



# 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





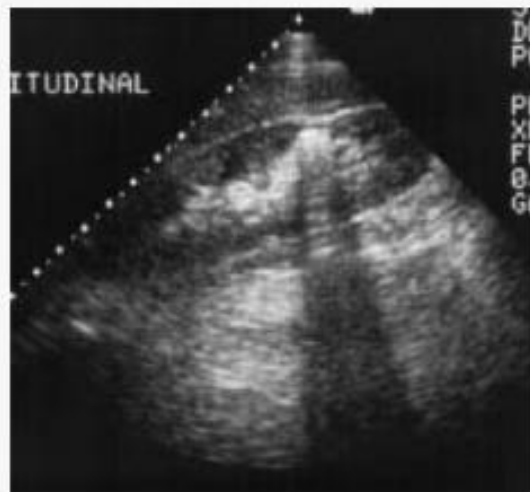
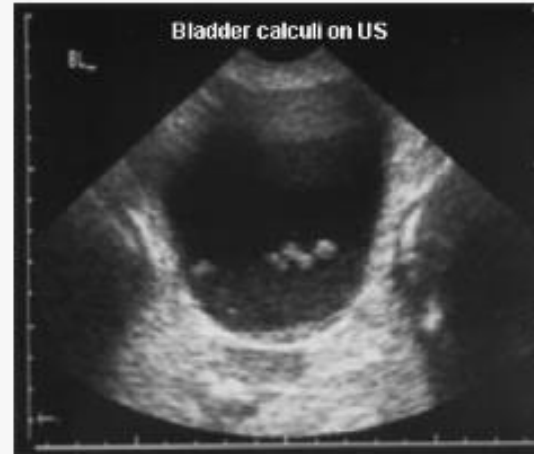


