Urinary tract obstruction

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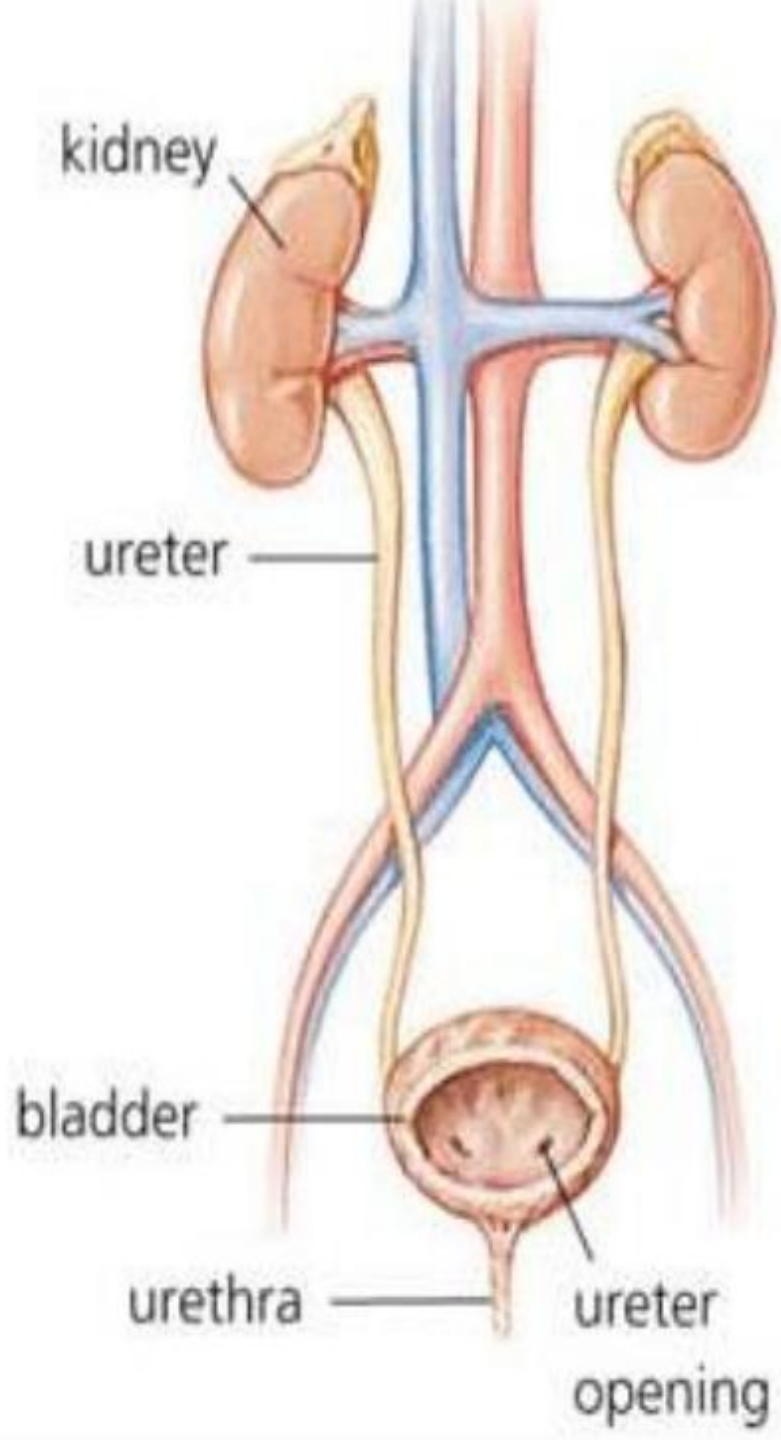
Classification

Obstruction may be classified according to

1. Cause (congenital or acquired).
2. Duration (acute or chronic).
3. Degree (partial or complete).
4. Level (upper or lower urinary tract) .

