



Radiology of Urinary System Diseases

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Objectives

To know the principle disease entities of the urinary system organs and how they look in imaging

To correlate the clinical manifestations with radiological images

Categories:

- Renal Colic
- Infections
- Urosepsis
- Masses
- Renal Failure
- Trauma

Renal Colic

- Caused by renal calculi
- *Classic presentation*: (sudden onset of severe flank pain radiating inferiorly and anteriorly +/- nausea and vomiting)
- *Diagnosis often made clinically*

Imaging: to confirm and evaluate calculi



Renal Colic

- ◆ Questions to ask:
 - Are urinary stones present?
 - If so, what is the level and size?
 - Are obstructions present?
 - If so, what is the level and severity?
 - Is urgent intervention required?
 - Factors include: urosepsis, solitary kidney, severe pain

Treatment: percutaneous nephrostomy or ureteric stent

Renal Calculi



KUB: to assess total stone burden, size, shape, location

Often: US or CT is required in conjunction

Microscopic Hematuria Bladder Calculi



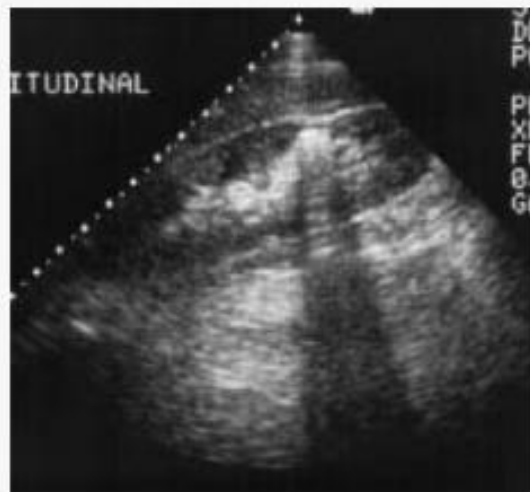
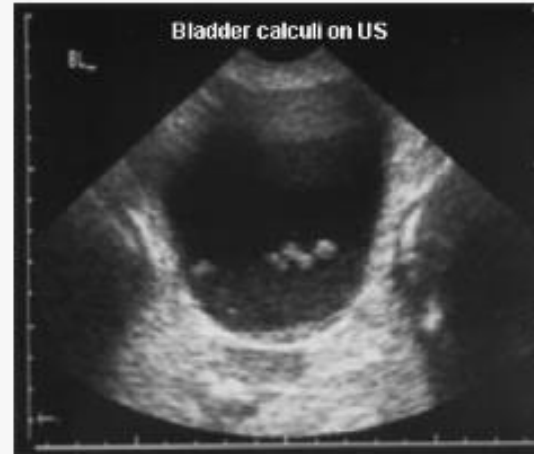


Renal Colic

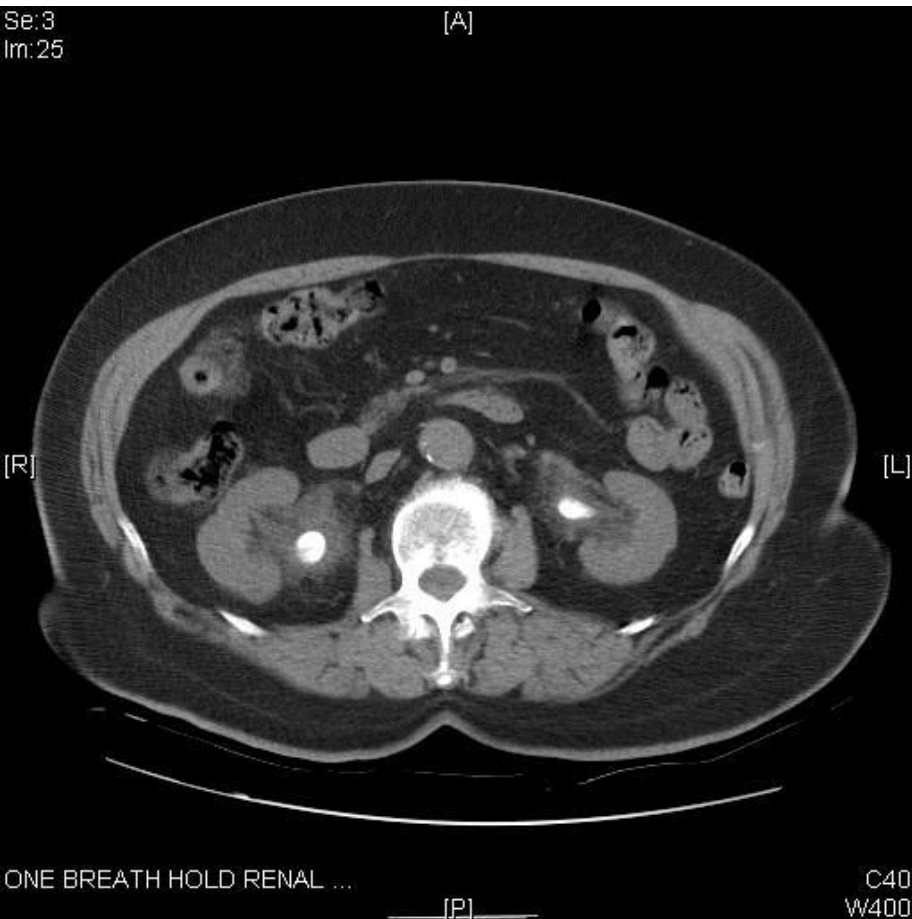


Radiolucent uric acid stones

Renal Calculus - US



Renal Calculus– CT Scan



Acute Pyelonephritis

- Life threatening infection & medical emergency
- Through lower urinary tract
- Early diagnosis and management has significant impact on patient outcome
- Presentation: (Fever, loin pain, nausea/vomiting)



Pyelonephritis: Wedge shaped hypoperfused lesion

Cystitis

- Presentation: (Fever, suprapubic pain, frequent urination)
- As upper UTI, more common in females

General

M

[2D] G75 / 80dB

FA2 / P90



Bladder Chronic Cystitis





Urosepsis

- ◆ Establish a clinical diagnosis:
pyelonephritis, cystitis, prostatitis
- ◆ Urosepsis and an obstructed ureter is a **urologic emergency!**
- ◆ Renal US performed to rule out:
 - Renal obstruction
 - Renal or perirenal abscess

Urosepsis



Left pyonephrosis



Right UPJ stone causing hydronephrosis



Approach to Renal Masses

- ◆ Most renal masses are simple cysts
- ◆ Use US to characterize the mass
 - simple cyst : STOP
 - solid mass or atypical cyst: CT
- ◆ US and CT characterize > 90% of masses > 1.5 cm
- ◆ Biopsy is rarely warranted

Renal Cysts

- US will determine if the lesion is cystic or solid
- 2 Types of Renal Cysts:
 - 1) Simple: spherical, echo-free fluid collection within a thin surrounding wall and will show good sound wave transmission
 - 2) Complicated: will show the presence of echos within the cyst, will have a thick wall, and/or show calcification in the wall



Renal Mass



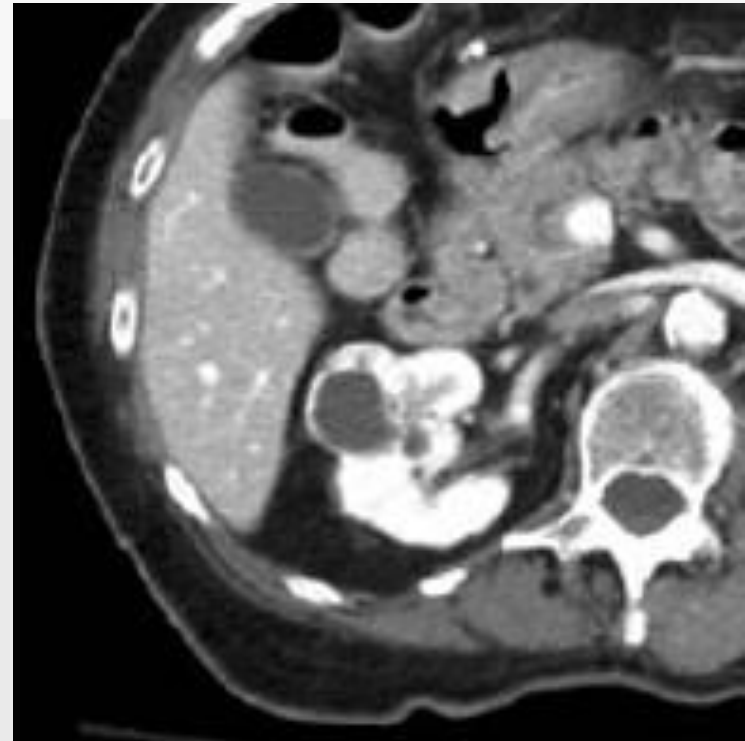
Left renal mass on IVP



Simple cyst on ultrasound

Renal Carcinoma

- if US indicates that the mass is solid, CT with IV contrast can characterize the tumour in greater detail – delineate extent, show the degree of vascularity, presence/absence of necrotic centre, presence/absence of local invasion of adjacent structures