# Renal Colic

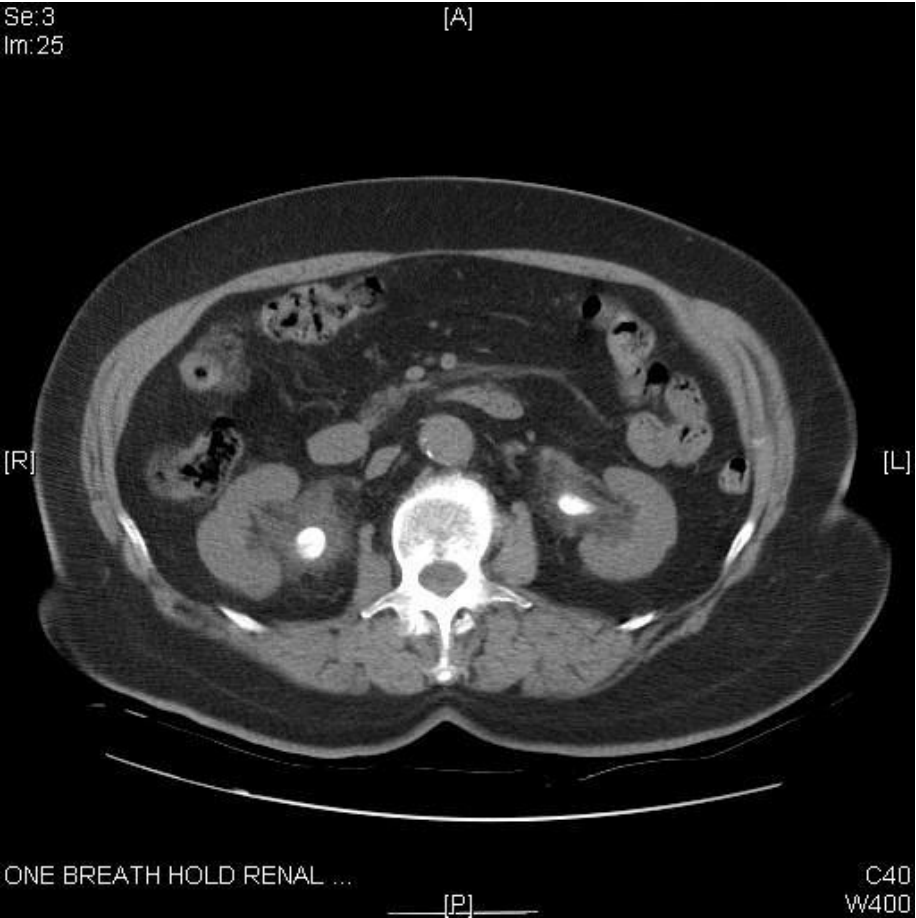


Radiolucent uric acid stones

# 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

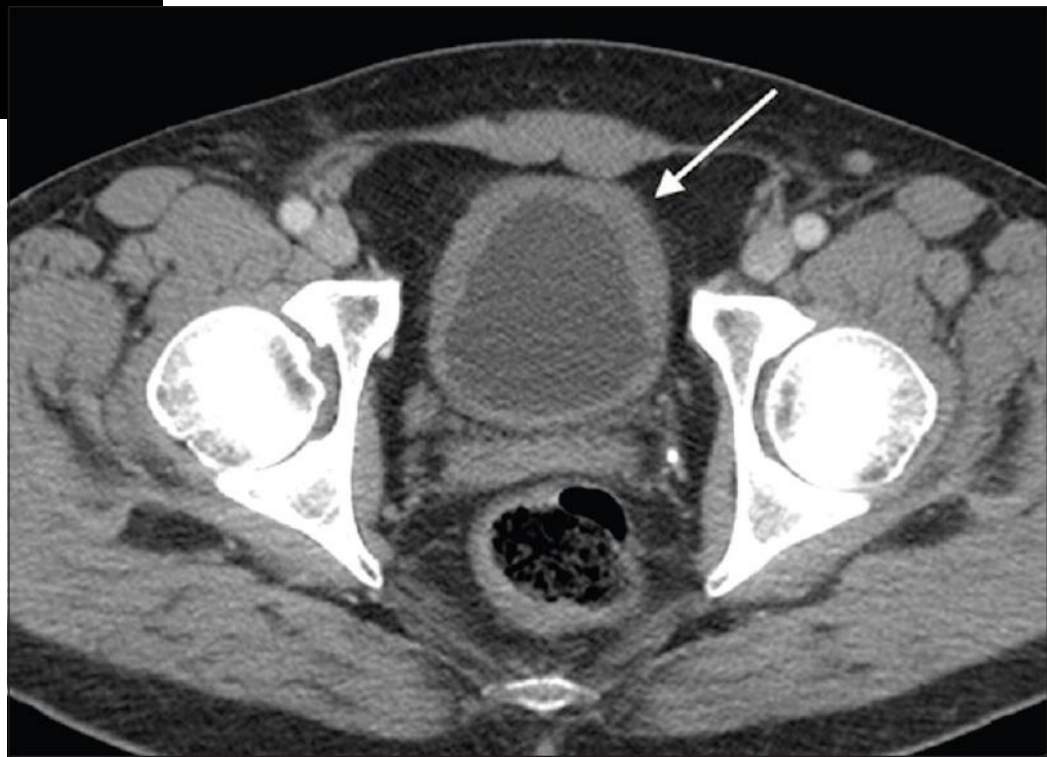
General

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



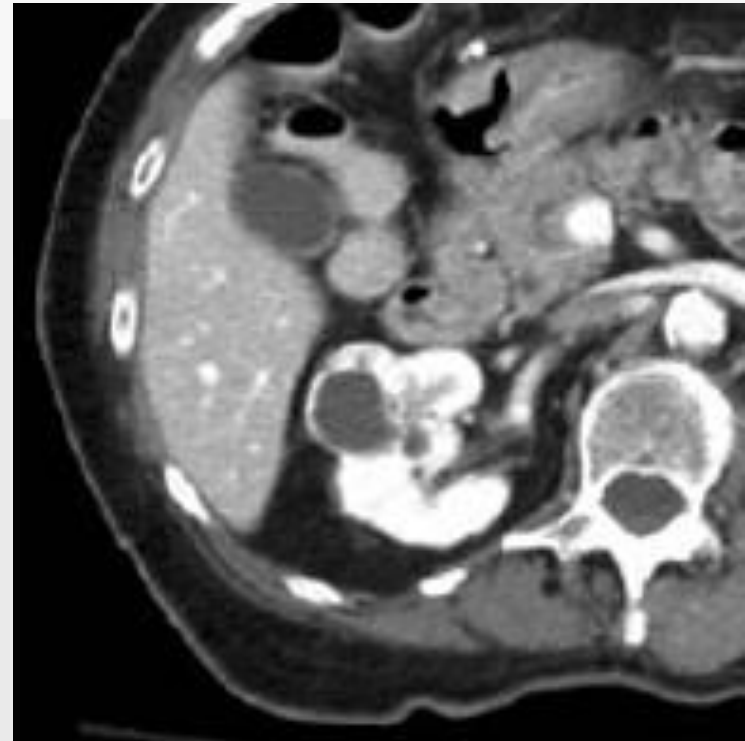
Left renal mass on IVP



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

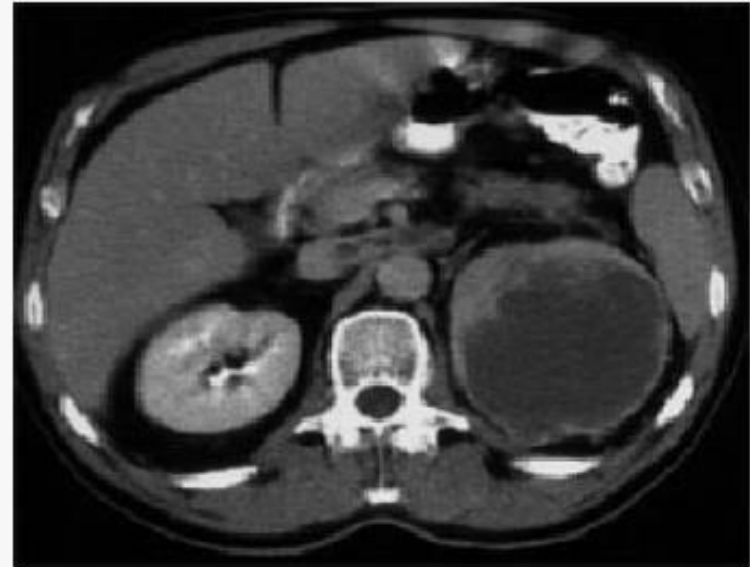
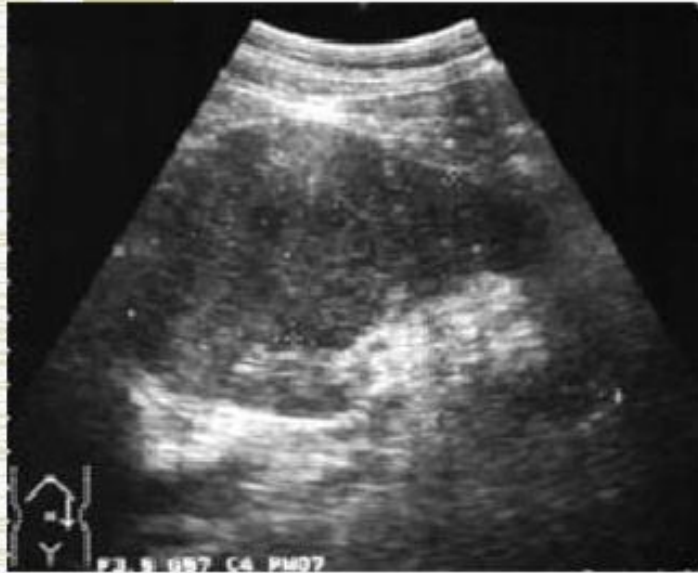


# Renal Mass



Distortion of left pelvicalyceal system in IVP

# Renal Mass



Solid left renal mass in a patient with micro hematuria



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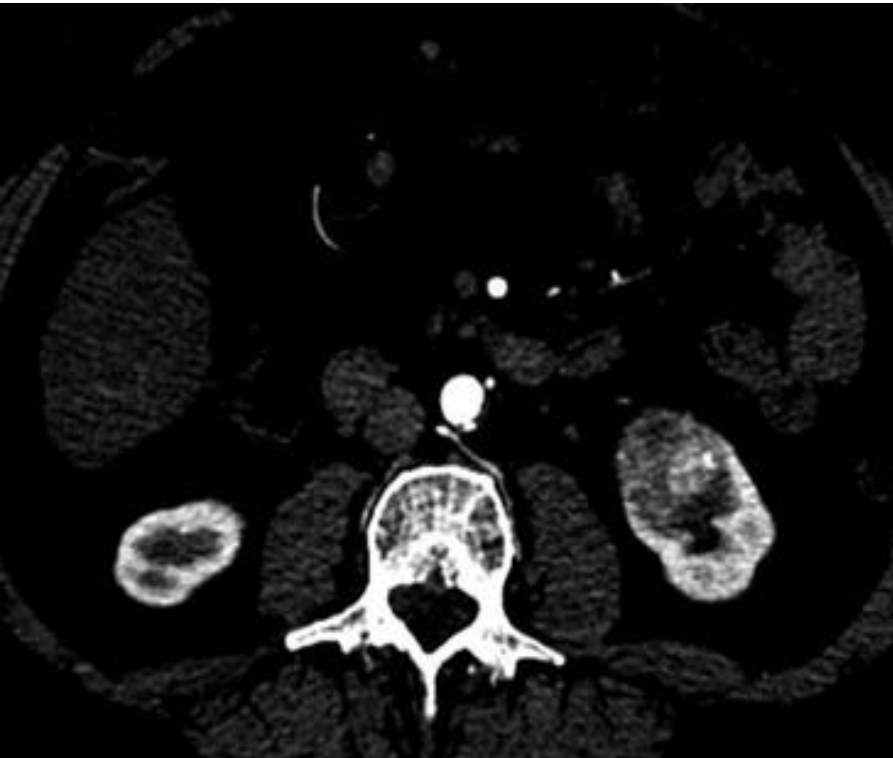
# Renal Mass