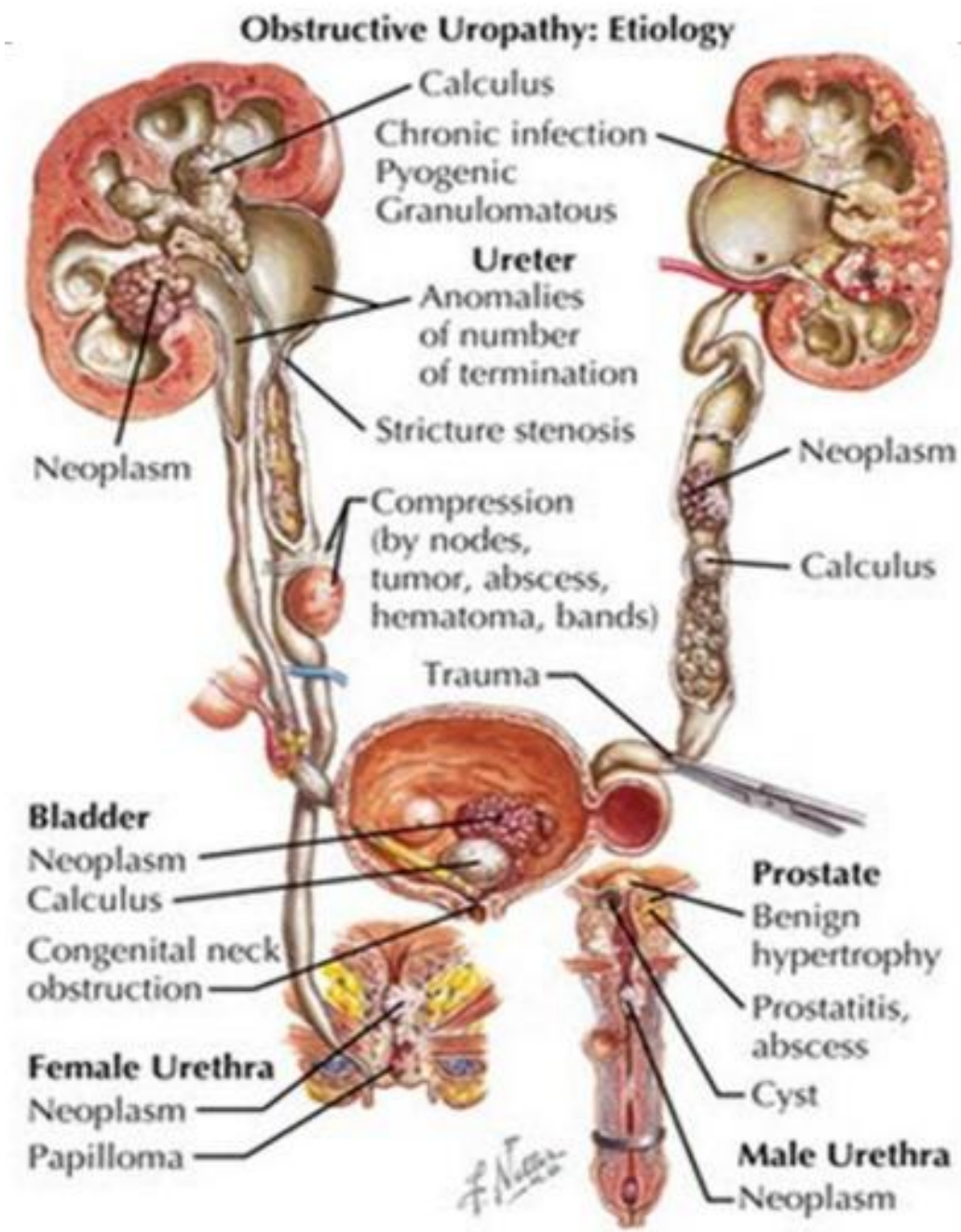

kidney
ureter
bladder
urethra
ureter opening

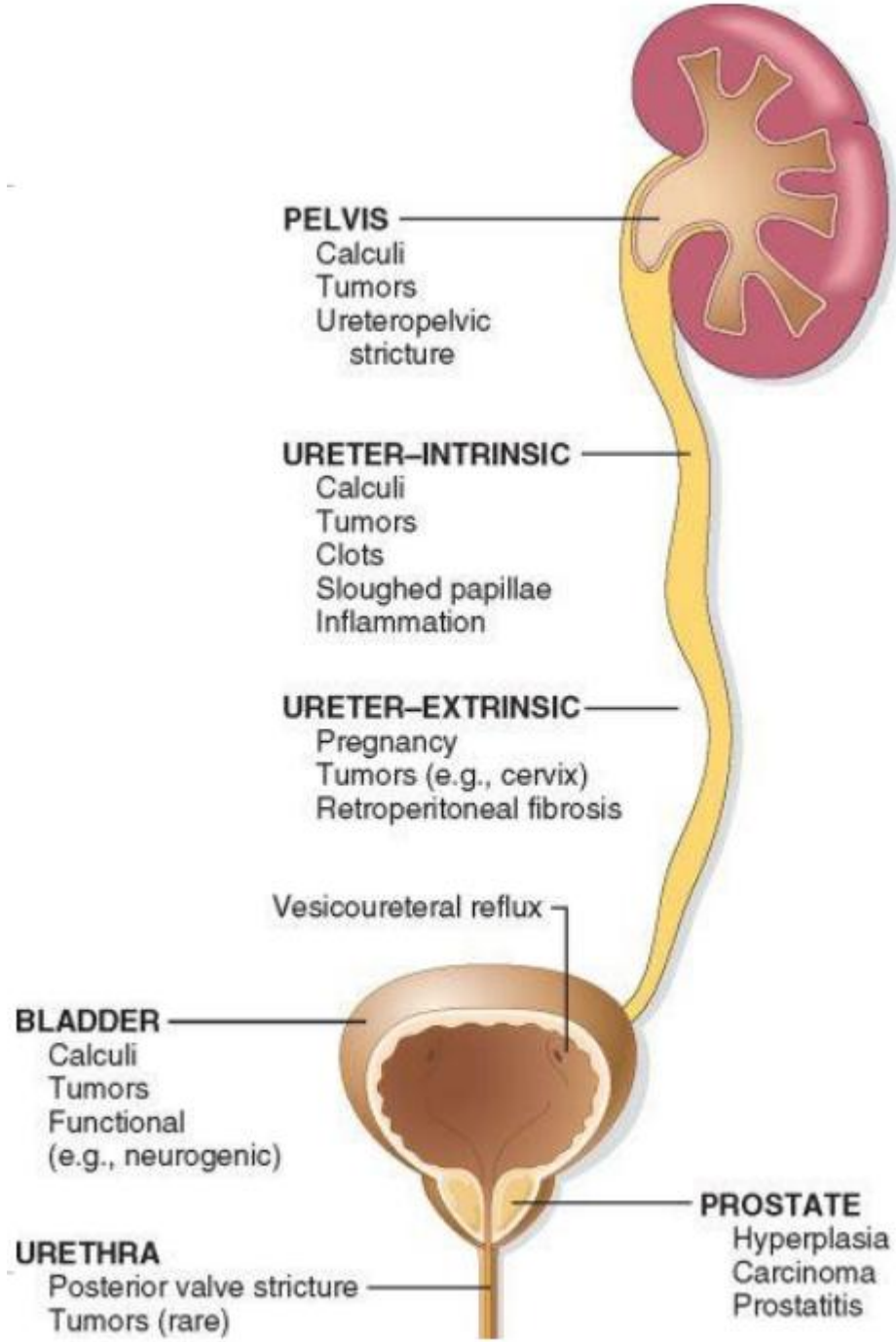
Common causes of obstruction of the lower outflow tract

- Benign prostatic hyperplasia
- Prostatic cancer
- Bladder cancer involving the bladder neck
- Bladder-neck obstruction (dyssynergia, infection, neurological disorders)
- Urethral obstruction (congenital posterior urethral valves, blocked urinary catheter, trauma, infection, stricture).

Common causes of obstruction of the upper urinary tract

- Renal and ureteric calculi (80% are calcium oxalate/phosphate stones)
- Pelviureteric junction obstruction (idiopathic hydronephrosis)
- Retroperitoneal fibrosis (idiopathic/malignant infiltration/radiotherapy)
- Urothelial cell cancer (with or without bleeding and clot)
- Congenital abnormalities (e.g., ectopic ureter, ureterocoele)
- Infections (notably schistosomiasis and tuberculosis).


Obstructive Uropathy: Etiology
Calculus
Chronic infection
Pyogenic
Granulomatous
Ureter
Anomalies
of number
of termination
Stricture stenosis
Neoplasm
Neoplasm
Compression
(by nodes,
tumor, abscess,
hematoma, bands)
Calculus
Trauma
Bladder
Neoplasm
Calculus
Congenital neck
obstruction
Prostate
Benign
hypertrophy
Prostatitis,
abscess
Cyst
Female Urethra
Neoplasm
Papilloma
Male Urethra
Neoplasm