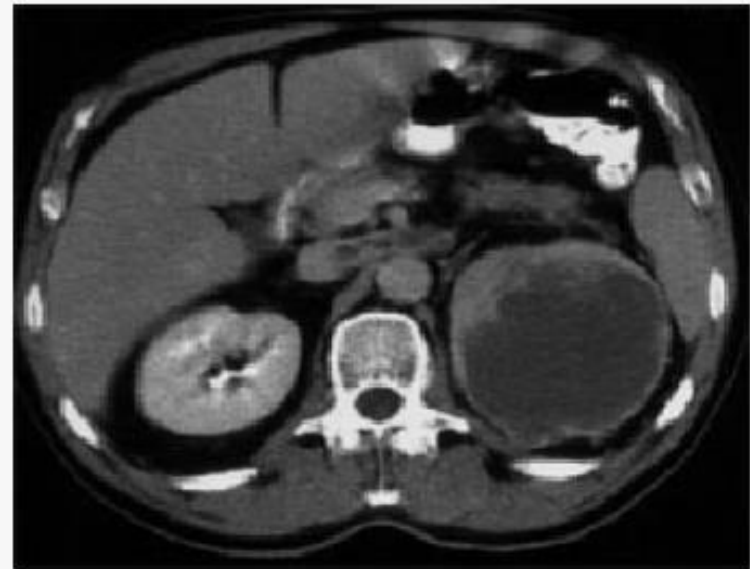


Renal Mass



Distortion of left pelvicalyceal system in IVP

Renal Mass



Solid left renal mass in a patient with micro hematuria

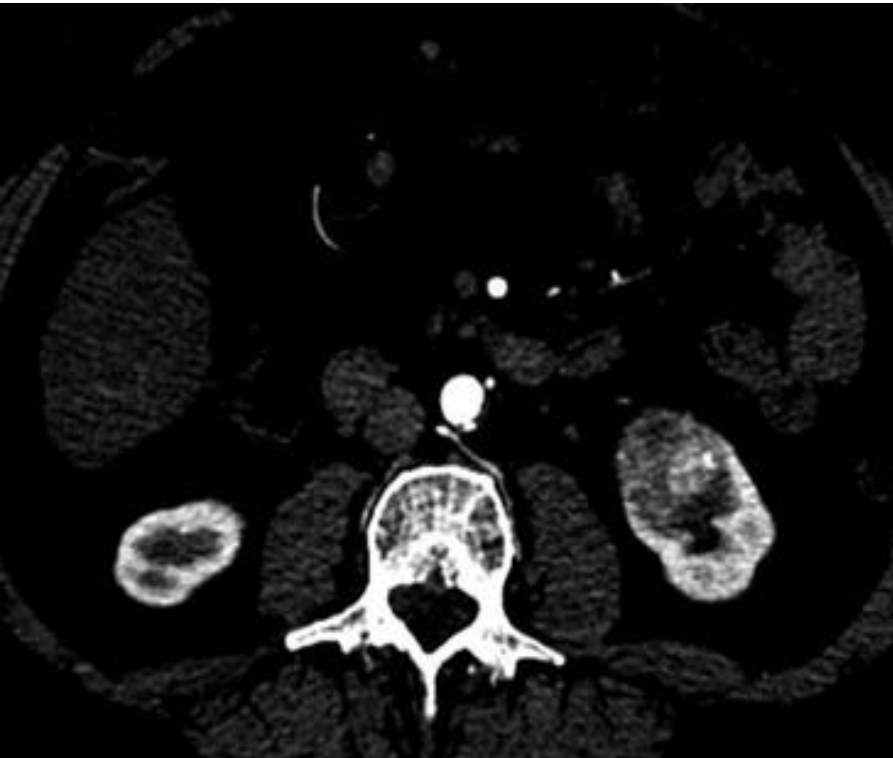


Renal Mass

Renal Adenocarcinoma

- ◆ 90% of all renal malignancies
- ◆ 15-30% metastatic at diagnosis
- ◆ Hematogenous and lymphatic spread
- ◆ 10% have venous invasion (renal vein or IVC)
- ◆ Treatment:
 - Radical nephrectomy
 - Partial nephrectomy

70 y/o female presented with painless hematuria

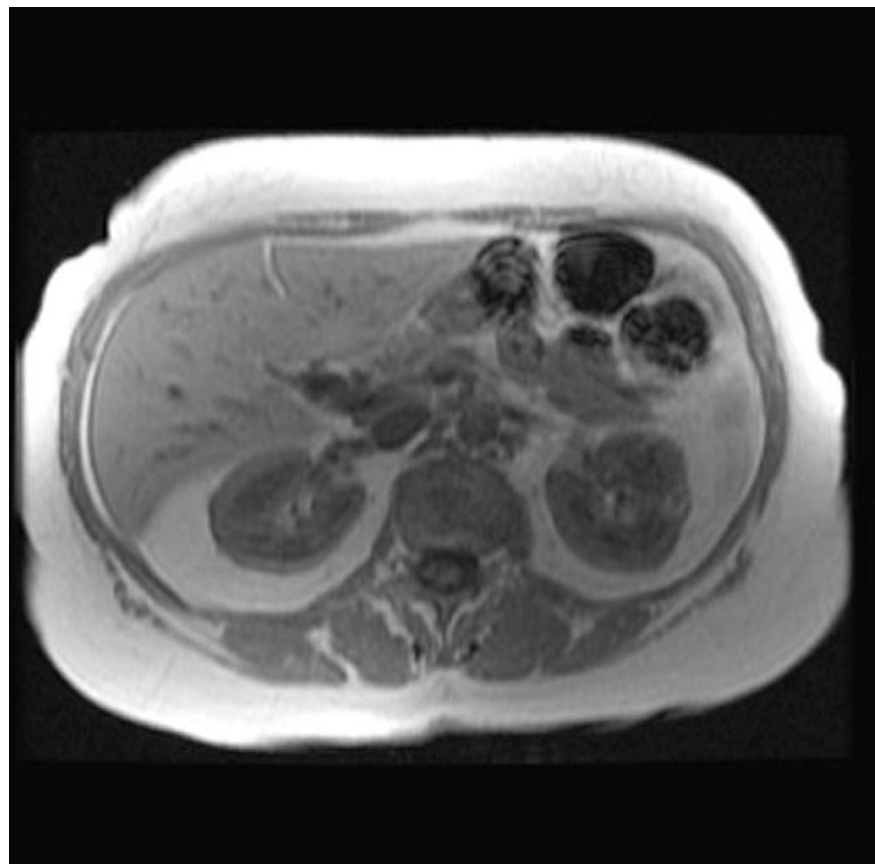
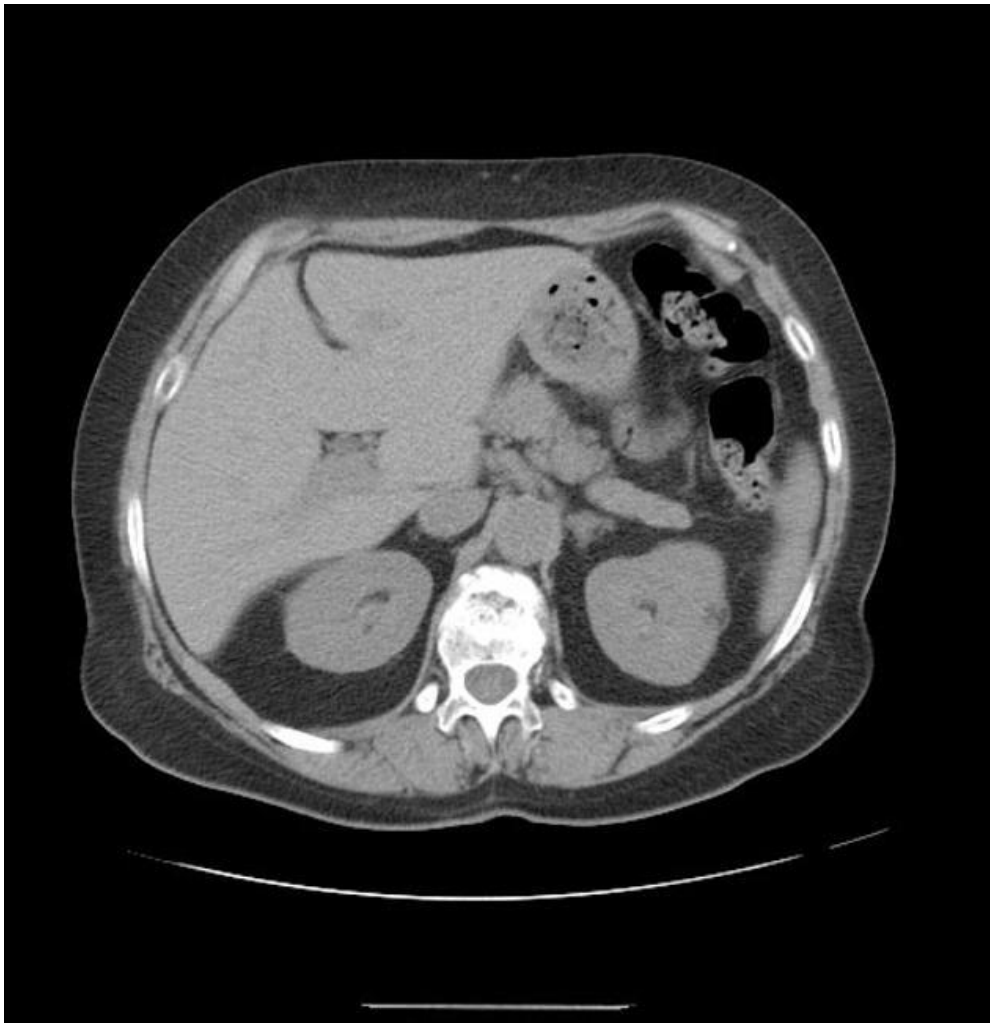