## 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



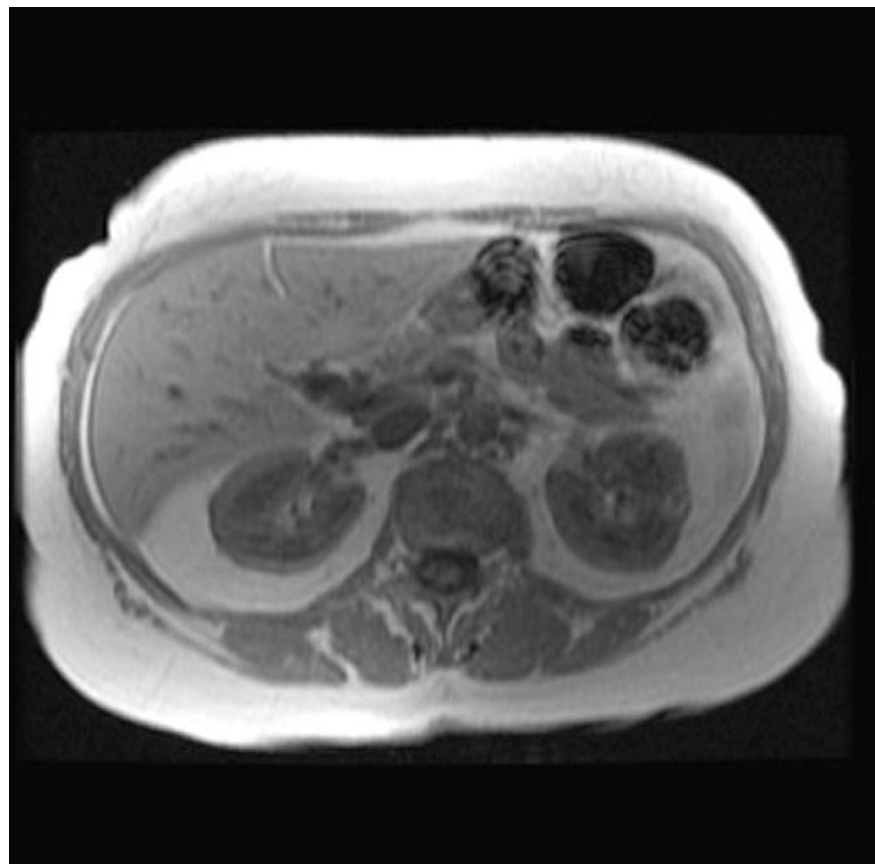
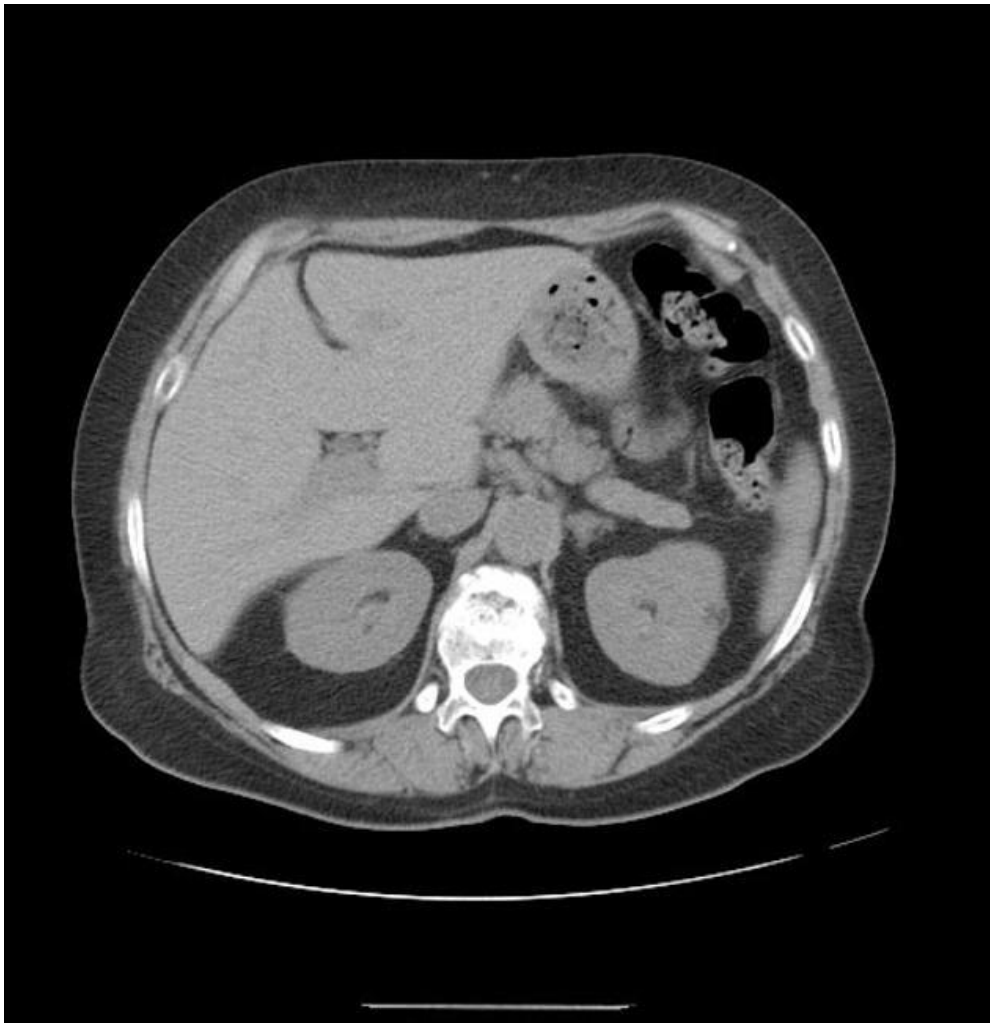


