tumor (type 4)
- It is anterior cortical mass in the left kidney with thickened wall and multiple septations and multiple hypo densities that might reflect a collection (maybe necrotic) and is taking a contrast in heterogeneous way
- There is no mass effect in adjacent structures
- We should look for other abnormality to know the staging of the tumor that might change our management, because some tumors when they metastasize we don't resect it

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?

ANS: Well circumscribed homogeneous hypo density in the right kidney and the walls well defined and thickened and taking the contrast, other than that lesion the cortex is normal.

What is the most likely diagnosis in the right kidney?

- A- pyelonephritis
- B- renal abscess
- C- simple cyst
- D- pelvicalicial dilatation

NOTES:

The correct answer is B

- In the left kidney normal cyst
- There is fat stranding and secondary inflammatory reaction to this abscess (thick wall abscess)
- Always correlate with the presenting symptoms when solving MCQs!

MCQs

1- 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

2- 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

3- 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

4- One of the following is an absolute contraindication for MRI:

- A- claustrophobia
- B- cardiac pacemaker
- C- pregnancy
- D- uncontrollable movement

Answer: 1-B, 2-D, 3-B, 4-B