Renal Mass

Renal Angiomyolipoma

- ◆ Benign hamartomatous tumour comprised of fat, smooth muscle and vessels
- ◆ Usually asymptomatic
- ◆ Occasionally present with hemorrhage when large or multiple
- ◆ Fat detected in 96% by CT





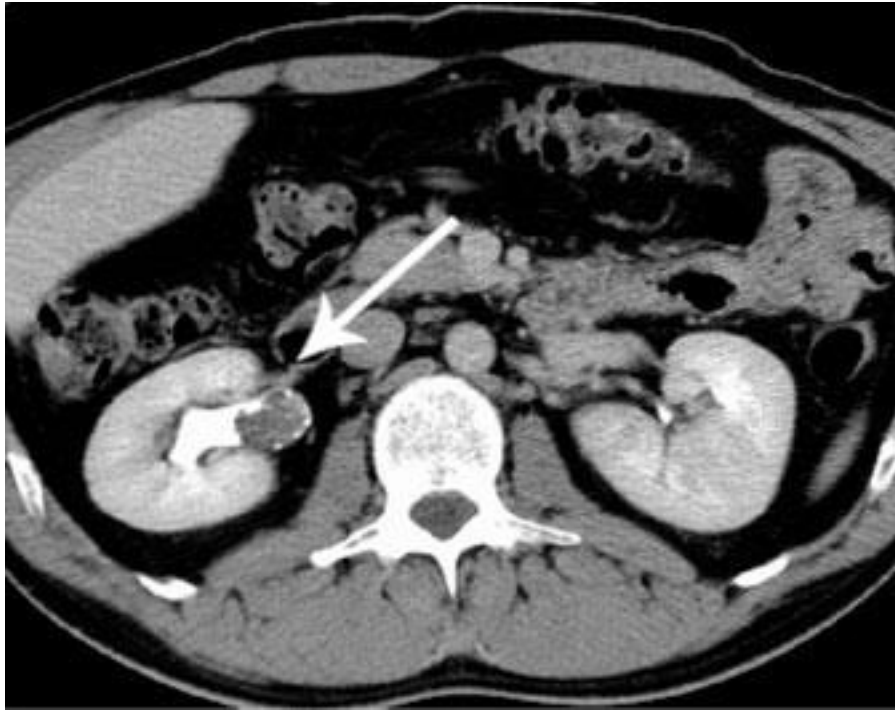
Transitional Cell Carcinoma

- ◆ Most common malignancy of ureter and bladder
- ◆ <10% of renal malignancies
- ◆ Typically present with gross hematuria
- ◆ CT for staging and surgical planning
- ◆ Treatment: radical nephrectomy

Transitional Cell Carcinoma



IVP and retrograde pyelogram TCC proximal left ureter



Transitional Cell Carcinoma



Small TCC of bladder in patient with hematuria



Acute and Chronic Renal Failure

- ◆ Clinical categories
 - Prerenal (dehydration, shock, cardiac failure)
 - Renal (parenchyma, diabetes, GN, drugs, renovascular)
 - Postrenal (obstruction)

- ◆ IV contrast **contraindicated** if creatinine > 200 mmol/d

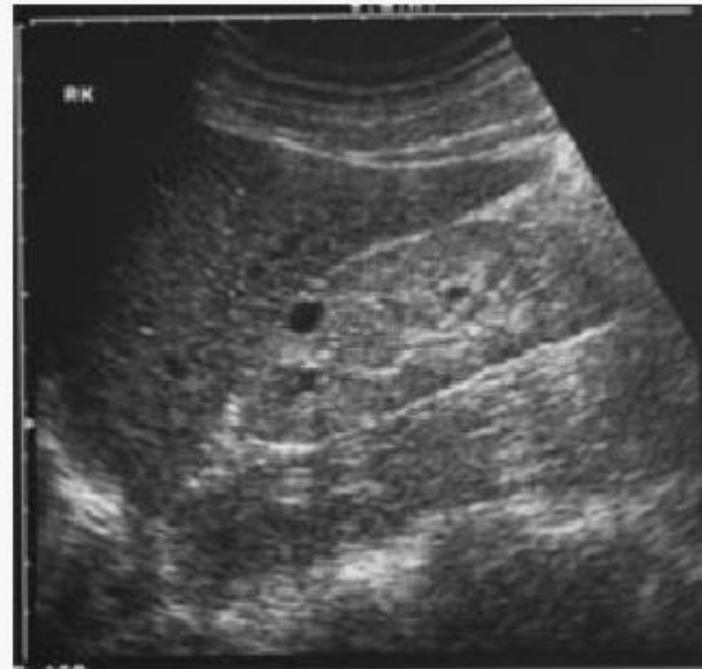
- ◆ Use ultrasound to assess:
 - Renal size
 - Parenchymal thickness

