



Radiology of Urinary System Disorders

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Categories:

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

Renal Colic

- Caused by renal calculi
- Most urinary calculi are calcified
- *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

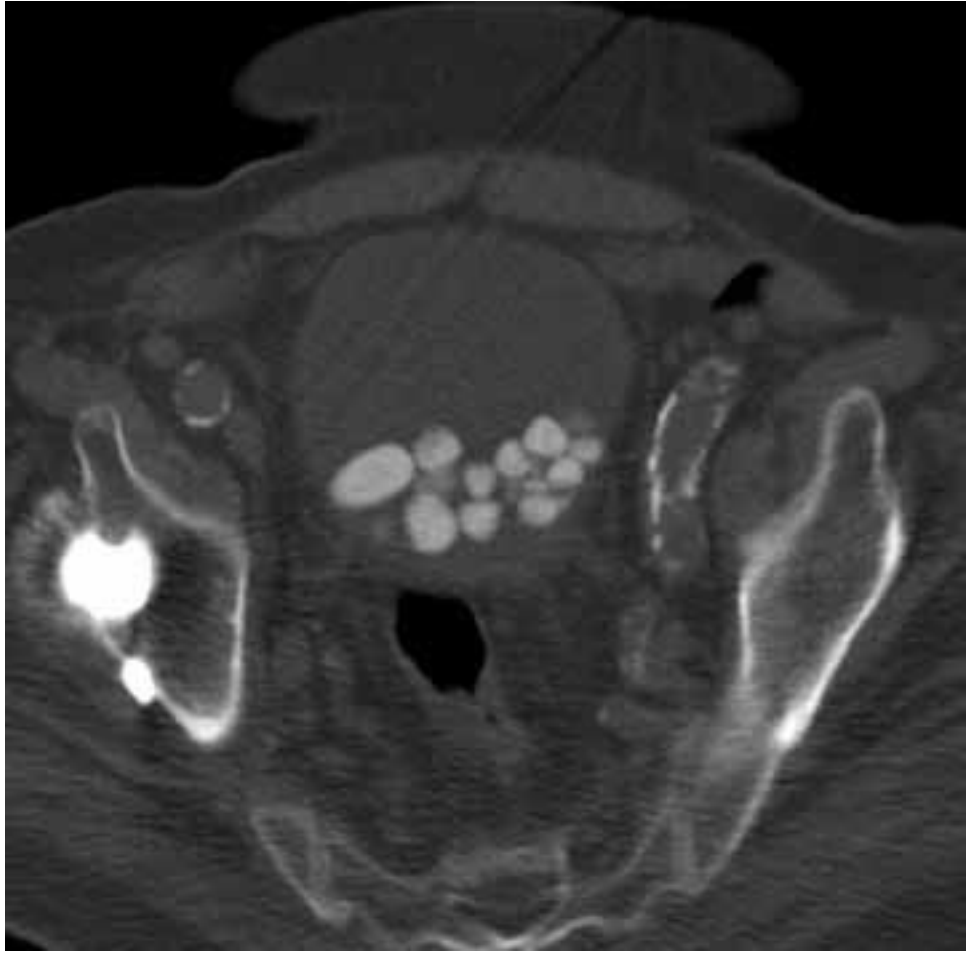


KUB: to assess total stone burden, size, shape, location

Often: US or CT is required in conjunction

Microscopic Hematuria Bladder Calculi



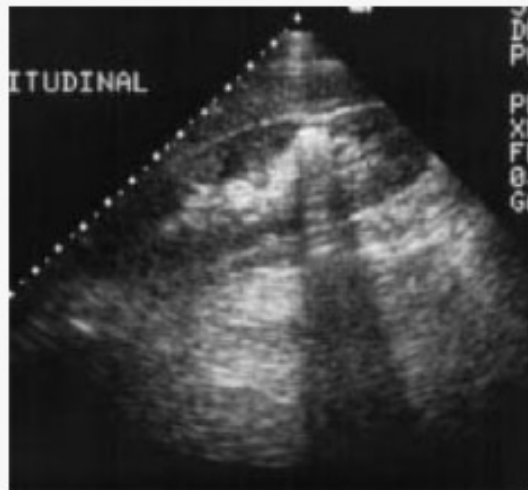
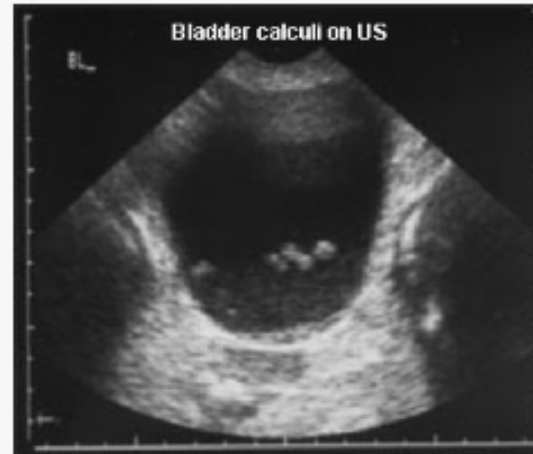
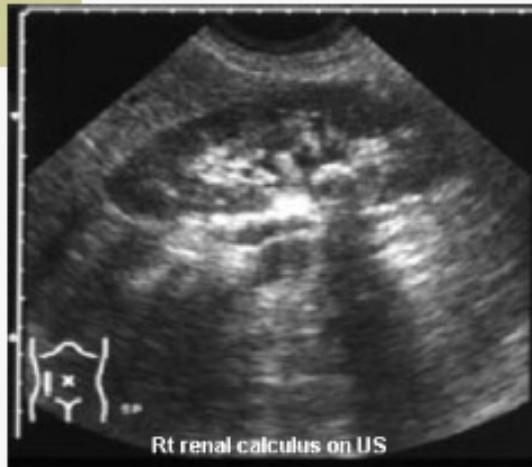