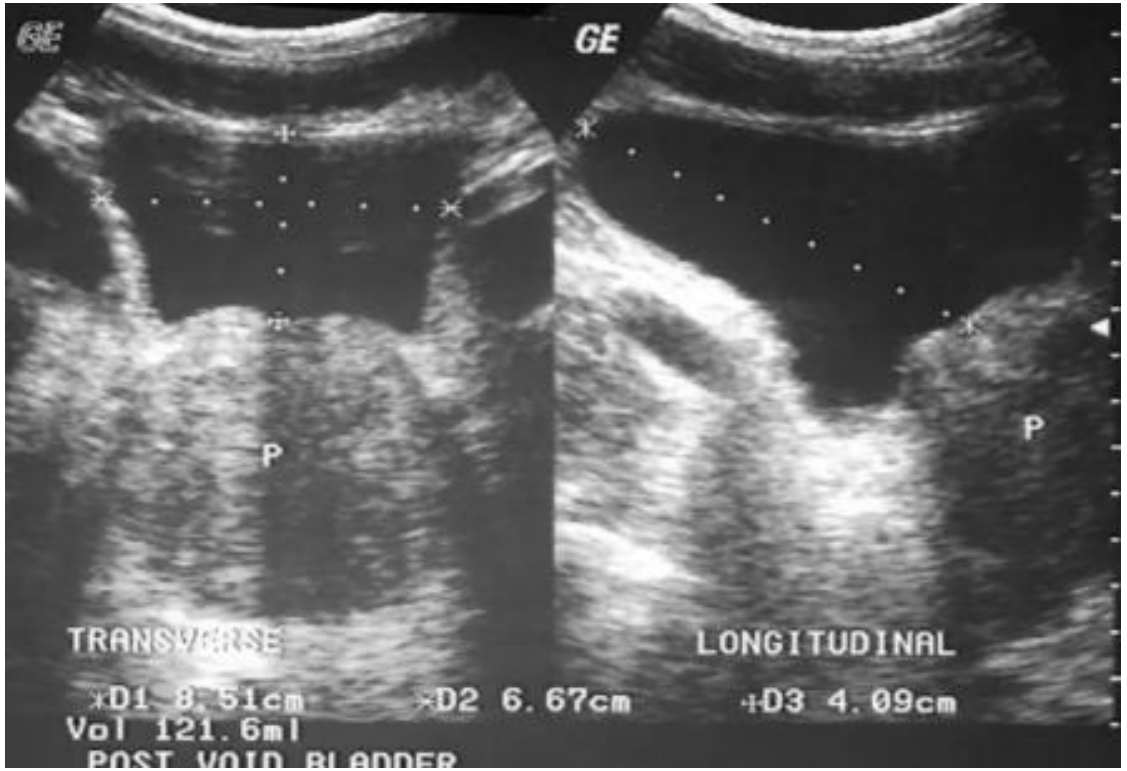

PELVIS
Calculi
Tumors
Ureteropelvic
stricture
URETER–INTRINSIC
Calculi
Tumors
Clots
Sloughed papillae
Inflammation
URETER–EXTRINSIC
Pregnancy
Tumors (e.g., cervix)
Retroperitoneal fibrosis
Vesicoureteral reflux
BLADDER
Calculi
Tumors
Functional
(e.g., neurogenic)
PROSTATE
Hyperplasia
Carcinoma
Prostatitis
URETHRA
Posterior valve stricture
Tumors (rare)

Methods of Imaging the obstruction of the urinary Tract

1. Plain radiography :
Predominantly to evaluate renal tract calcifications .

2. Excretion urography (intravenous urogram [IVU]) : ureteric obstruction severity, site and cause e.g. urolithiasis and PUJ stricture

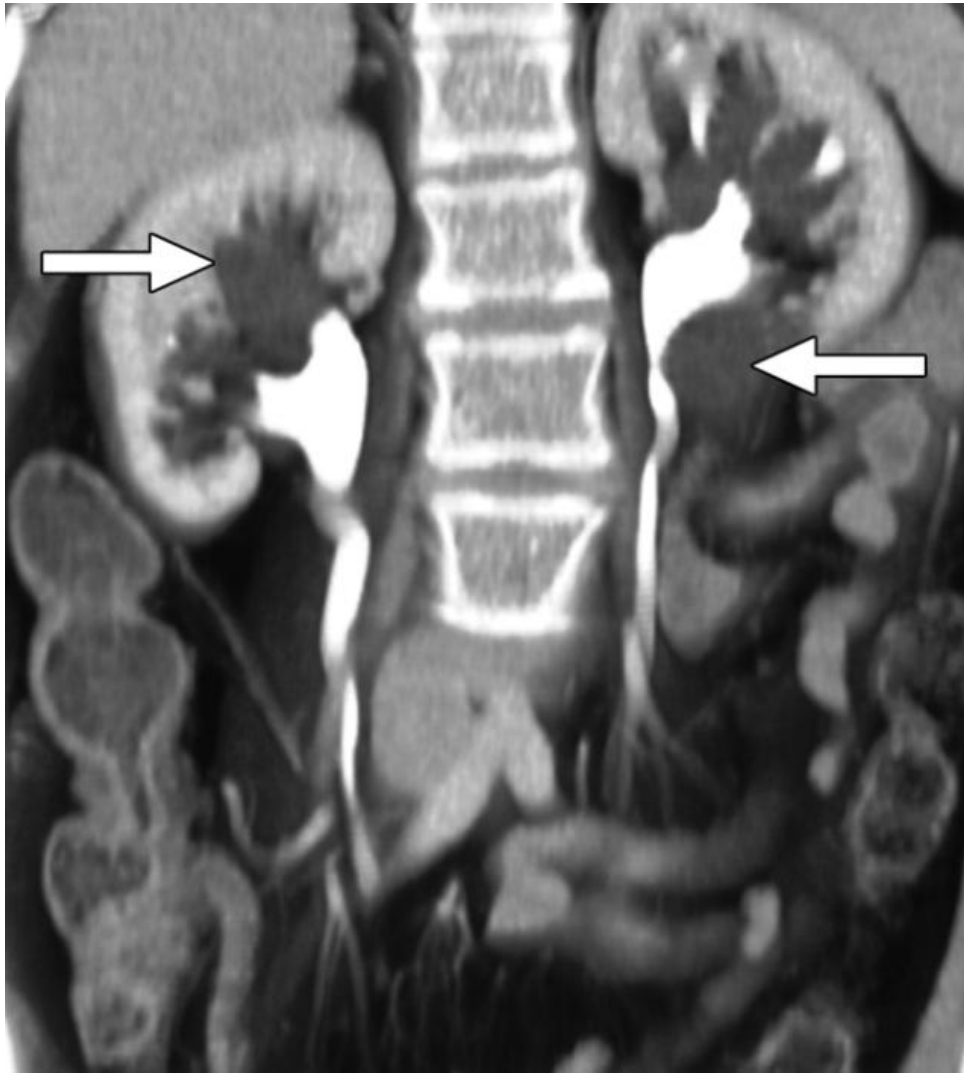
3. Ultrasound (US) :
Bladder outflow obstruction like bladder masses or prostate issue .