- ◆ Ultrasound guided renal biopsy to establish diagnosis

Acute and Chronic Renal Failure



Hydronephrosis post-renal



Atrophic, echogenic kidney
Medical renal disease



GU Trauma

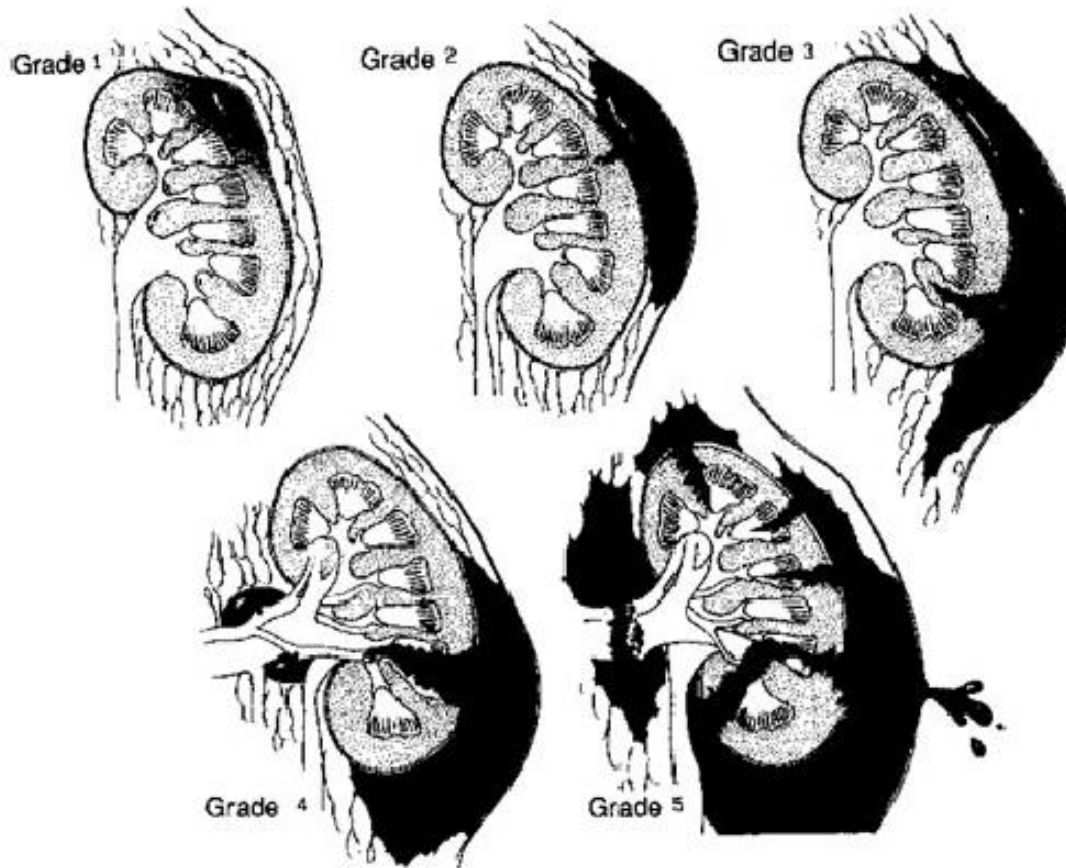
Penetrating trauma (gunshot, stab)