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## Renal Mass

### 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





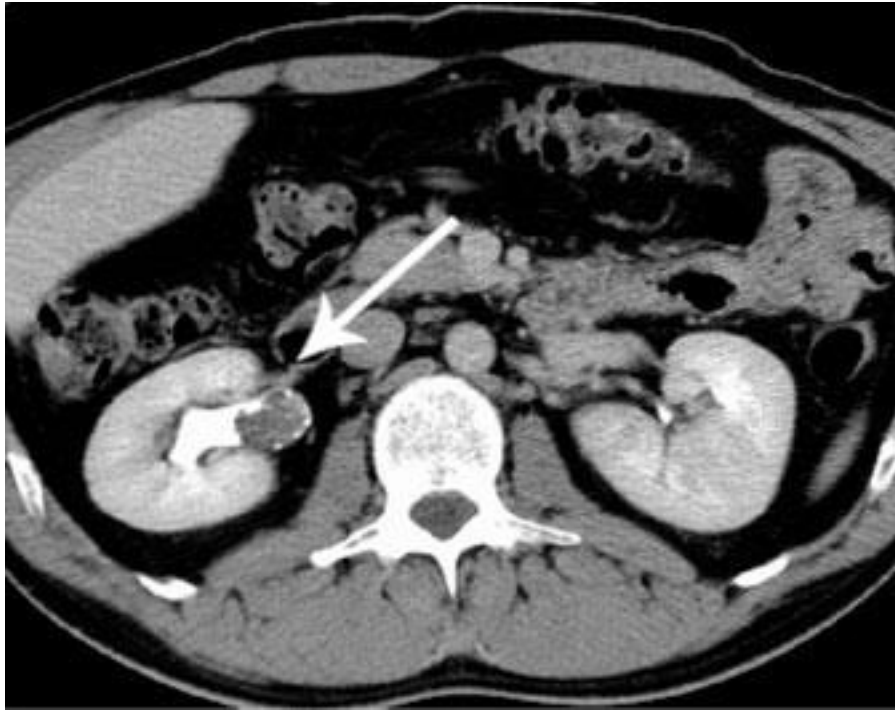
# Transitional Cell Carcinoma

- ◆ 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





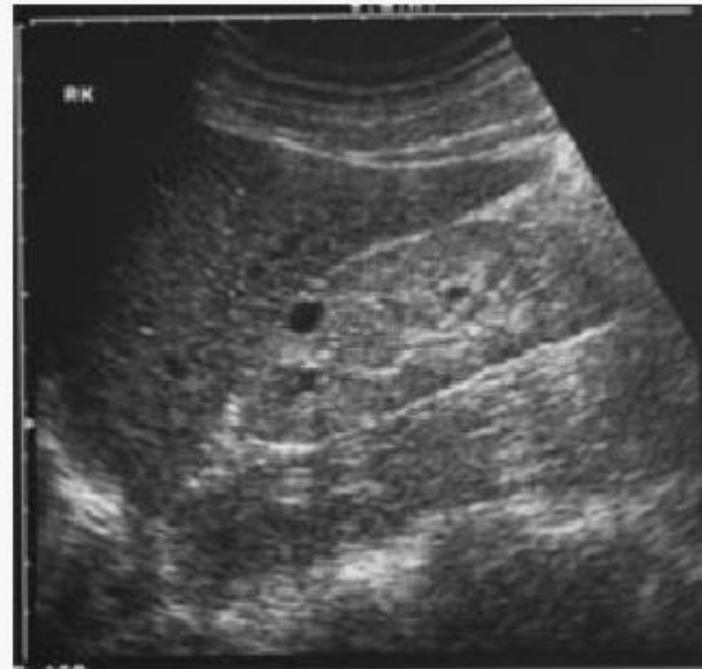
# Acute and Chronic Renal Failure

- ◆ 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



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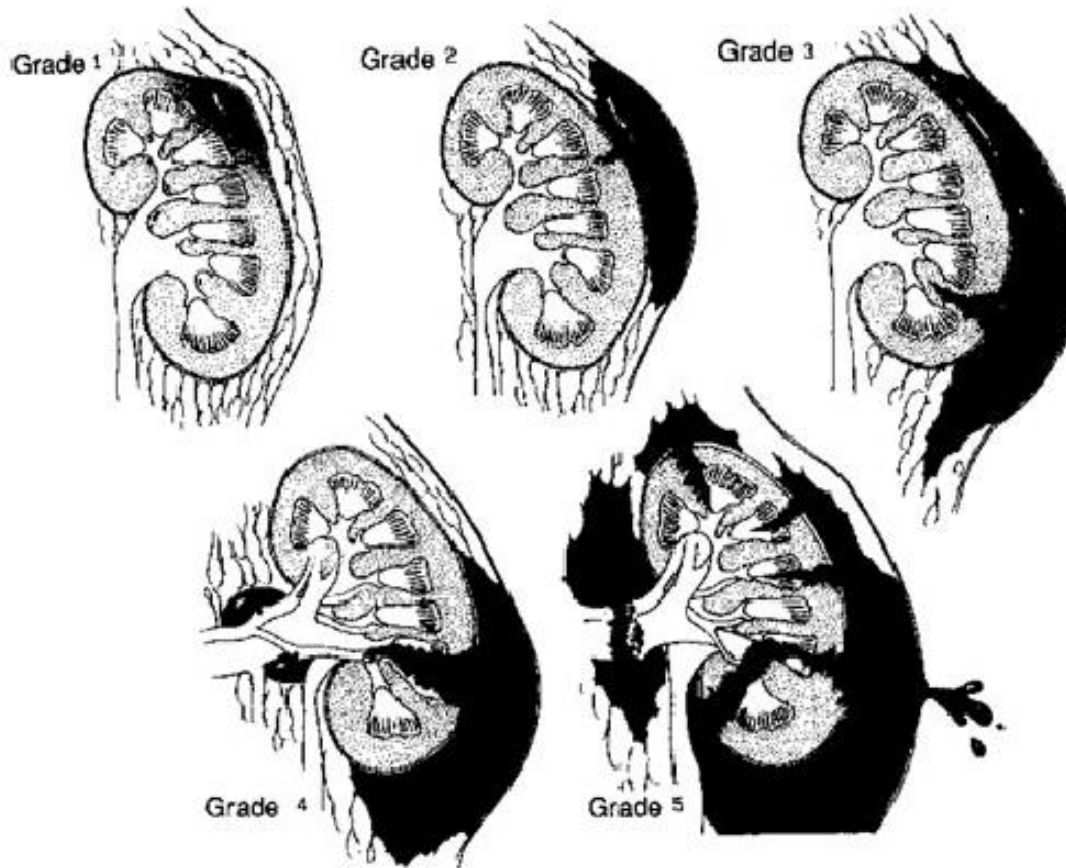
## GU Trauma