Renal Colic

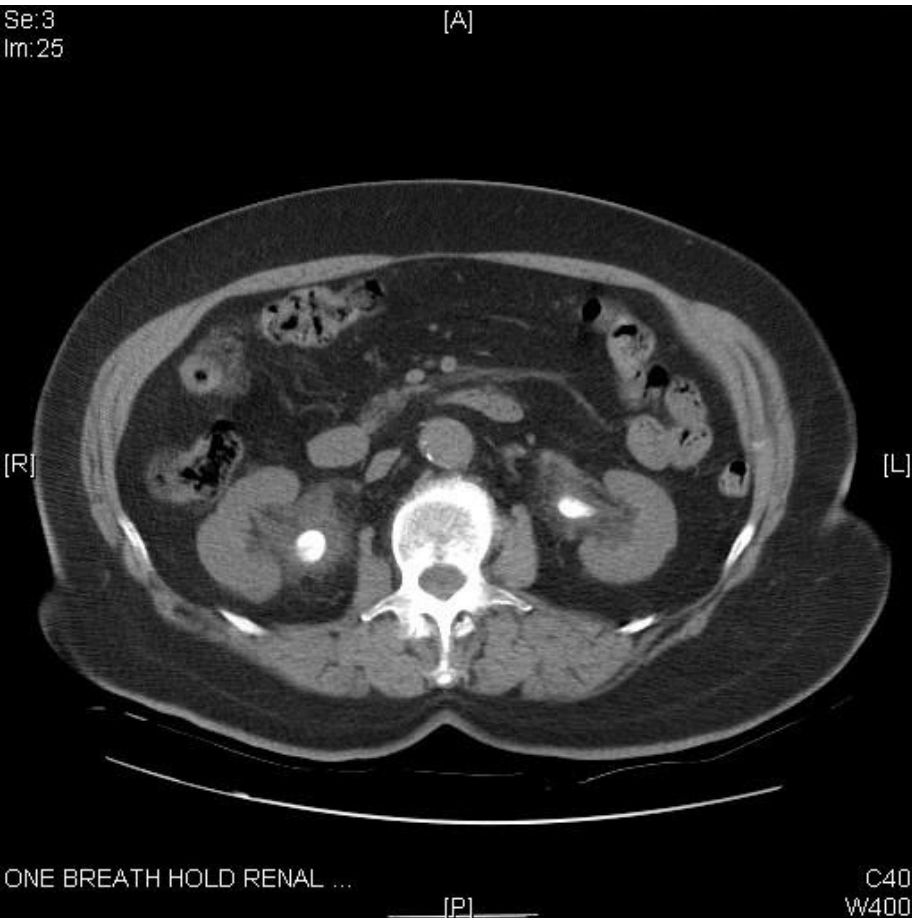


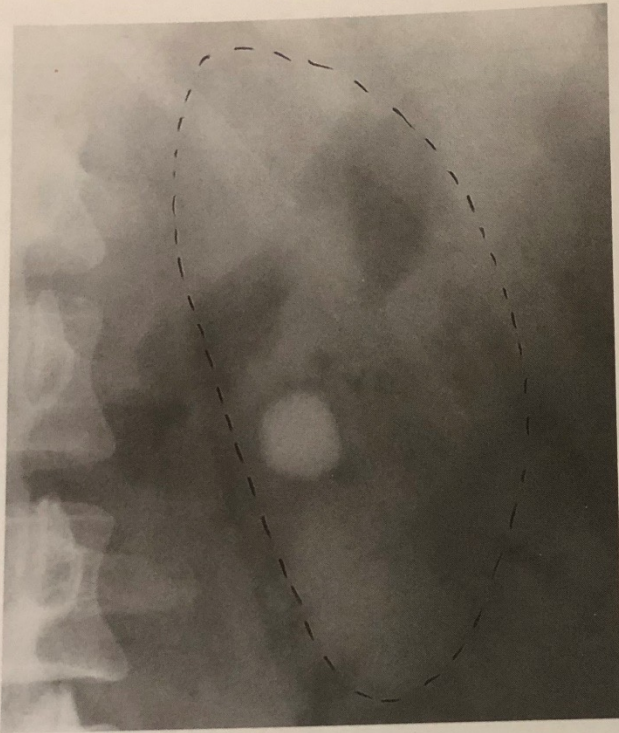
Radiolucent uric acid stones

Renal Calculus - US



Renal Calculus– CT Scan





(a)



(b)

Fig. 8.3 (a) A rounded calcification is seen overlying the left kidney in the anteroposterior plain film. (b) Post contrast film in the same patient. As the contrast medium and the calculus have the same radiographic density, the calculus is hidden by the contrast medium.

Box 8.2 Causes of dilated calices

Due to obstruction, with dilatation down to a specific point of hold-up

Within the lumen

- Calculus
- Blood clot
- Sloughed papilla

Within the wall of the collecting system

- Intrinsic pelviureteric junction obstruction
- Transitional cell tumour
- Infective stricture (e.g. tuberculosis or schistosomiasis)

Extrinsic compression

- Retroperitoneal fibrosis
- Pelvic tumour, e.g. cervical, ovarian or rectal carcinoma
- Aberrant renal artery or retrocaval ureter

Due to papillary atrophy or destruction

- Reflux nephropathy
- Papillary necrosis
- Tuberculosis

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)
- Diagnosed mainly clinically

Predisposing Factors:

- Stones
- Obstruction
- Reflux
- DM
- Pregnancy



Pyelonephritis: Wedge shaped hypoperfused lesion

Cystitis

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

General

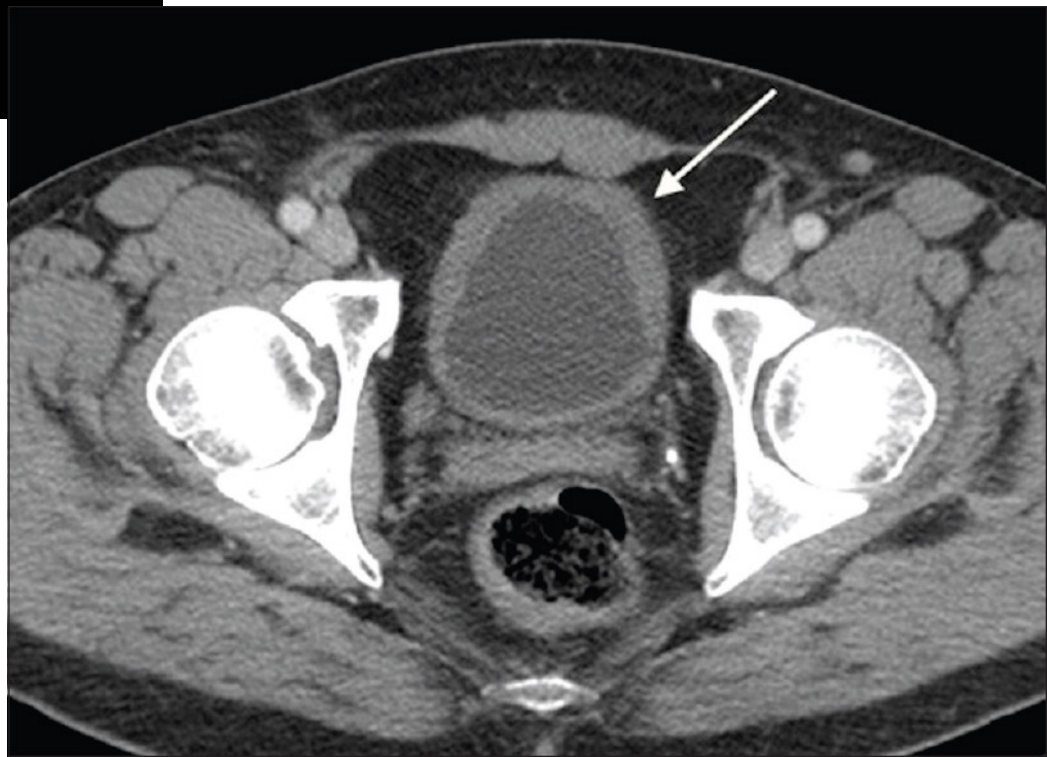
M

[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

Renal Masses

- Most solitary renal masses are either: malignant tumor or simple cyst
- In adult, a malignant tumor is almost certain to be a **renal cell carcinoma (RCC)** whereas in young children it is usually **Wilm's tumor**
- Other causes of renal mass include: renal abscess, benign tumor (Oncocytoma, angiomyolipoma), metastasis

Multiple renal masses include:

- Multiple simple cysts
- Polycystic disease
- Malignant lymphoma
- Metastases
- Inflammatory masses