4. Computed tomography (CT):

(a) CT KUB (kidneys, ureters, bladder) : CT without contrast for stones detection

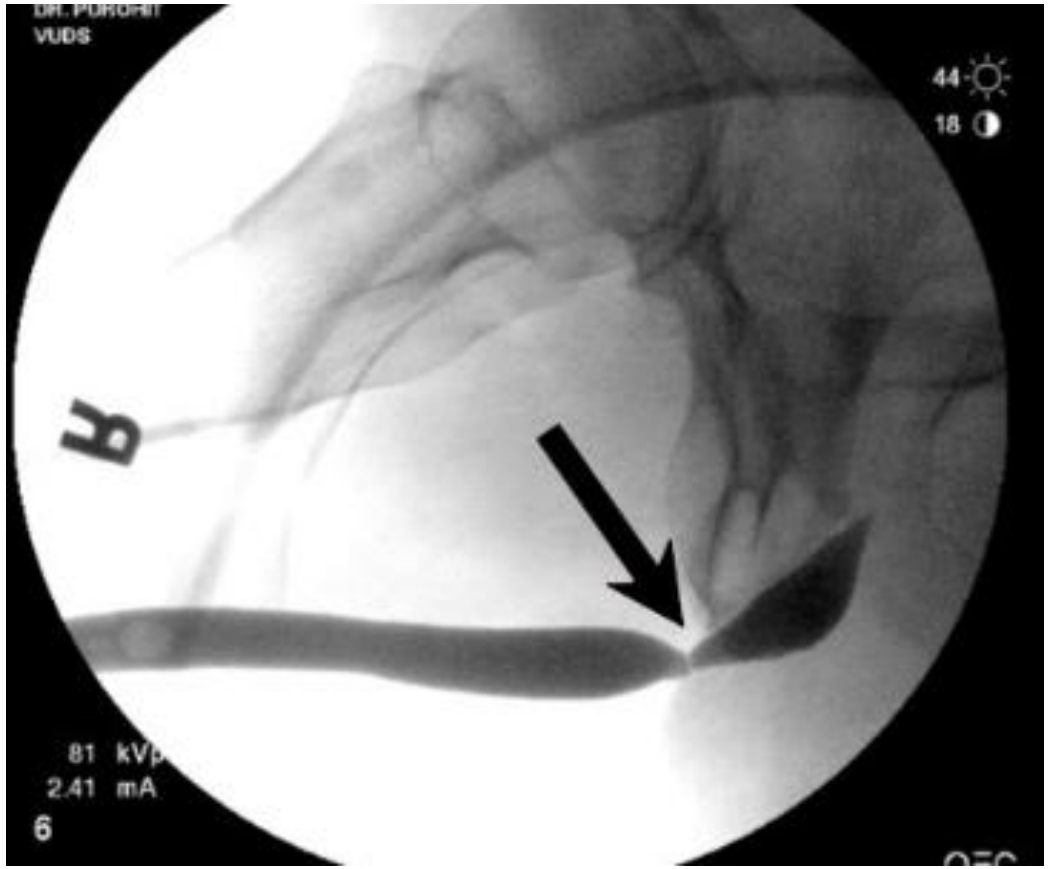
(b) CT urography (CTU) : CT with IV contrast to detect severity of the obstructive uropathy , Hydronephrosis and hydroureter , also if there is bladder masses



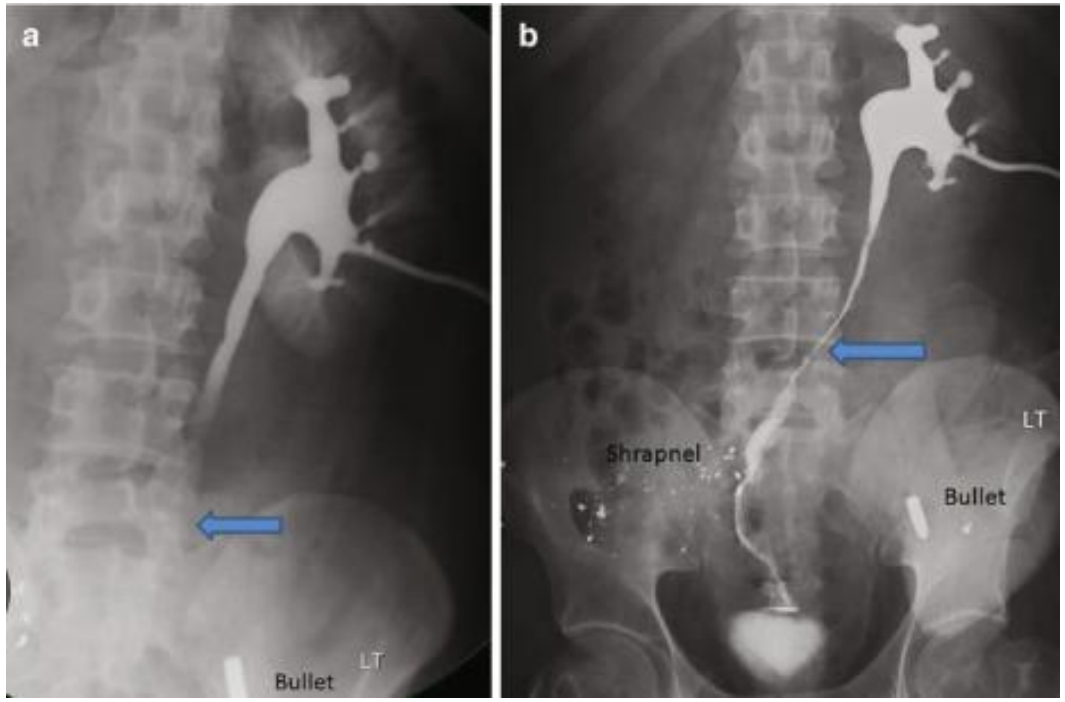
5. Magnetic resonance imaging (MRI):