### 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



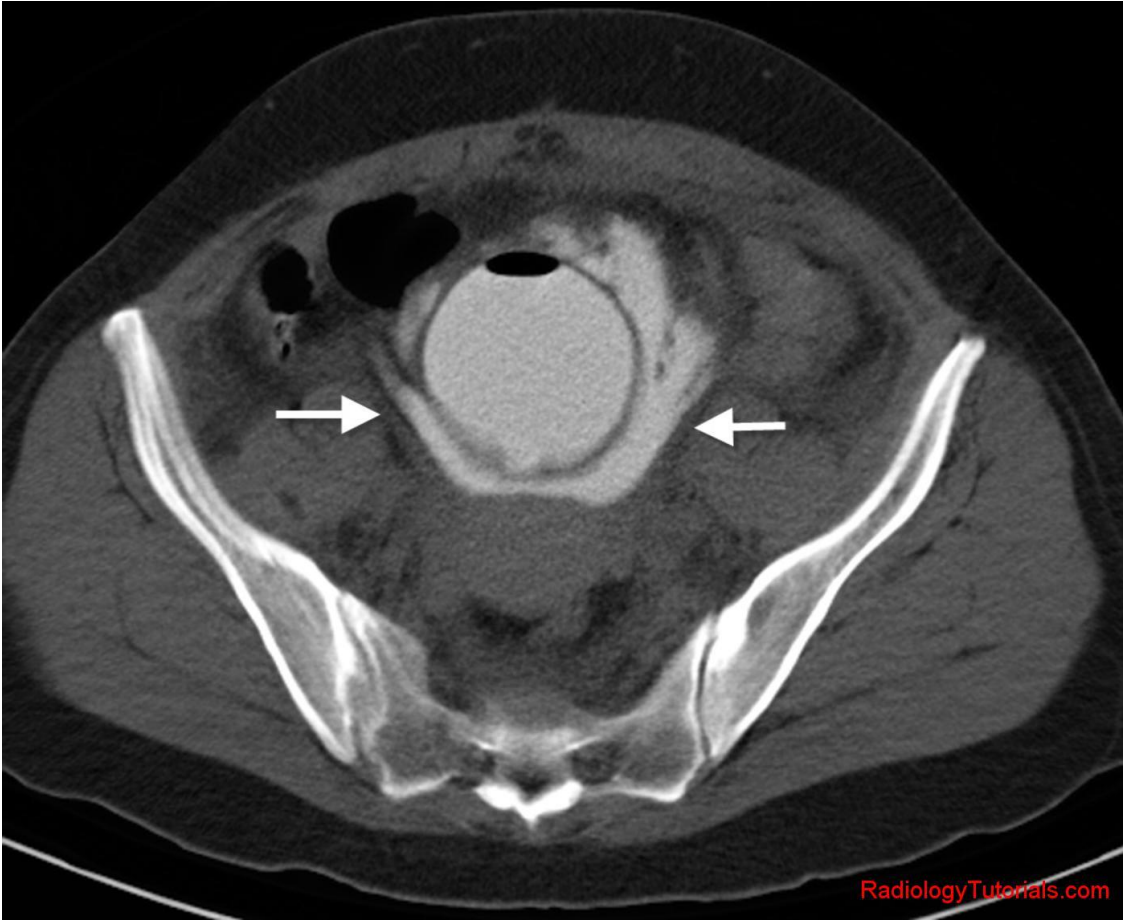
# GU Trauma



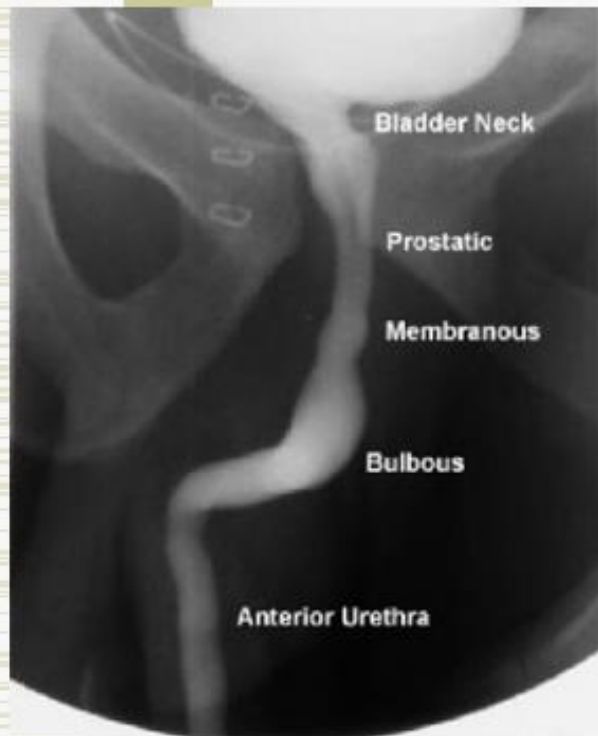
Extraperitoneal bladder rupture



Intraperitoneal bladder rupture