- ◆ Unstable
 - Surgery or angiography

- ◆ Stable
 - CT

GU Trauma

RADIOGRAPHIC ASSESSMENT OF RENAL TRAUMA





Grade 1-2 injury



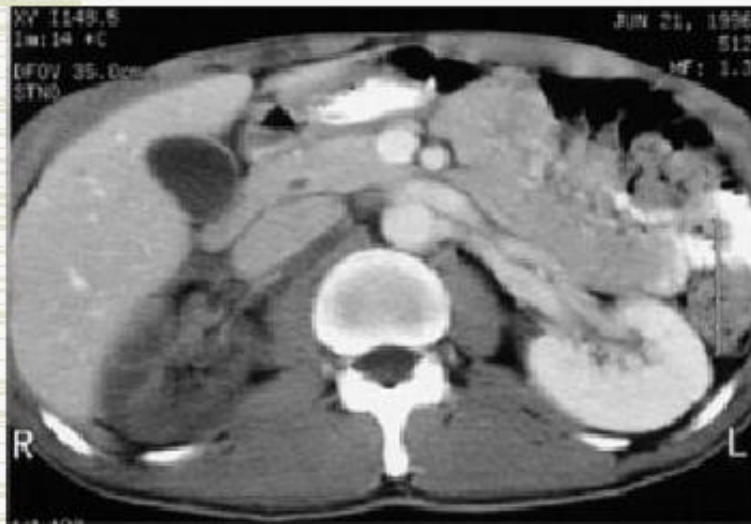
Grade 3 injury

GU Trauma



Grade 4 injury: deep lacerations with perirenal hemorrhage

GU Trauma