(a) MR prostate (b) MR bladder (c) MR urography

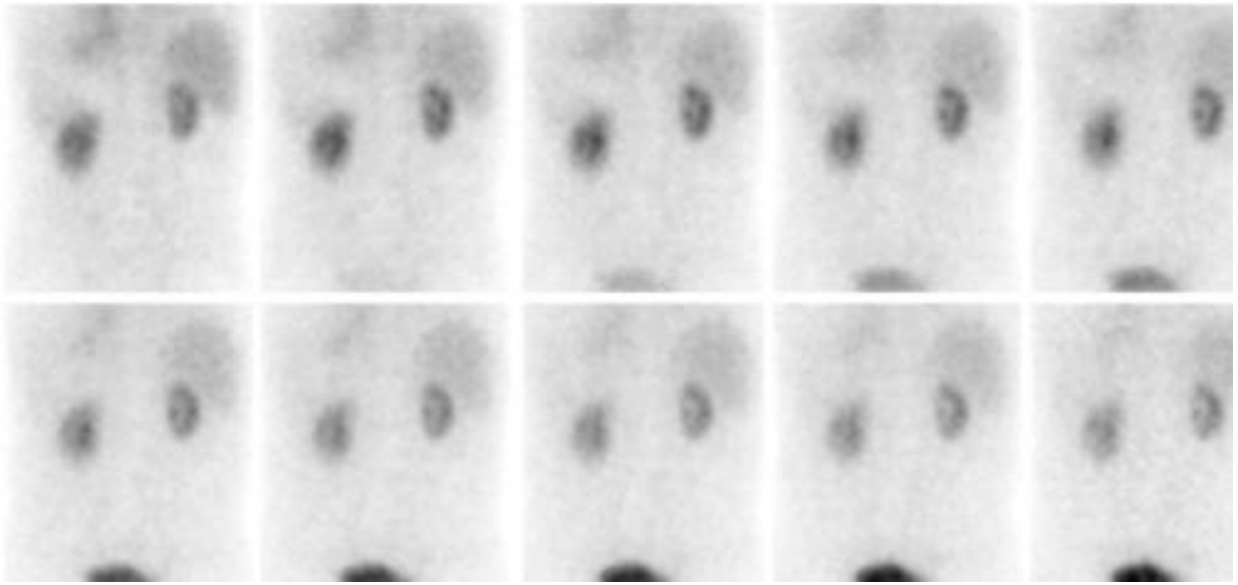
6. Ascending urethrography : for urethral obstruction (stricture due to infection or trauma)



7. Retrograde pyeloureterography :
Demonstration of the site and nature of an obstructive lesion

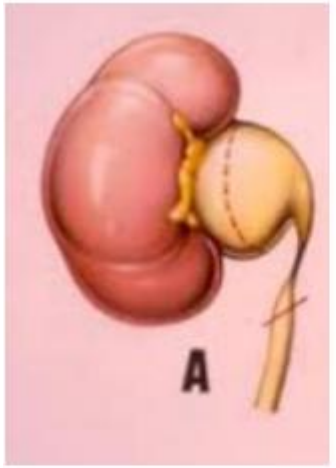


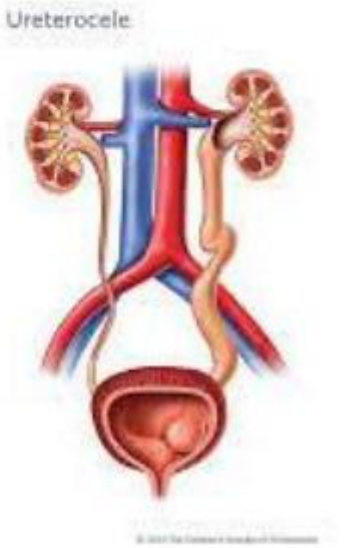
8. Radionuclide imaging: Dynam
renography using 99mTc-MAG-3



Pelviureteric junction obstruction

- Narrowing of the junction between the renal pelvis and the ureter is a common cause of hydronephrosis.
- This condition can present at any age.
- It is likely to be congenital and can be bilateral.





Clinical features

- In its grossest form, PUJ obstruction may produce a large, painless mass in the loin and the volume of urine in the hydronephrotic sac may simulate free fluid in the peritoneal cavity.
- However, the more usual moderate hydronephrosis causes ill-defined renal pain .
- Rarely, there may be no symptoms.

Radiographic features

Dilated renal pelvis is described as "ballooned renal pelvis" with collapsed proximal ureter.

Fluoroscopy/IVU Traditionally, intravenous urography/pyelography (IVU/IVP) has been performed for assessing for pelviureteric junction obstruction.

Ultrasound will often show a dilated renal pelvis with a collapsed proximal ureter

CT May show evidence of hydronephrosis +/- caliectasis with collapsed ureters.

Useful for assessing crossing vessels at the pelviureteric junction, especially when surgical intervention is planned.

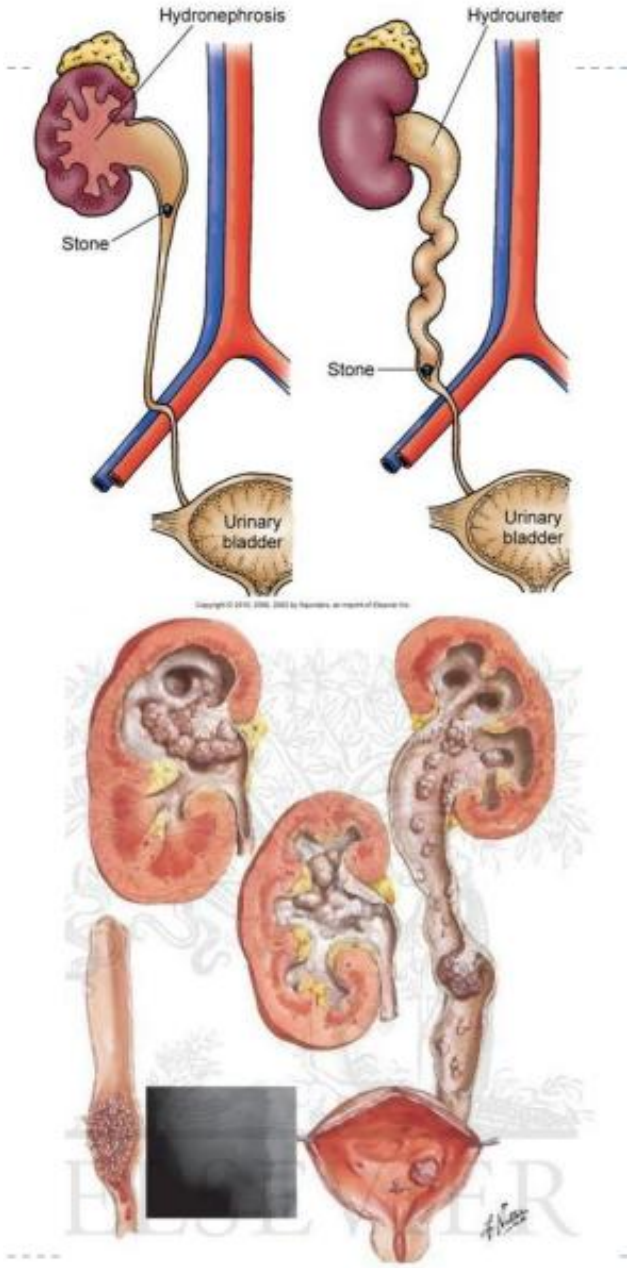
MRI unilateral or bilateral pelviureteric junction (PUJ) obstruction, upstream hydronephrosis and associated congenital renal abnormalities

Management

- Laparoscopic, open or robotic assisted pyeloplasty is performed to remove the obstructing tissue and refashion the PUJ so that the lower part of the renal pelvis drains freely into the ureter .