# GU Trauma



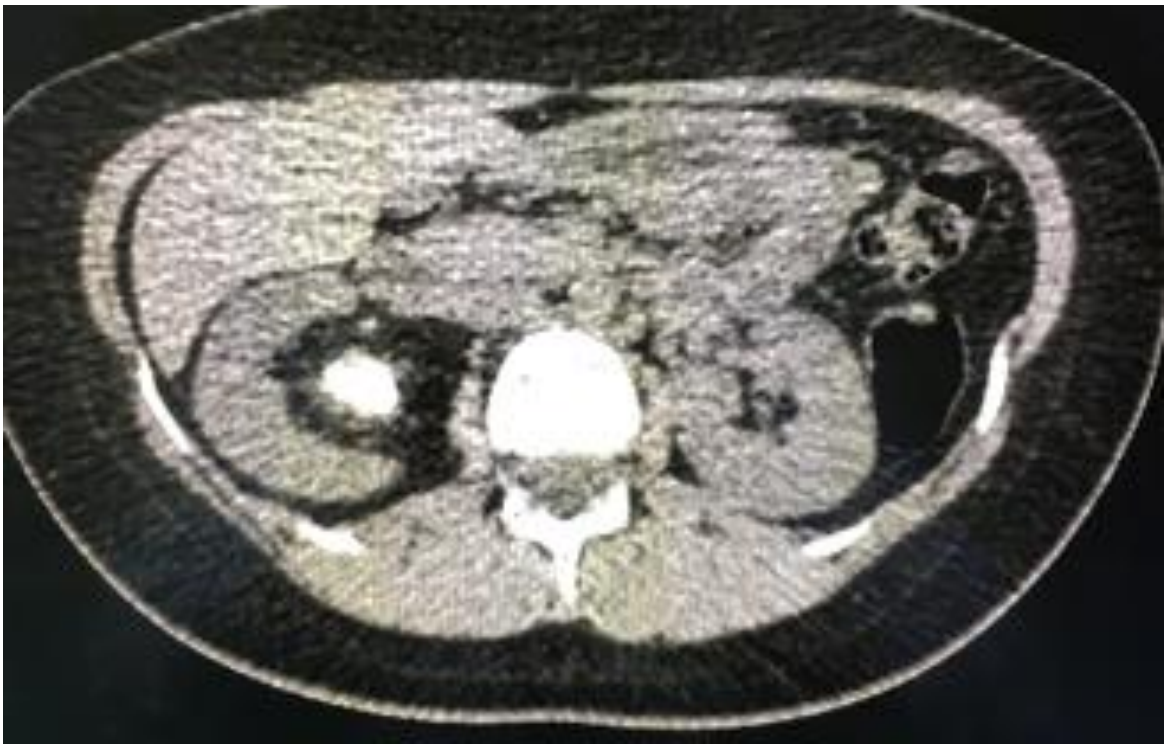
Normal retrograde urethrogram

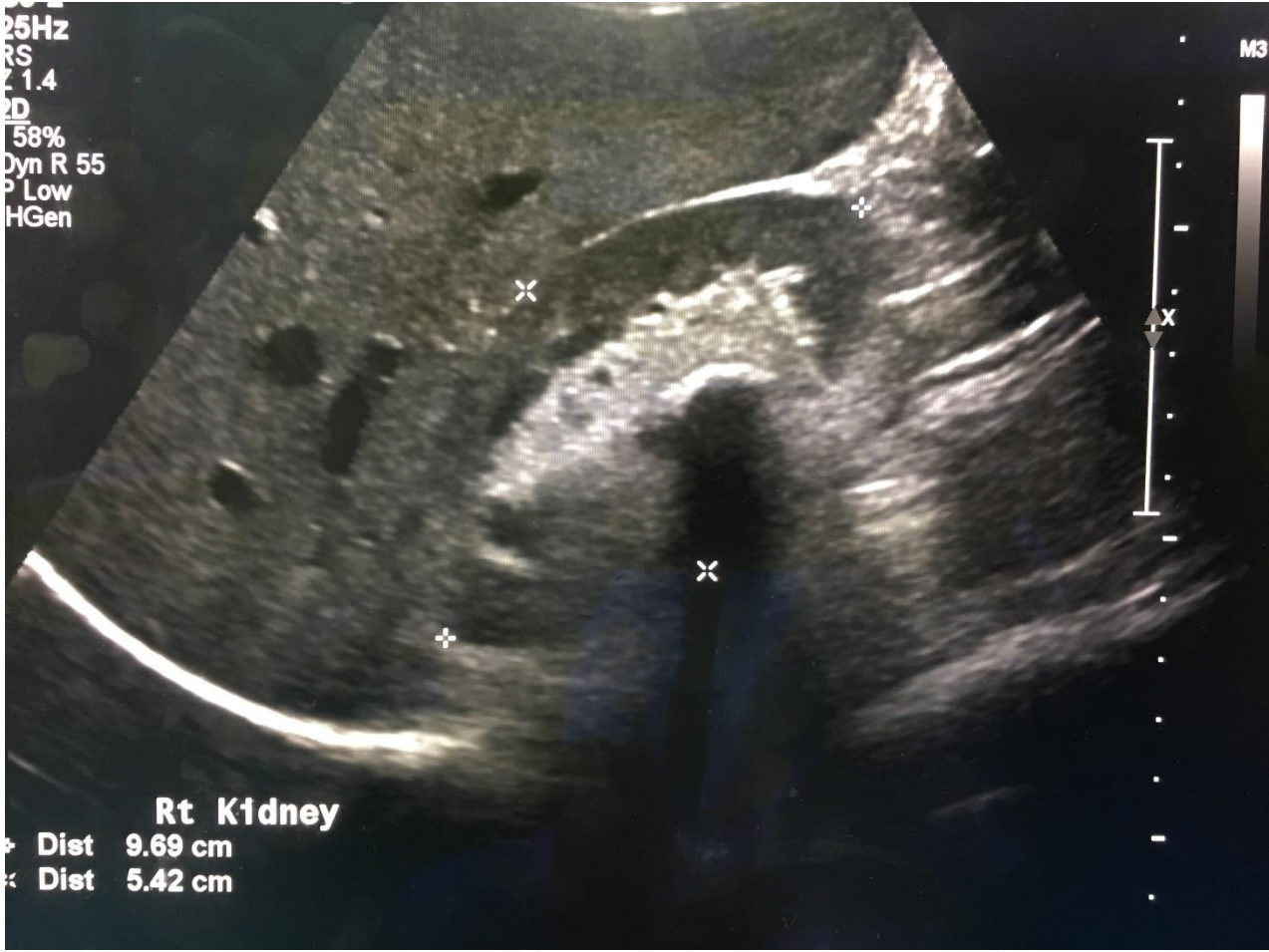


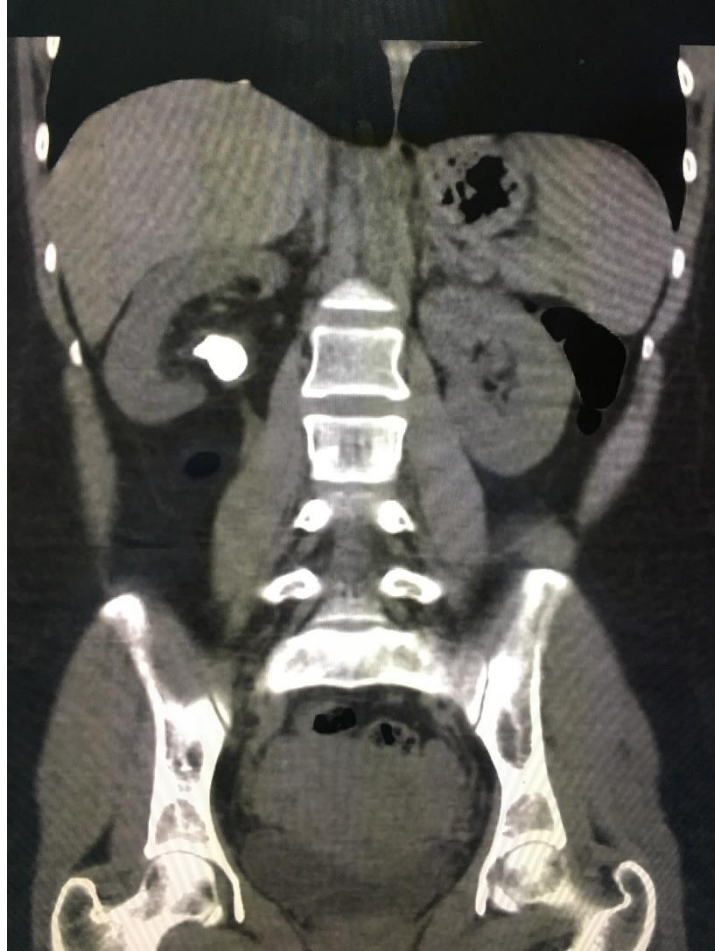
Traumatic rupture of bulbous urethra

# Spot Diagnoses











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