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



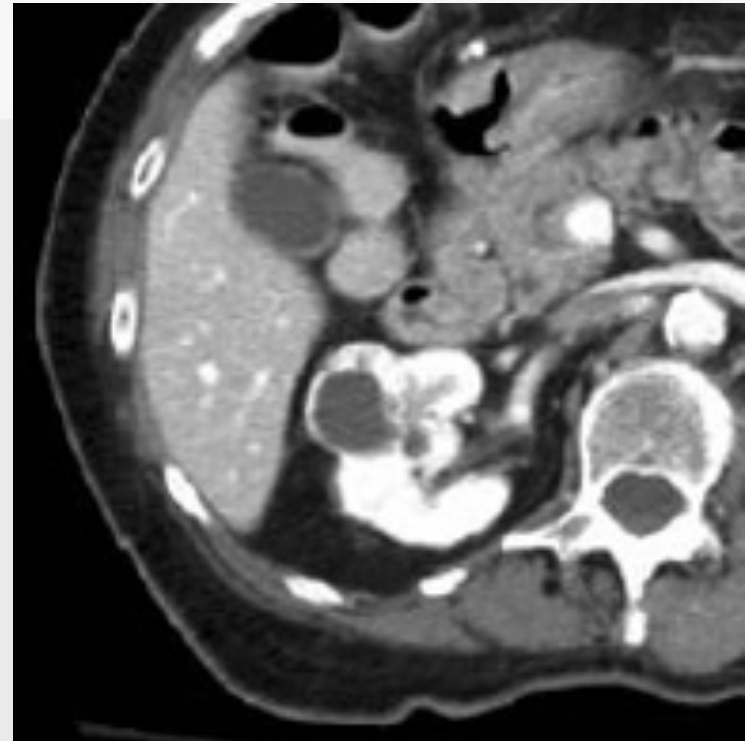
Left renal mass on IVP



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

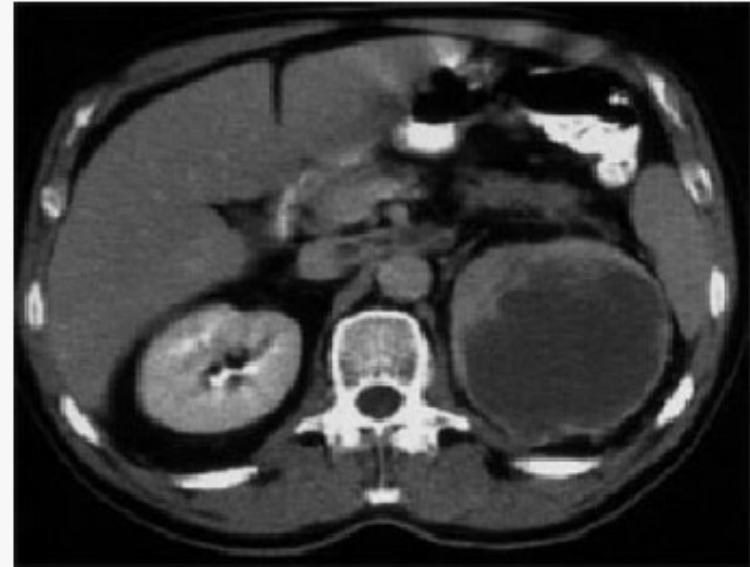


Renal Mass



Distortion of left pelvicalyceal system in IVP