Ureteric calculi

- Ureteric calculi or stones are those lying within the ureter, at any point from the ureteropelvic junction (UPJ) to the vesicoureteric junction (VUJ).
- They are the classic cause of renal colic-type abdominal pain.



Clinical presentation

- Patients with ureteric calculi may present with peristaltic pain (renal colic)
- Hematuria
- Nausea and vomiting.

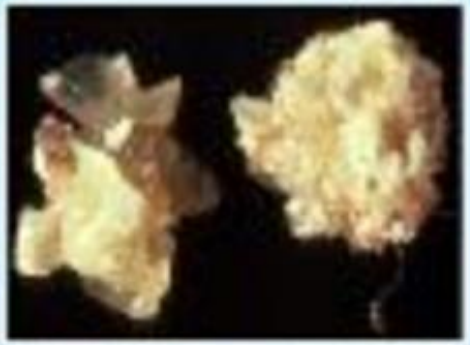
Pathology

Up to 80% of renal calculi are formed by calcium stones.

Other types include

struvite, uric acid and cystine stones.

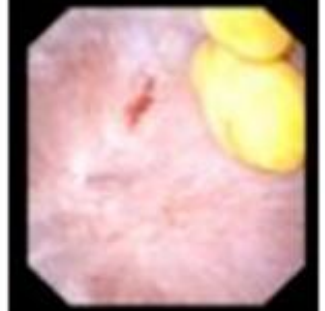
CaOx MonoHydrate



CaOx DiHydrate

Uric Acid

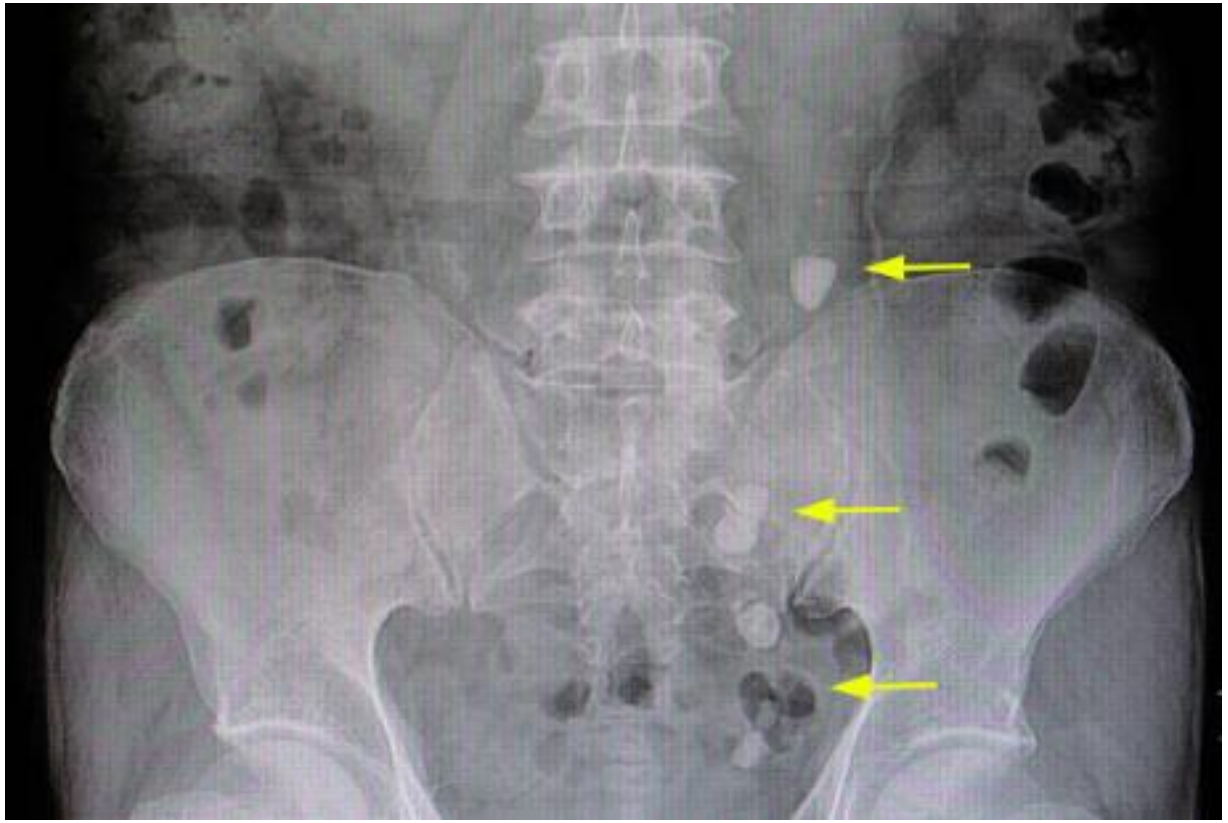
Cystine



Radiographic features

Plain radiograph

- A plain abdominal (KUB) film can identify large radiopaque calculi.
- However, smaller calculi and/or radiolucent stones may go undetected.

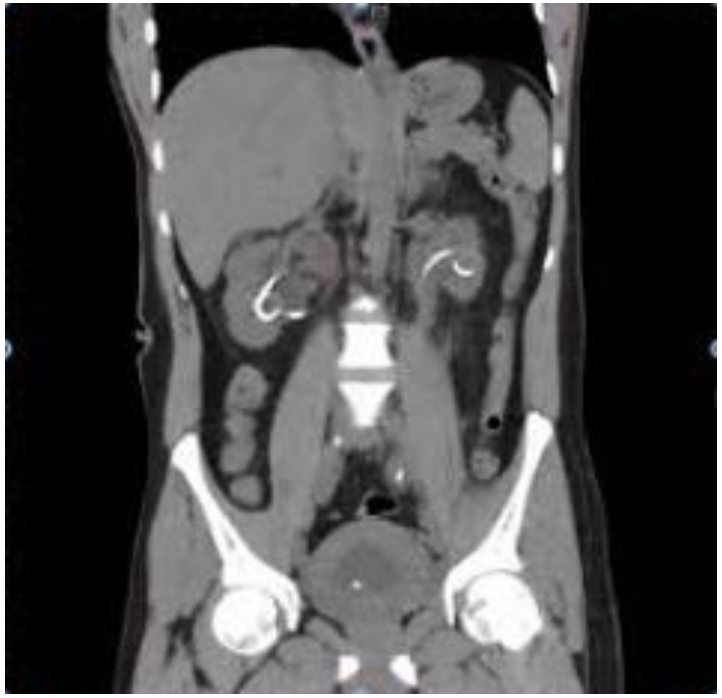


CT

Non-contrast CT (CT KUB) is the gold standard for imaging ureteric stones, with the vast majority (99%) being radiodense.