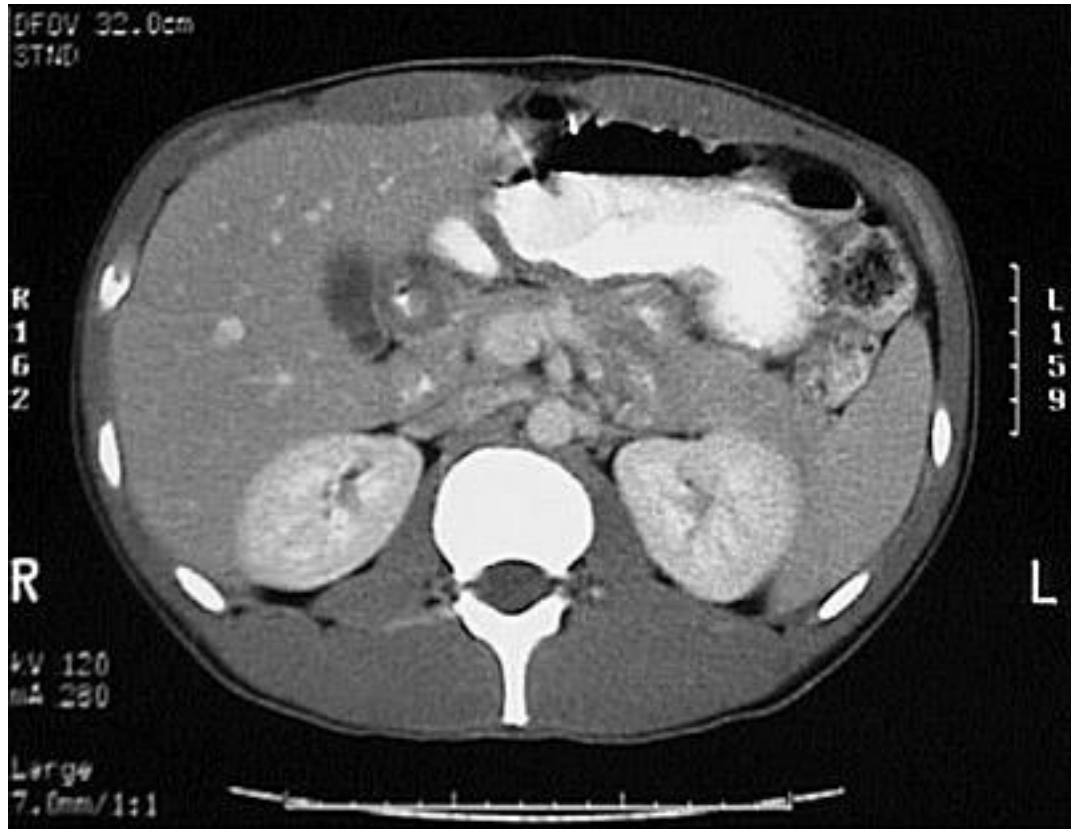


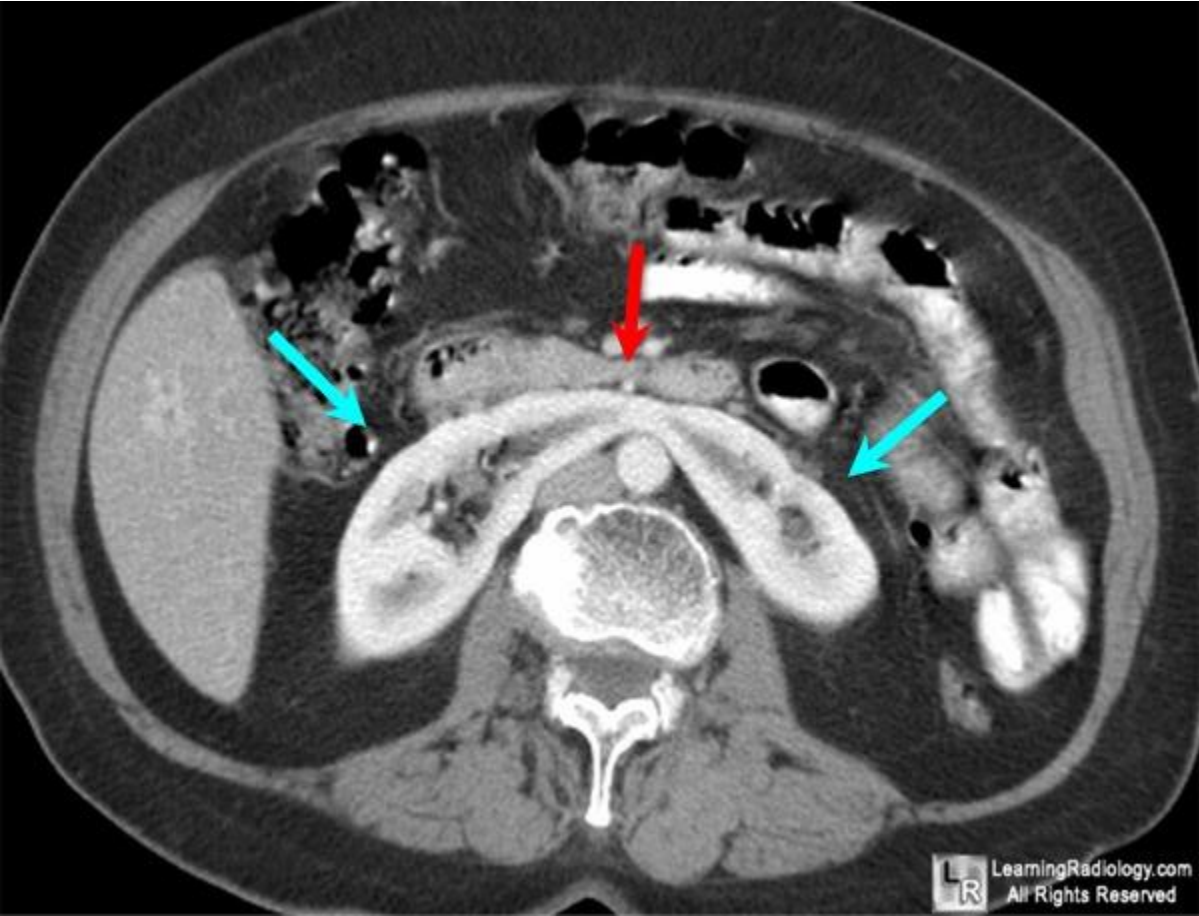






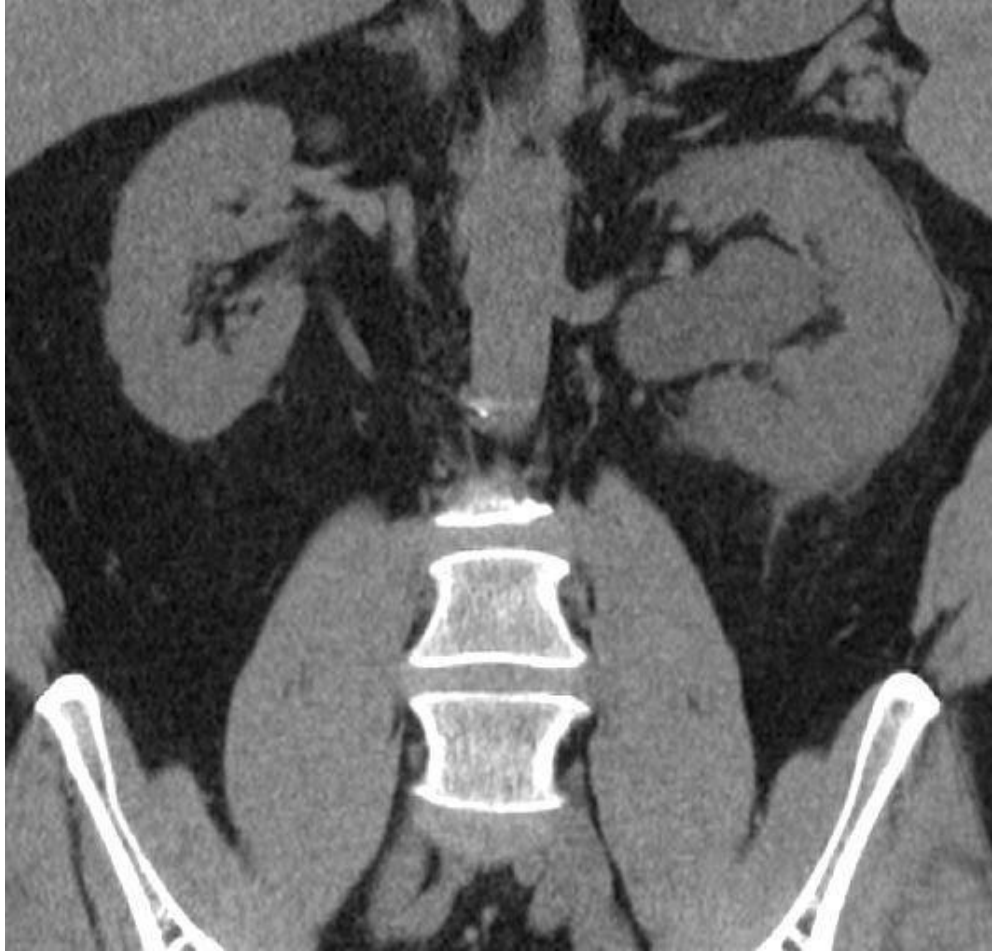


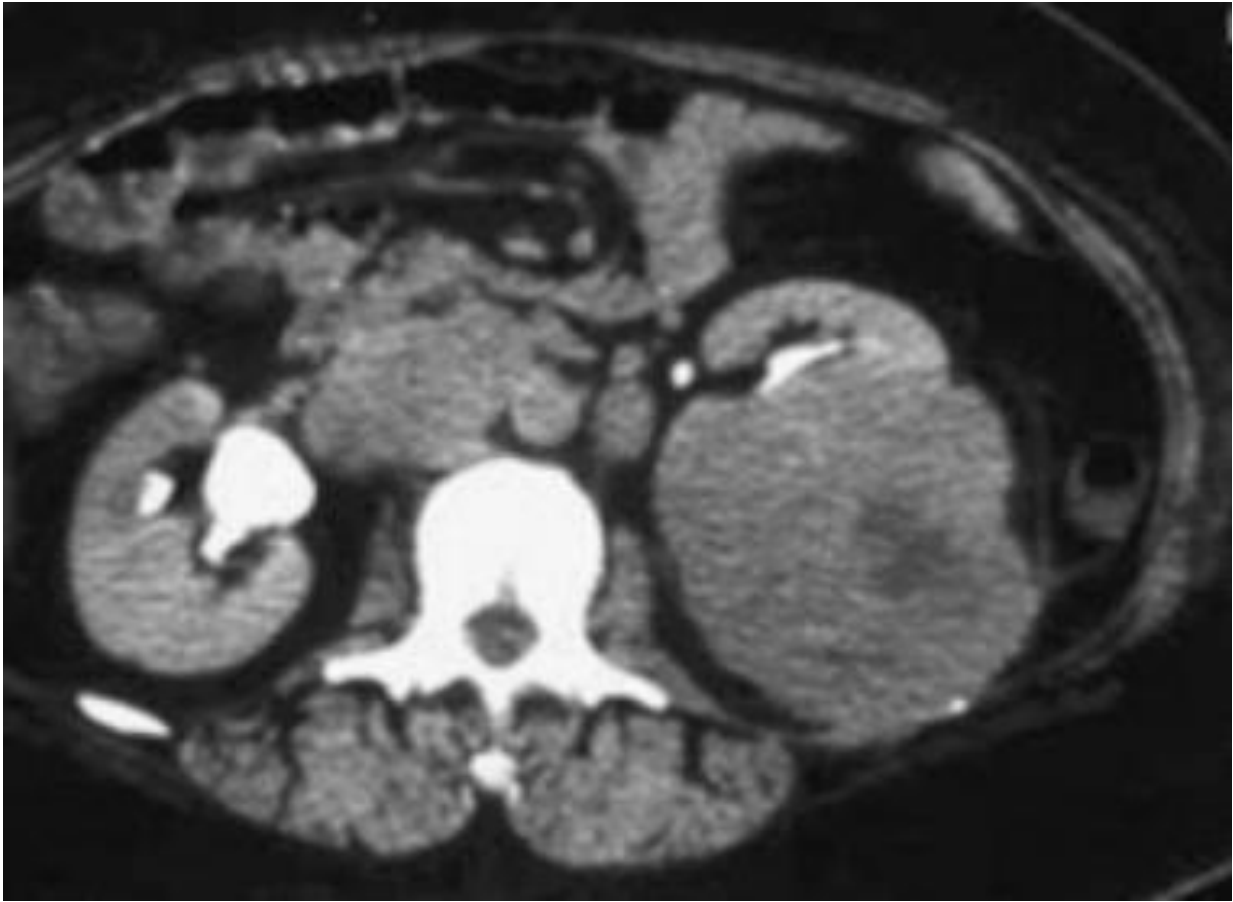


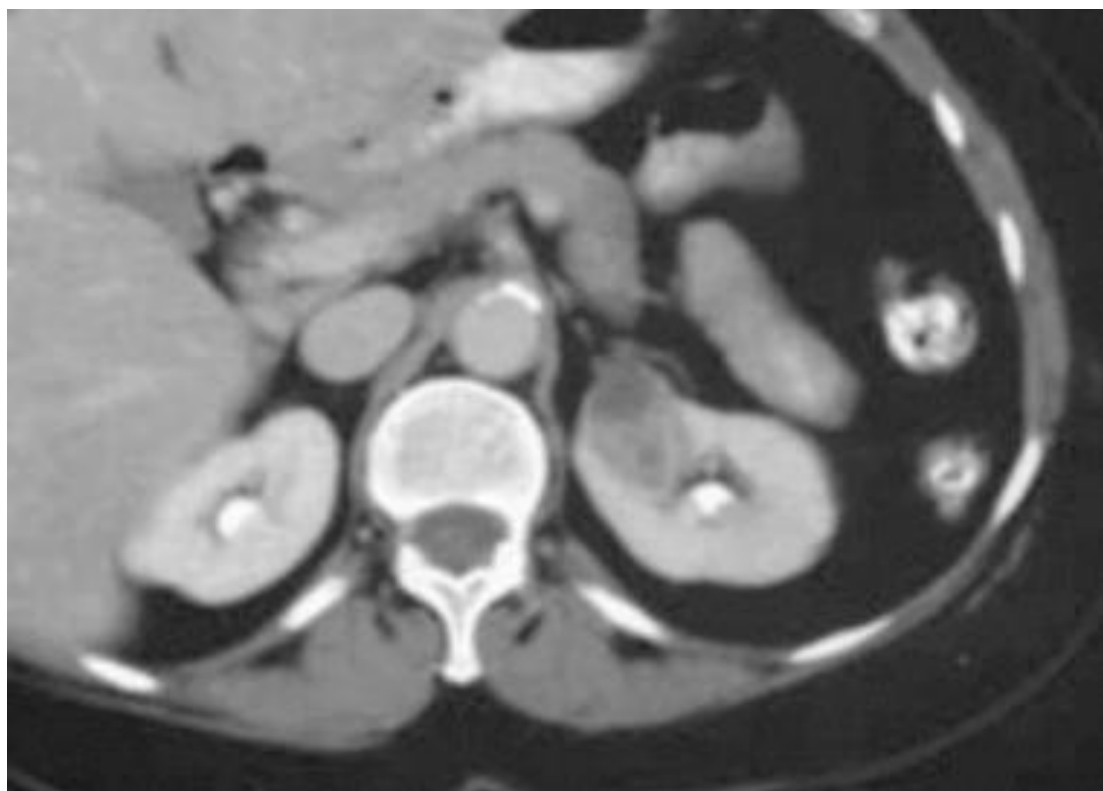