Renal Mass



Solid left renal mass in a patient with micro hematuria

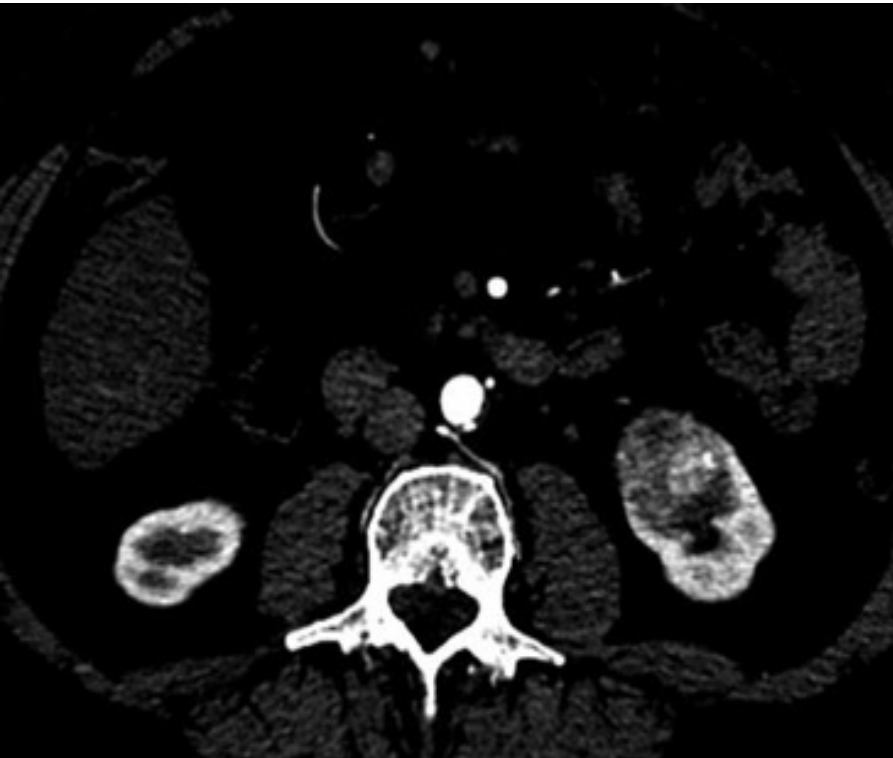


Renal Mass

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

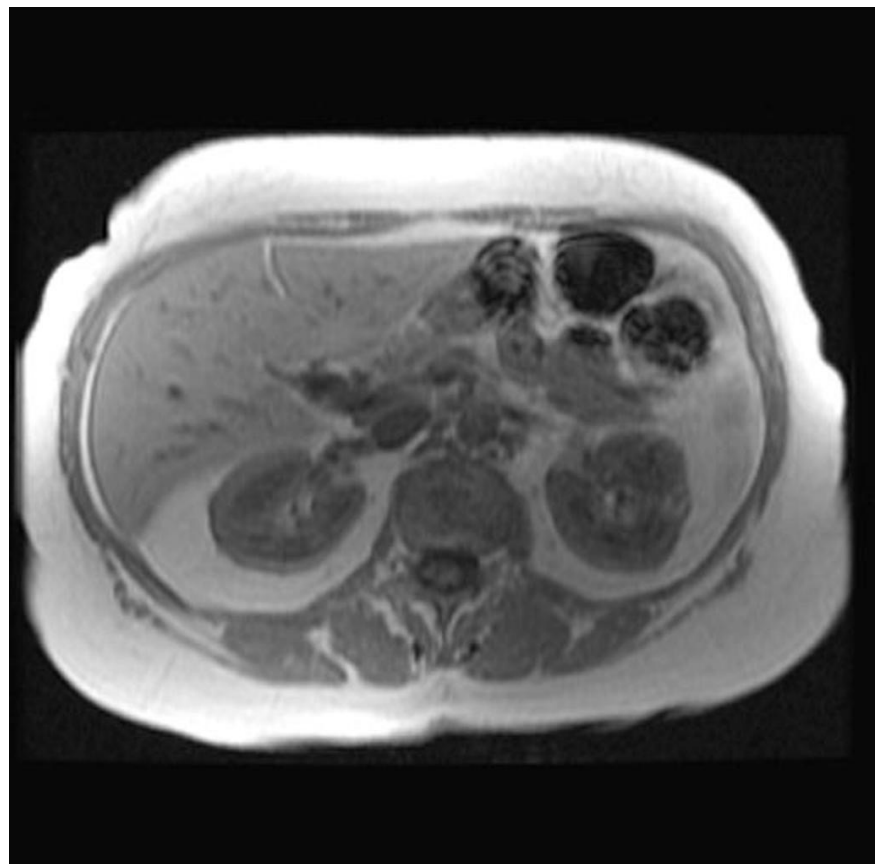
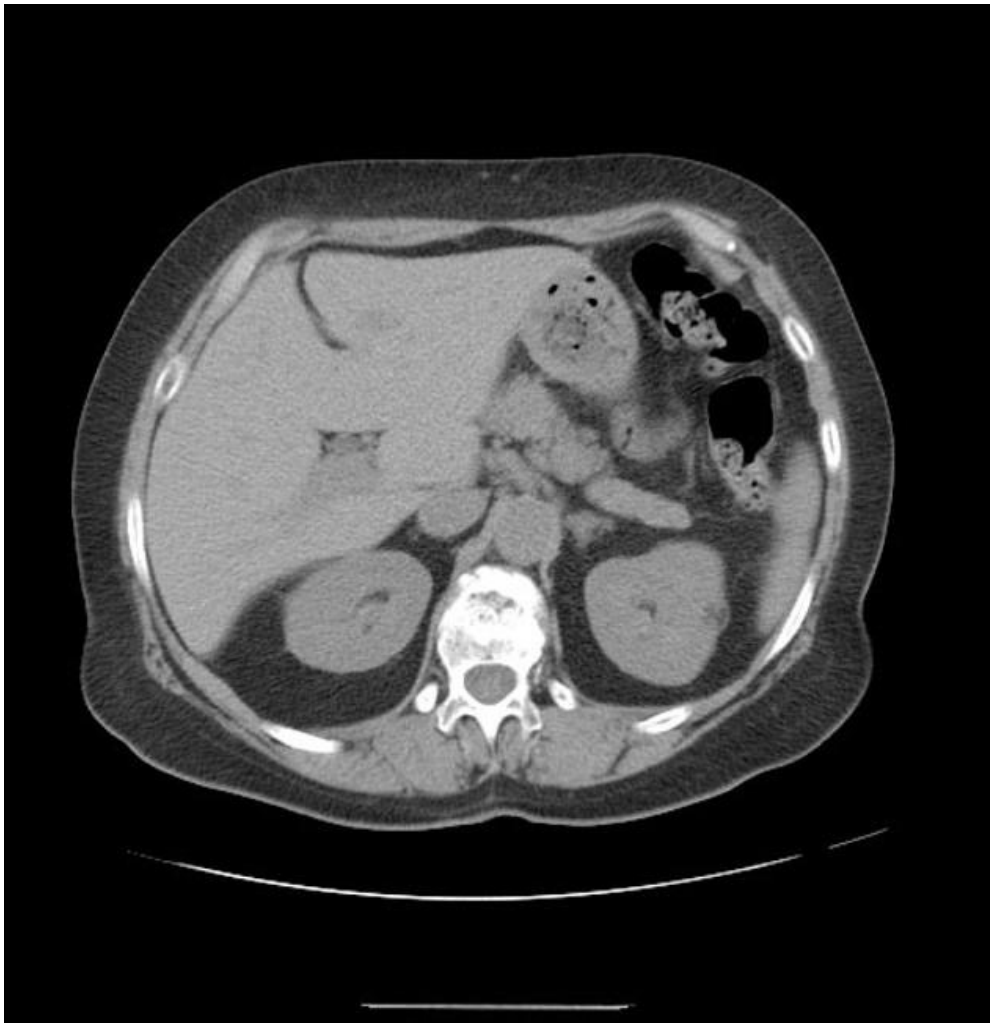