Grade 5 injury: thrombosed renal artery

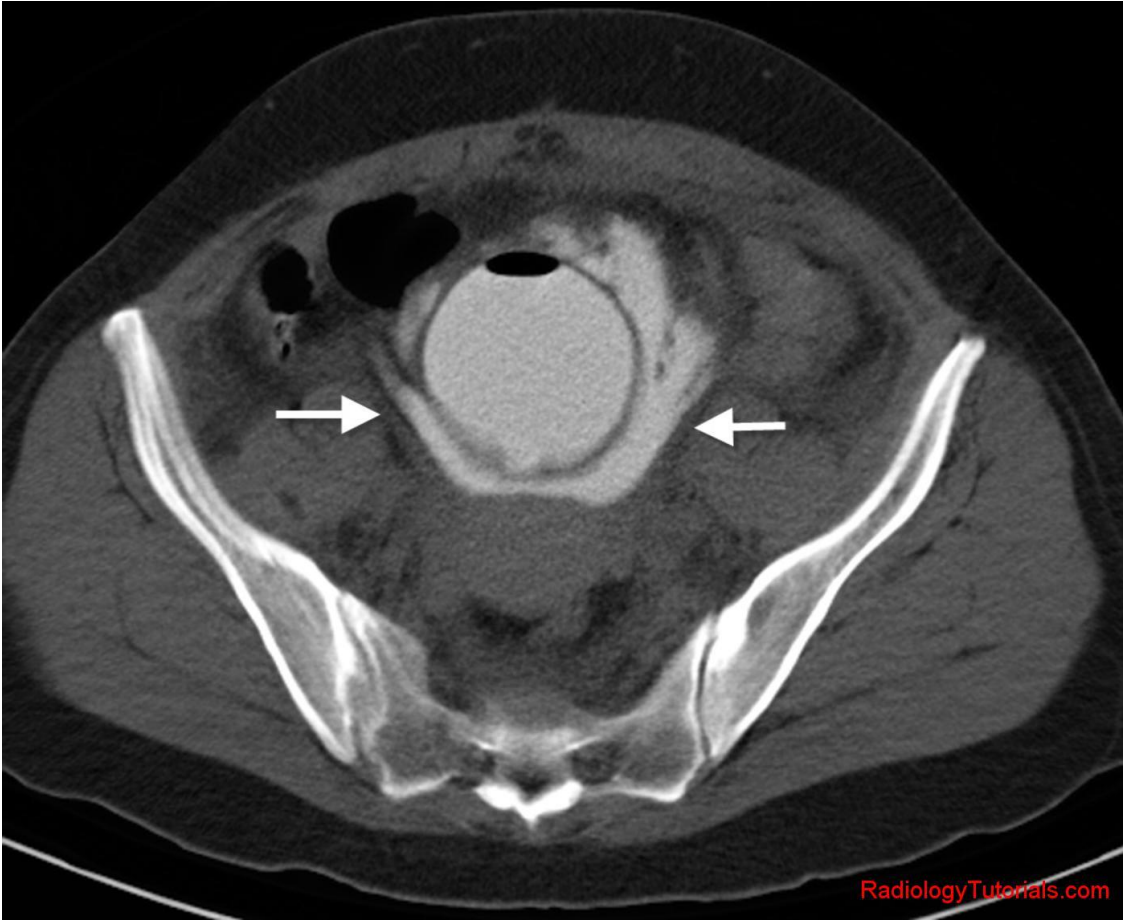
GU Trauma



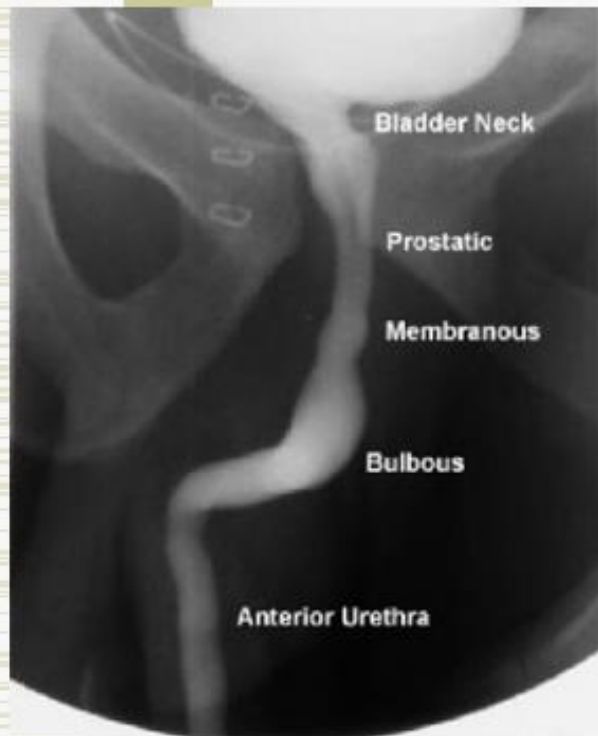
Extraperitoneal bladder rupture



Intraperitoneal bladder rupture



GU Trauma



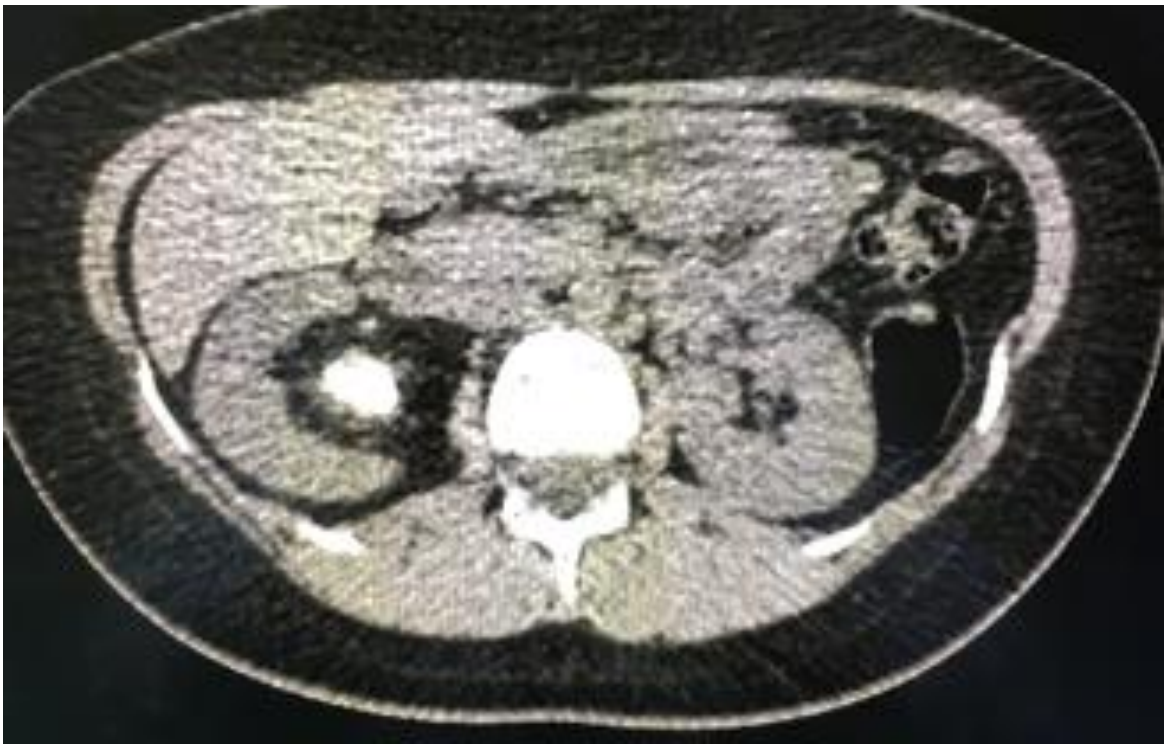
Normal retrograde urethrogram