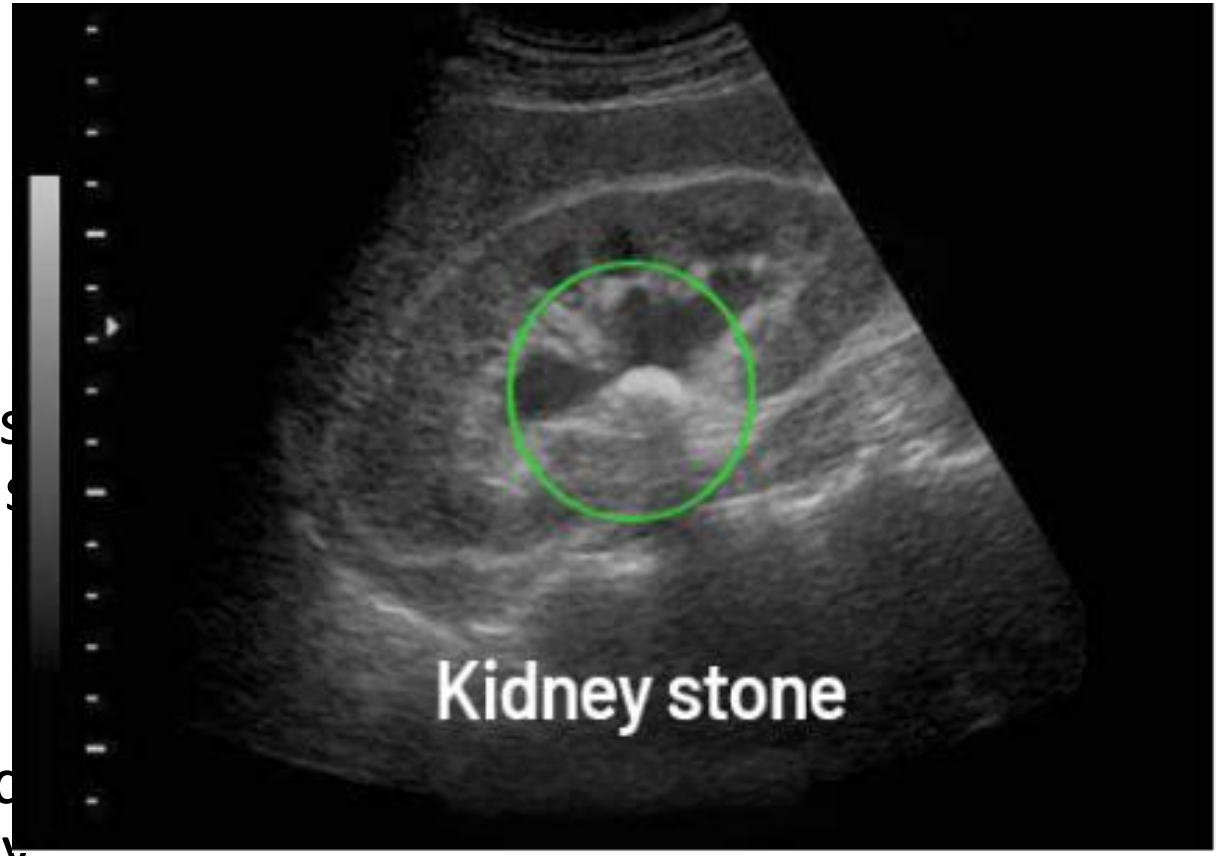
Stones >1 mm in size are visualized, with the specificity of helical CT as high as 100% .

CT KUB can also detect secondary signs of urinary tract obstruction, including ureterohydronephrosis and perinephric stranding



Ultrasound

- There is evidence that screening patients with ultrasound in the emergency department can help avoid CT in more than half of patients leading to reduced cumulative radiation dose .
- Ultrasound may be used for patients who need to avoid radiation, such as pregnant women.
- It is also useful for assessing for complications, such as hydronephrosis or pyonephrosis and in aiding percutaneous nephrostomy tube insertion in septic patients.

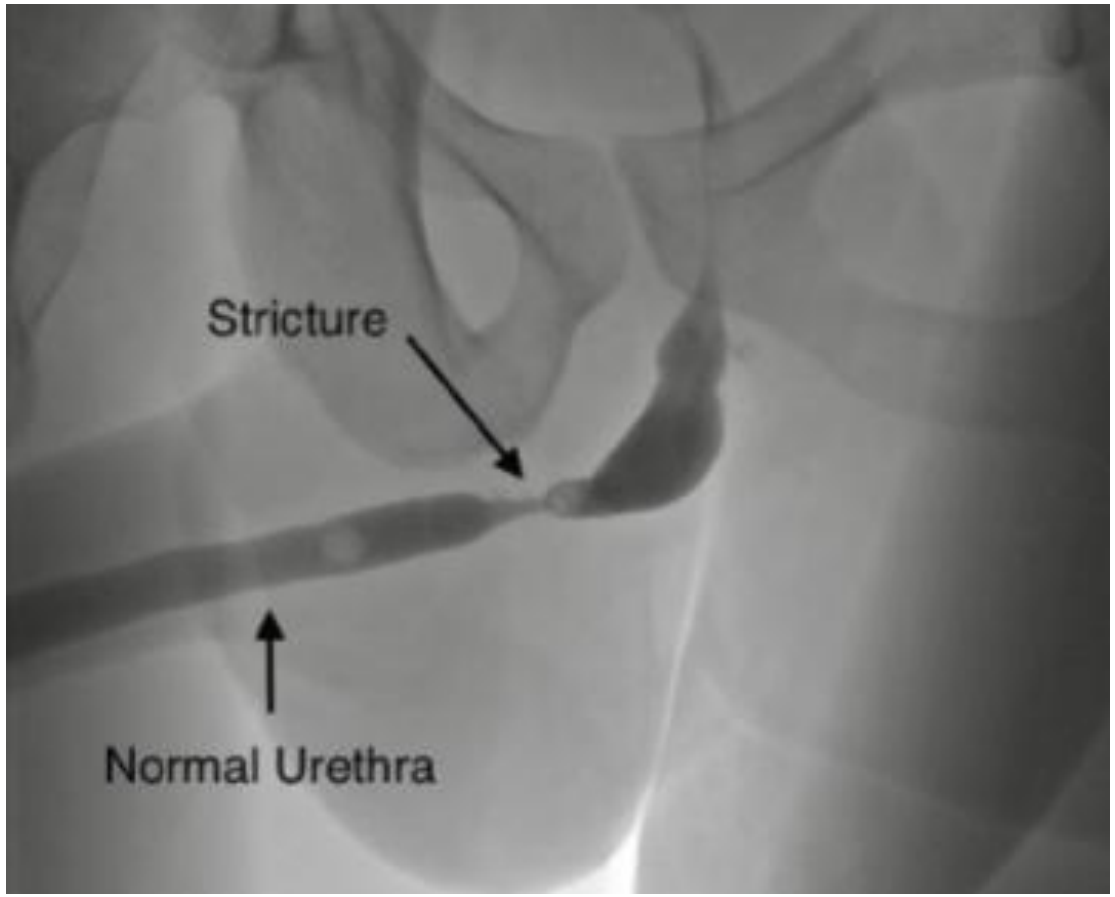


Urethral stricture

Urethral strictures are relatively common and typically occur either in the setting of trauma or infection.