Renal Mass

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

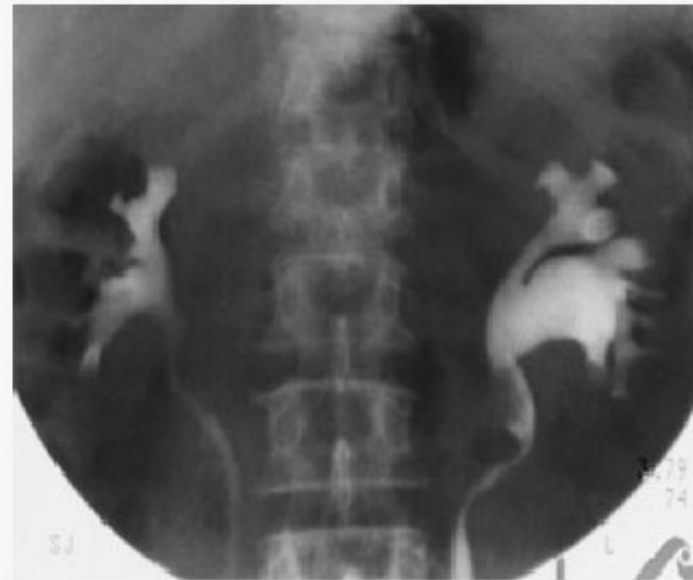




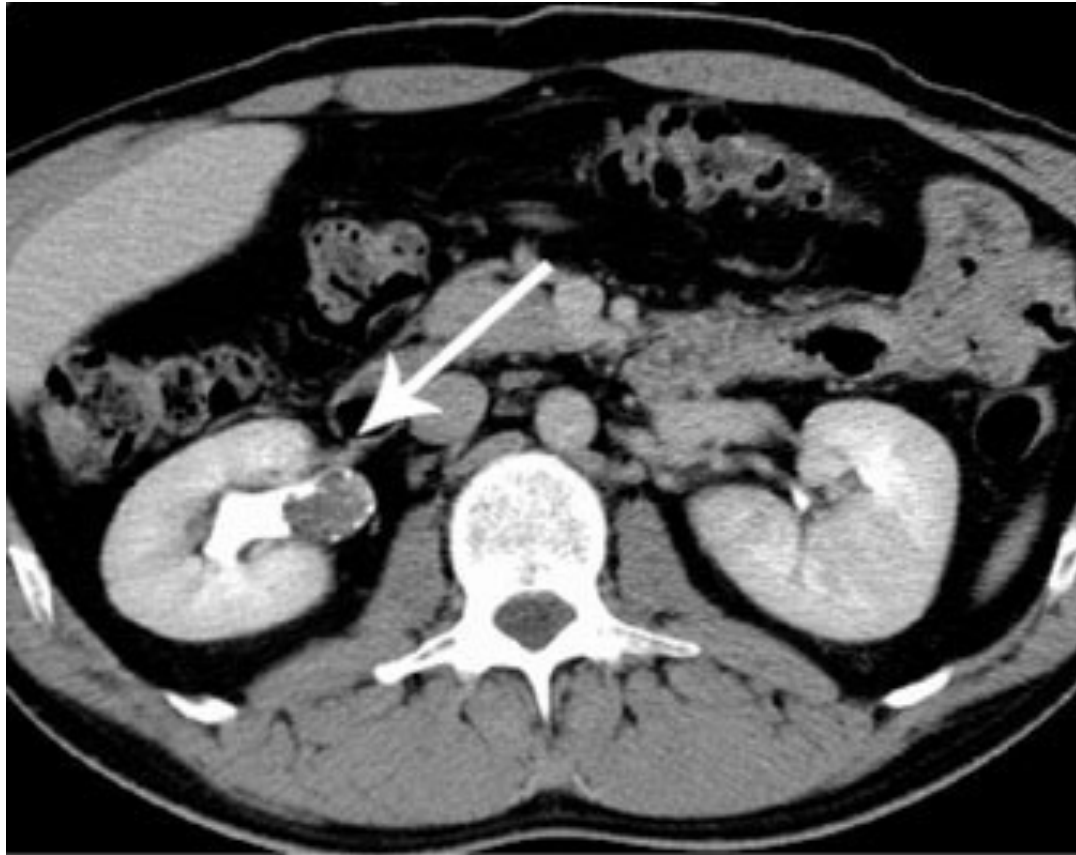
Transitional Cell Carcinoma

- ◆ 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

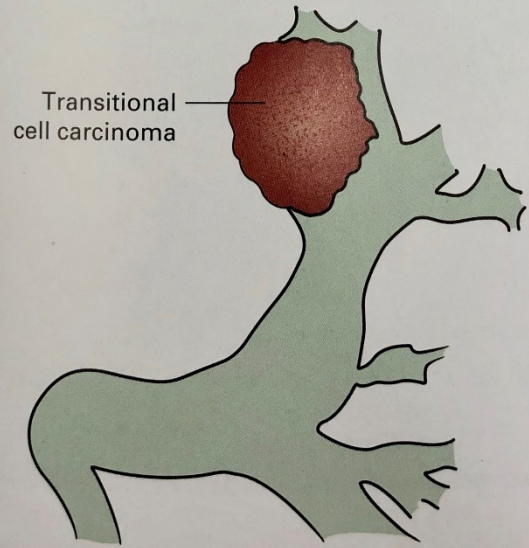


Large TCC of Rt renal pelvis

Transitional Cell Carcinoma



Small TCC of bladder in patient with hematuria



Transitional cell carcinoma

(a)

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



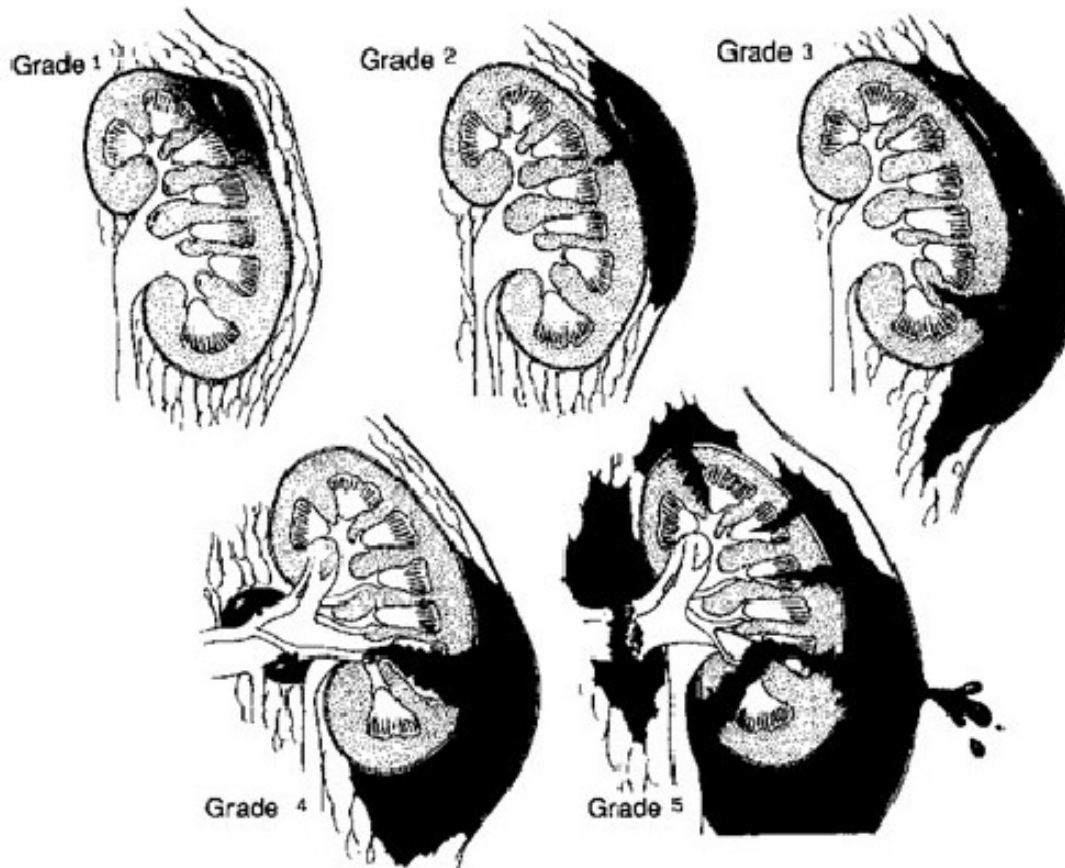
GU Trauma

Penetrating trauma (gunshot, stab)