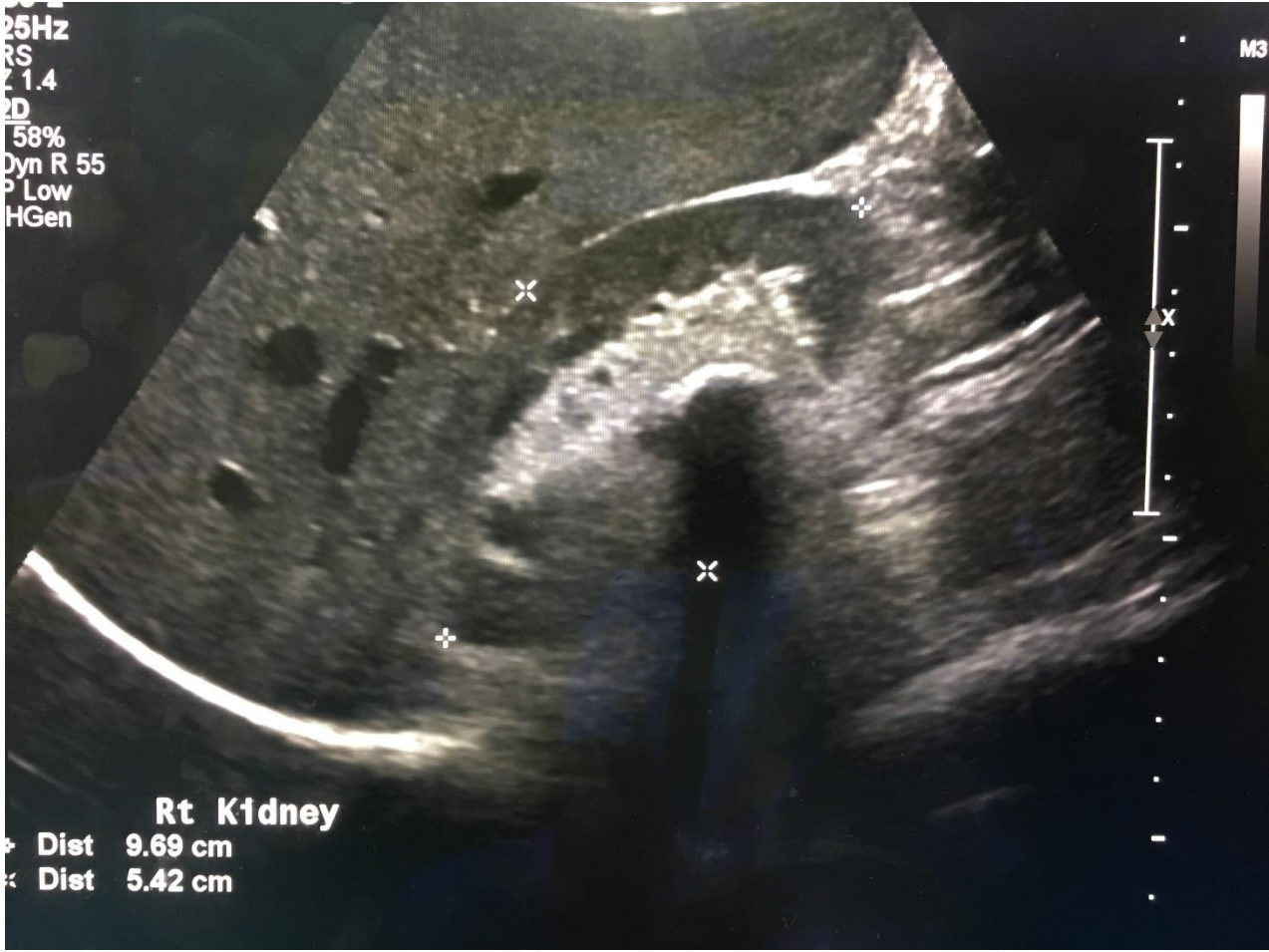


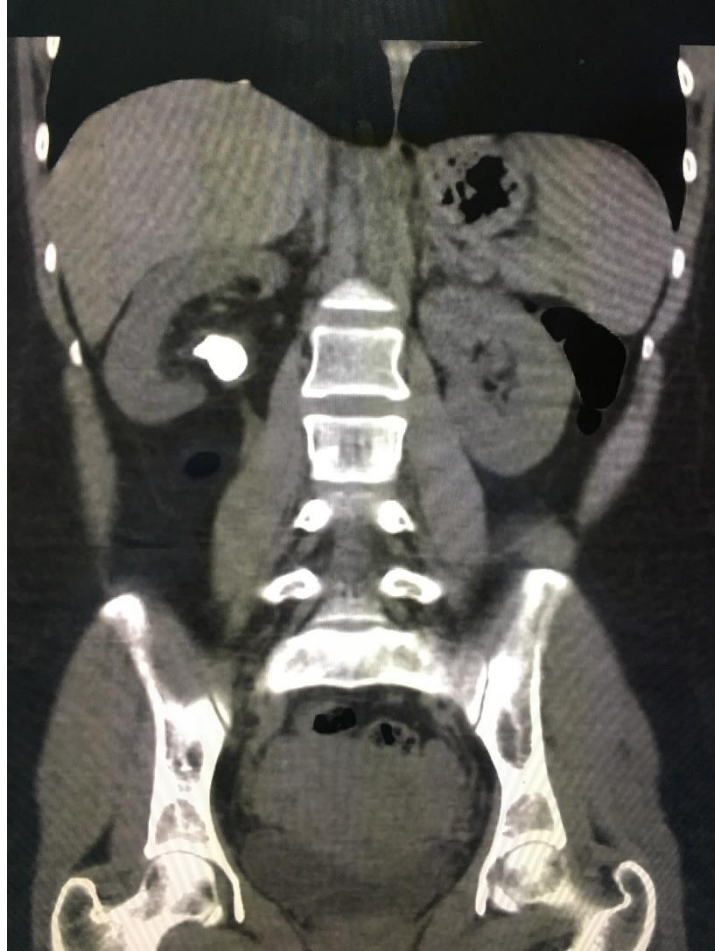
Traumatic rupture of bulbous urethra

Spot Diagnoses









F G G 70%
D 15 cm XV 1
PRC 15-3-L PRS 3
PST 3

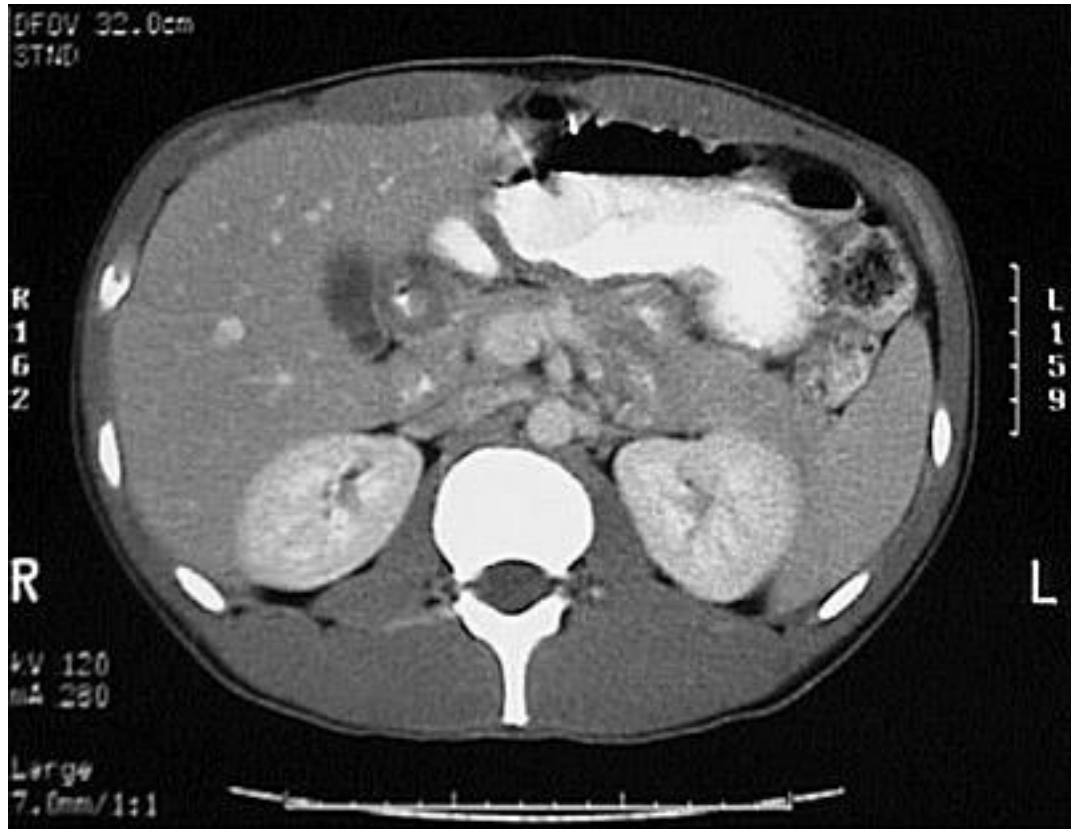


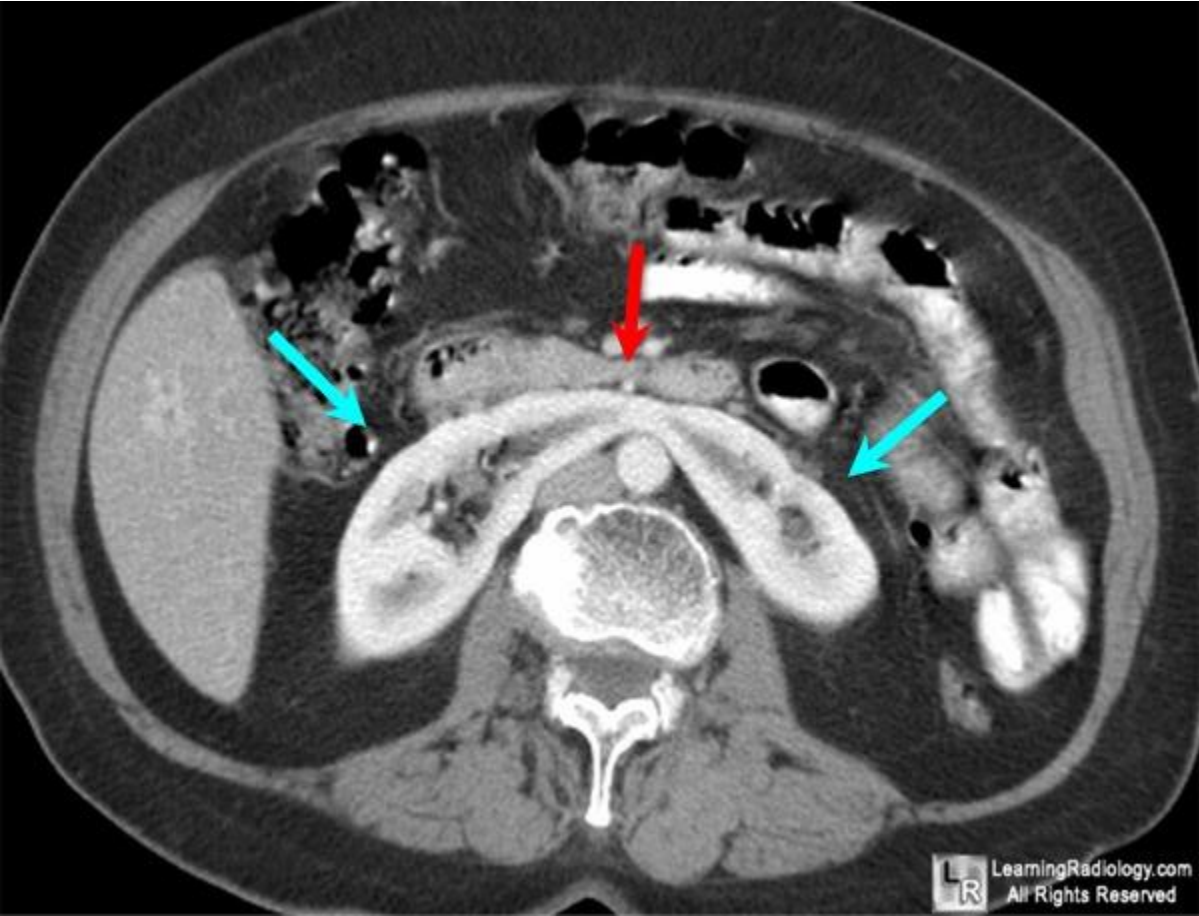




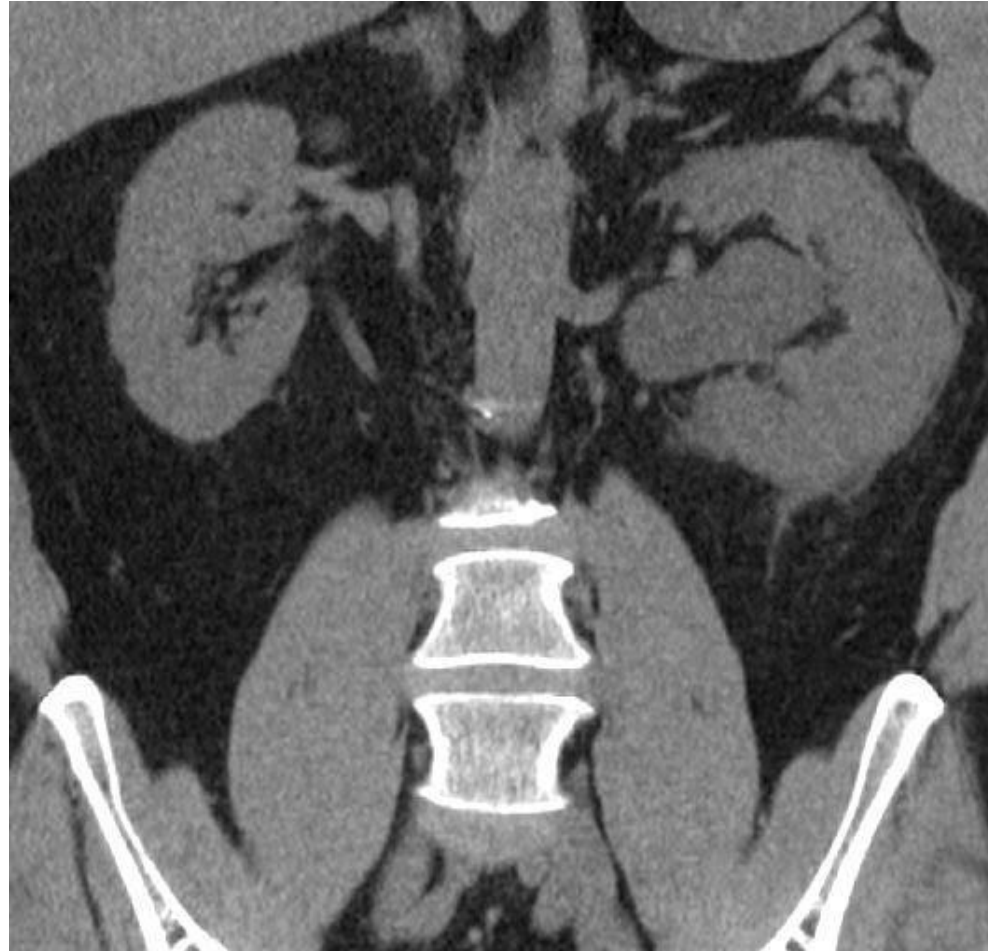