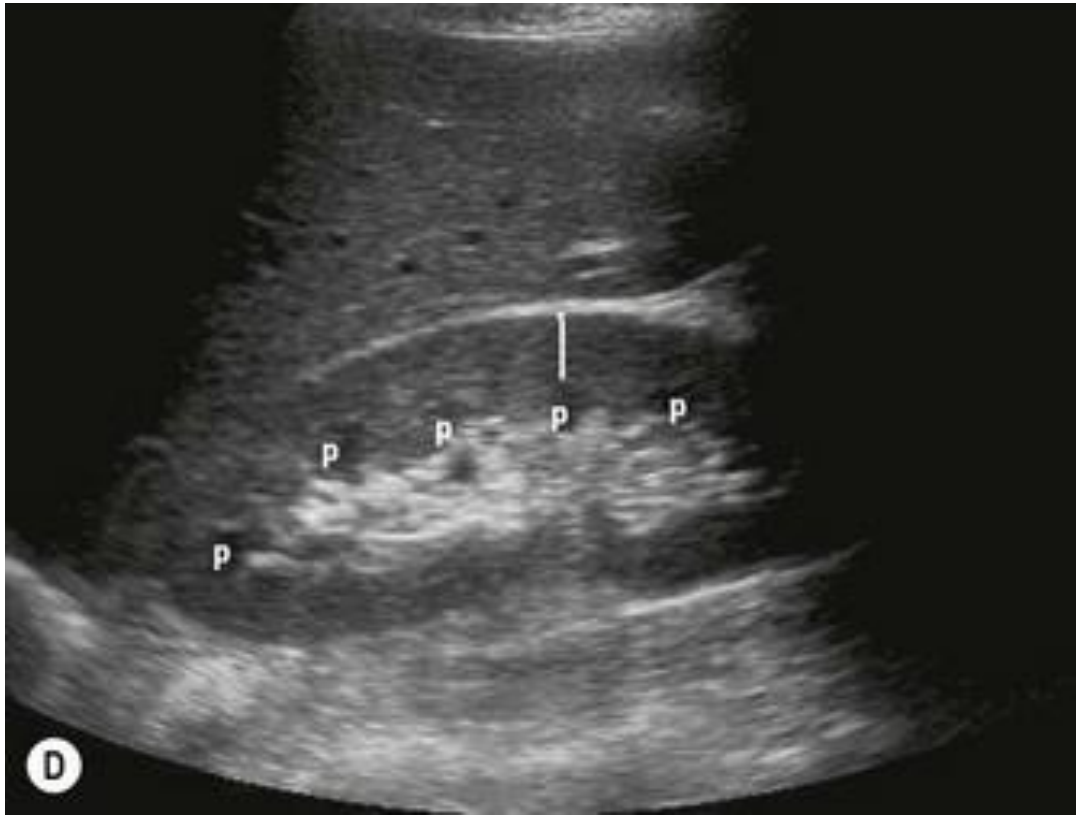






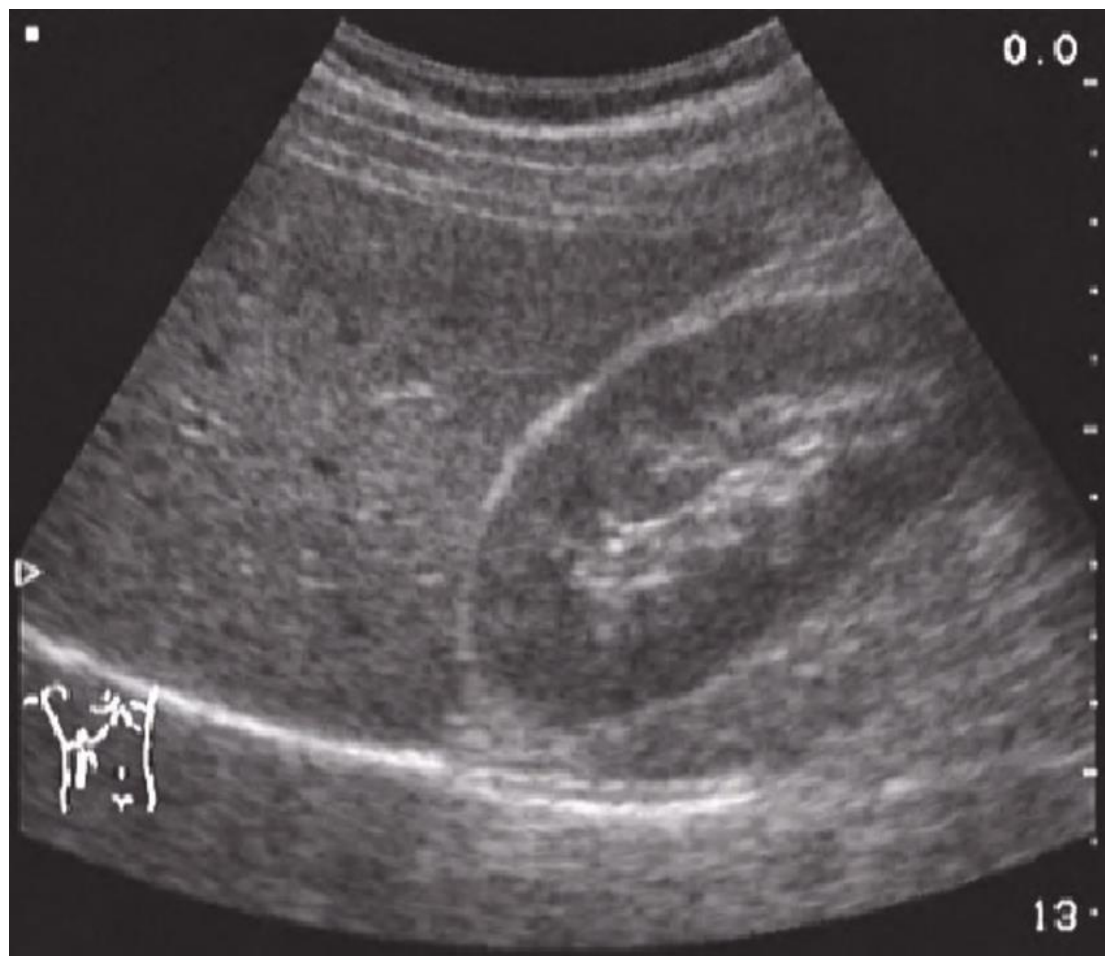






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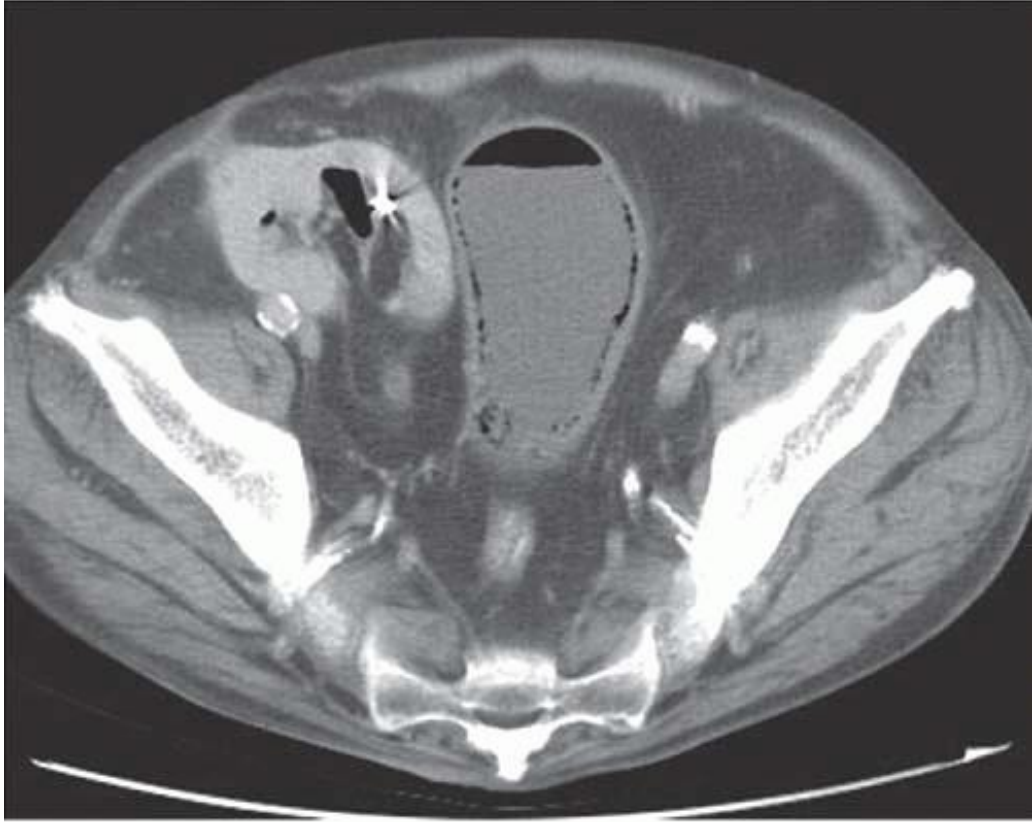
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*Thank you*