- ◆ Unstable
 - Surgery or angiography
- ◆ Stable
 - CT

GU Trauma

RADIOGRAPHIC ASSESSMENT OF RENAL TRAUMA



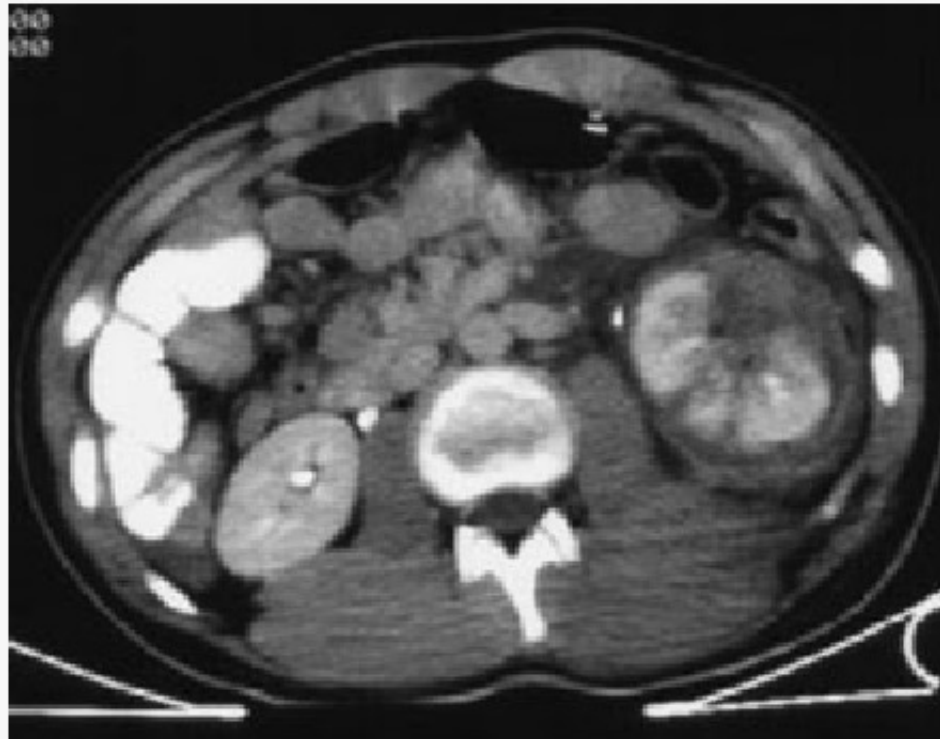


Grade 1-2 injury



Grade 3 injury

GU Trauma



Grade 4 injury: deep lacerations with perirenal hemorrhage

GU Trauma



Grade 5 injury: thrombosed renal artery

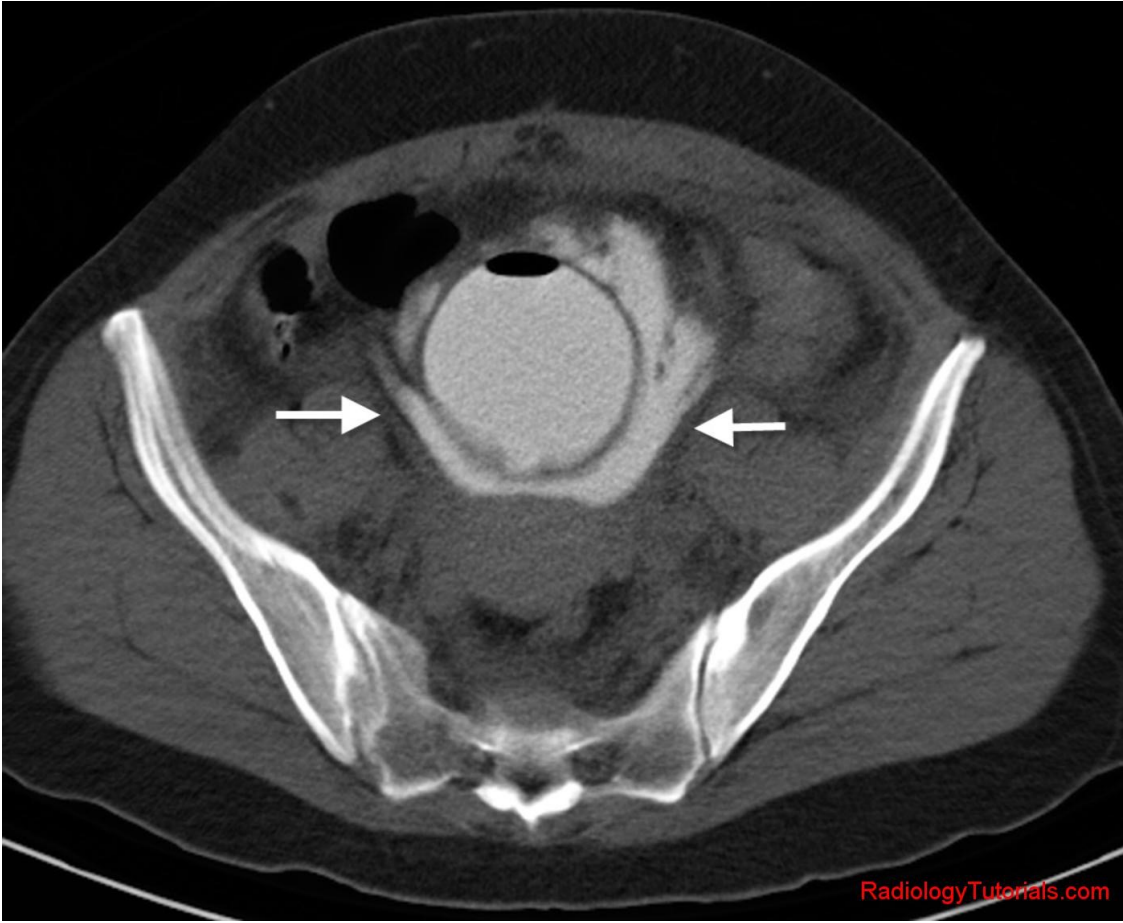
GU Trauma



Extraperitoneal bladder rupture