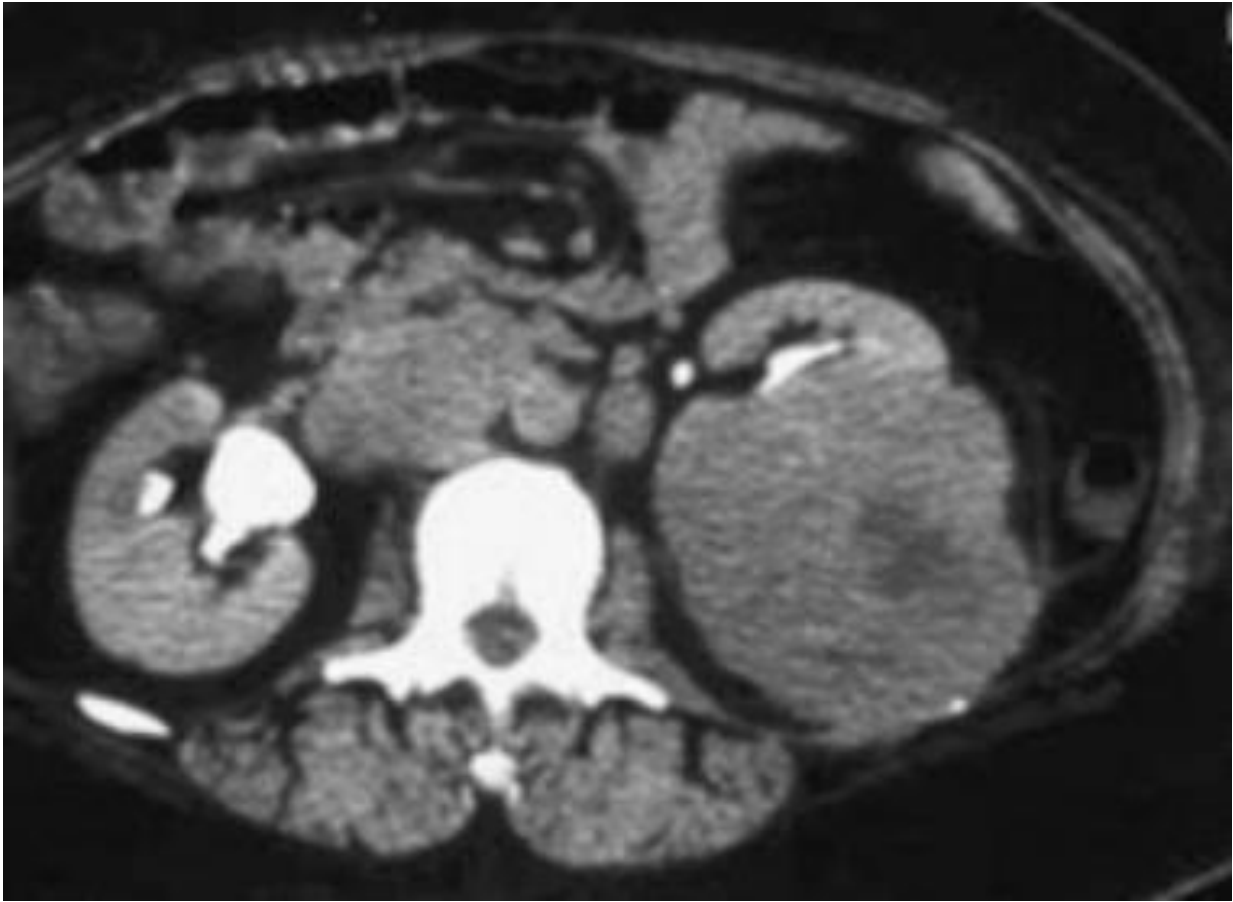


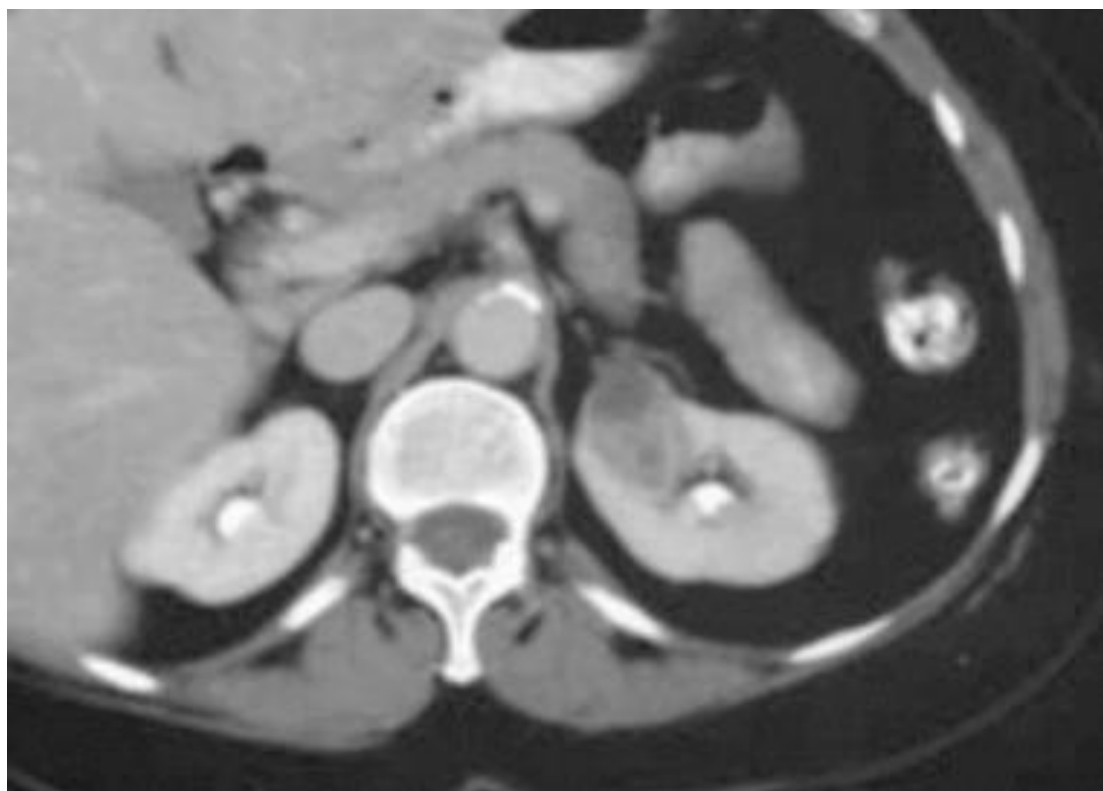










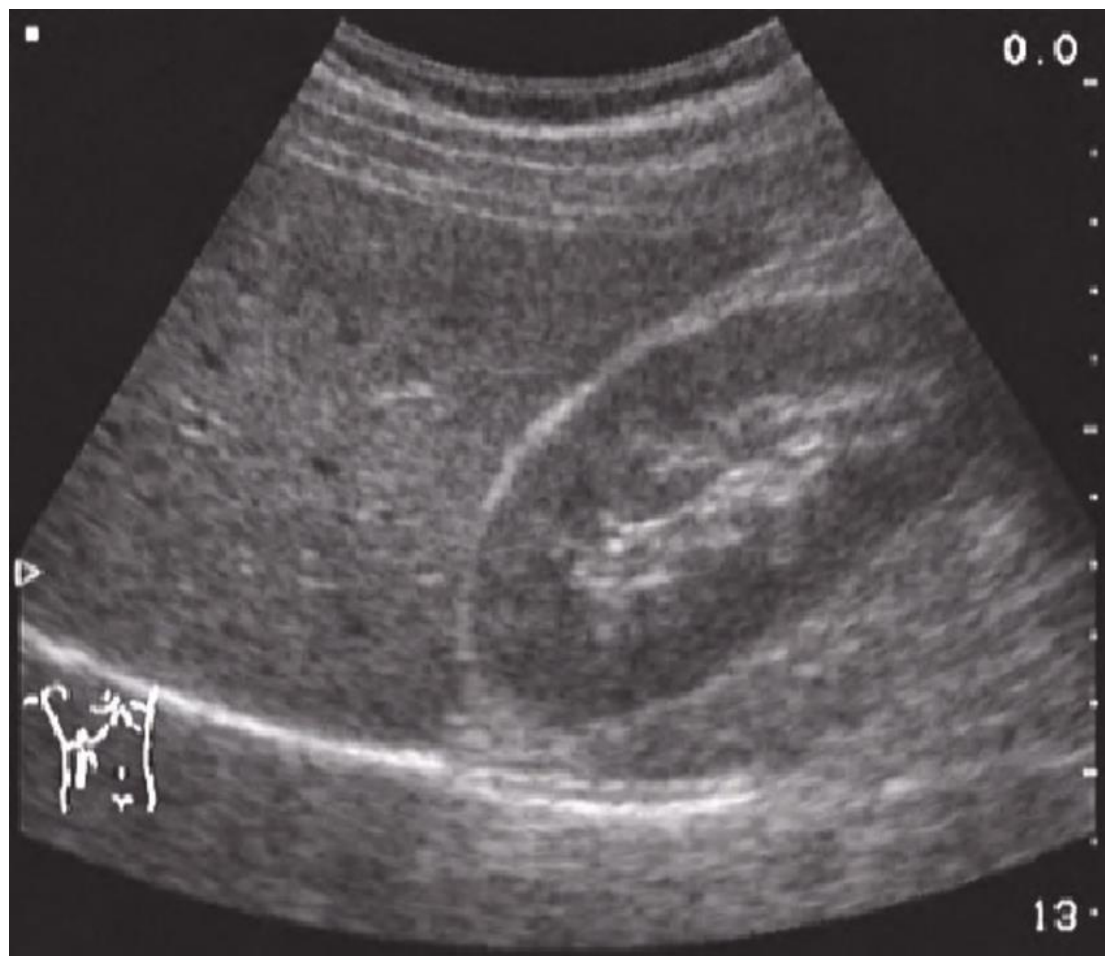






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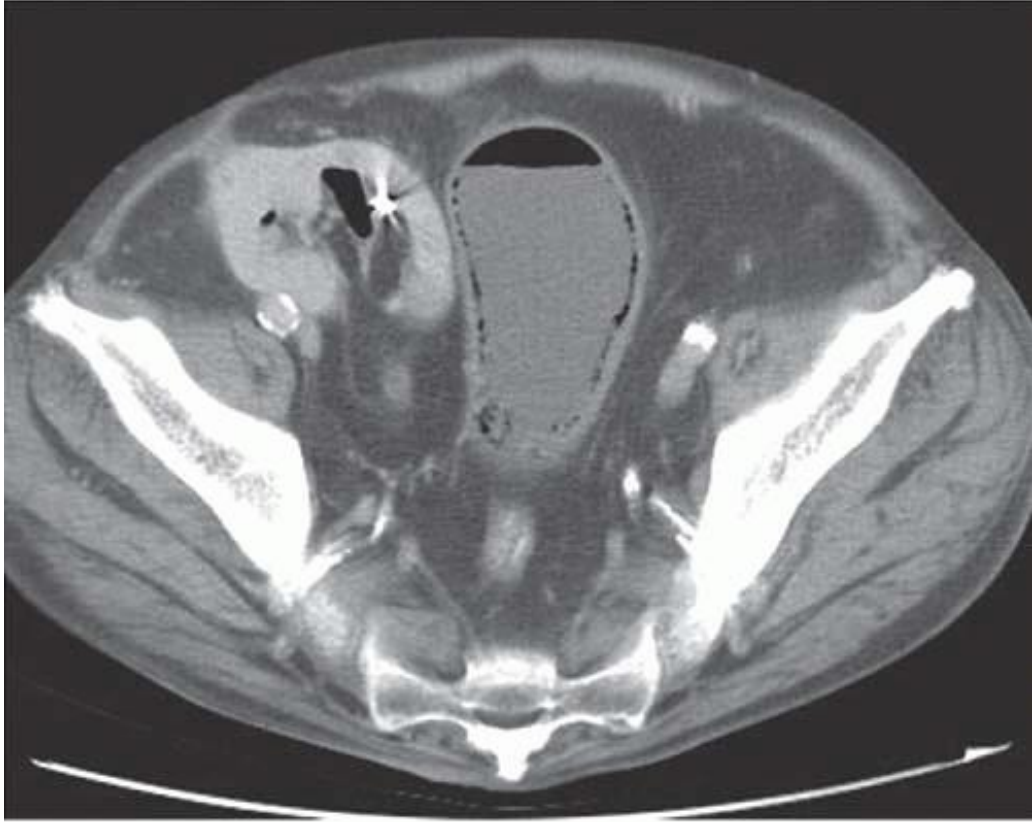


H: 40 %

F: 30 %













Thank you