Intraperitoneal bladder rupture



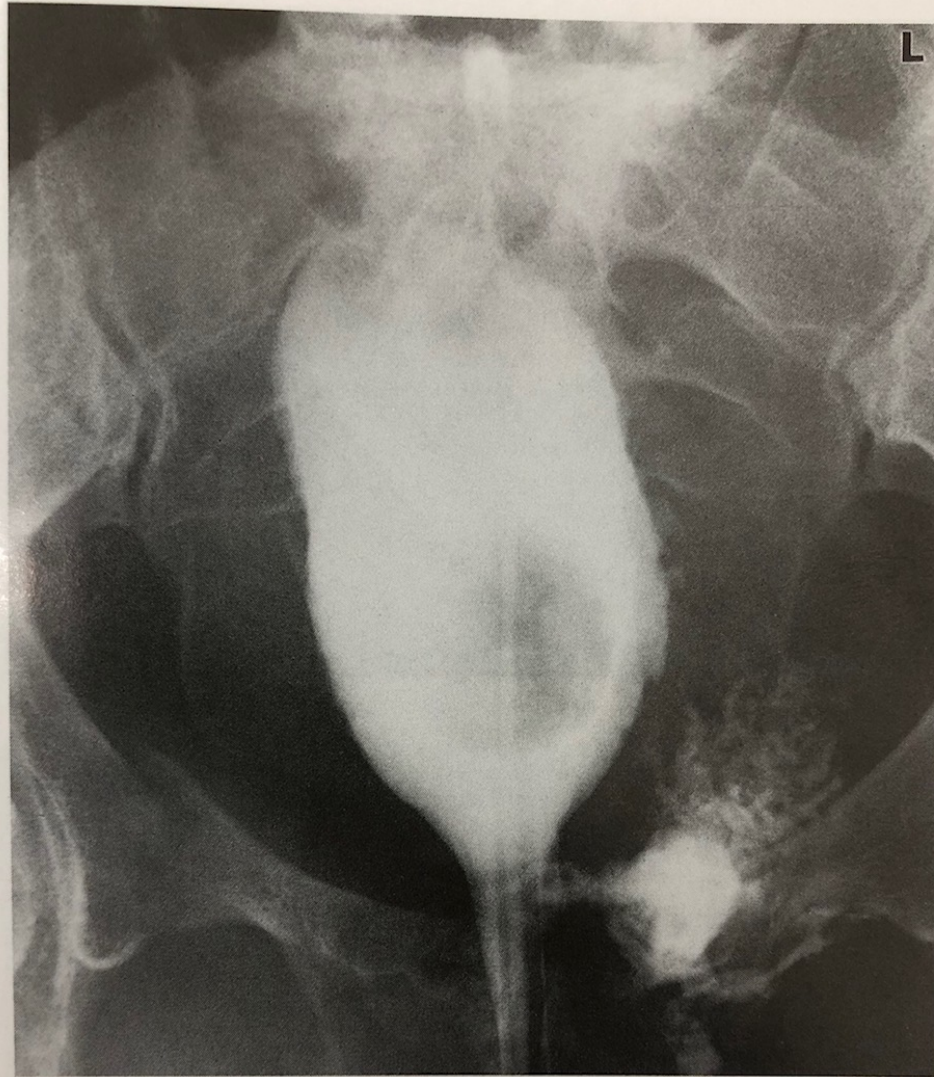
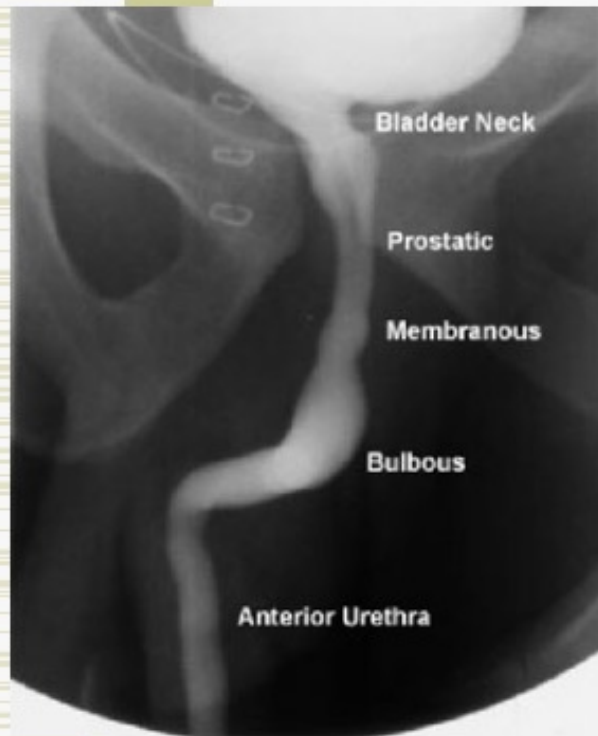


Fig. 8.56 Rupture of the base of the bladder. Cystogram showing extravasation of contrast into the extraperitoneal space on the left, and deformity of the bladder due to surrounding haematoma and urine.

GU Trauma



Normal retrograde urethrogram



Traumatic rupture of bulbous urethra



Thank you