Clinical presentation

- The primary mode of presentation of a symptomatic stricture is with poor urinary stream.
- If severe, bladder hypertrophy and trabeculation may occur.



Common causes of urethral strictures include :

1.**Infection :** gonococcal urethritis (more common) , non-gonococcal urethritis (less common)

2. External trauma : straddle injury (most common) and pelvic fractures

3.Iatrogenic : instrumentation , prolonged catheterization and transurethral resection of the prostate

Radiographic features

Radiographic evaluation helps define the location, length, number, and degree of strictures.

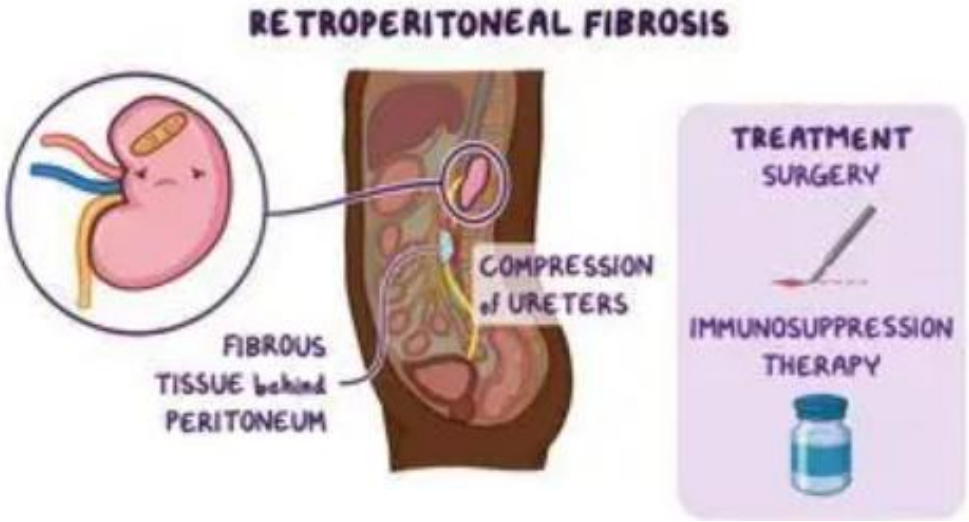
Fluoroscopy

Retrograde urethrography is the primary method used to image anterior urethral stricture. In posterior urethral strictures following blunt trauma, simultaneous antegrade

cystourethrography and retrograde urethrography are often required to determine the length of the urethral defect.

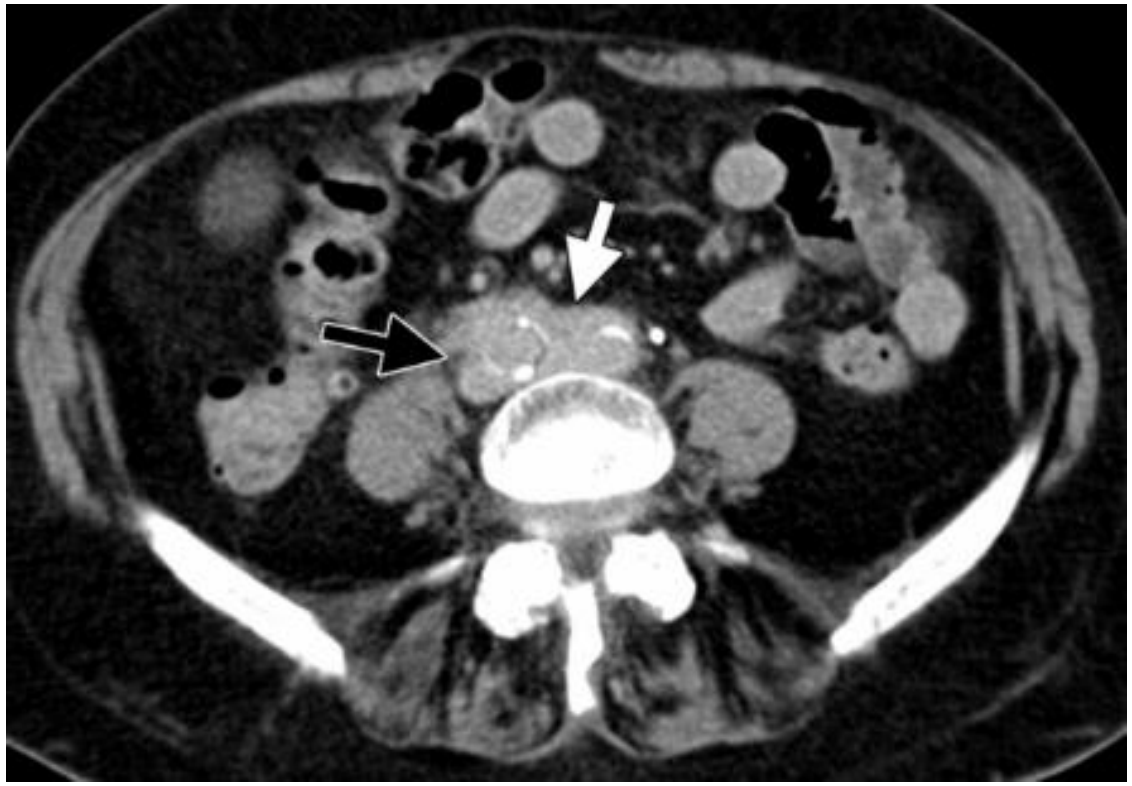
Retroperitoneal fibrosis

- Fibrosis of the retroperitoneal connective tissues may encircle and compress the ureter(s), causing obstruction.
- The fibrosis is most commonly idiopathic but can represent a reaction to infection, radiation or aortic aneurysm, or be caused by metastatic cancer.
- It is recognised as part of the spectrum of disorders associated with elevated IgG4 levels.
- Rarely, it can be associated with inflammatory bowel disease. Patients usually present with ill-defined symptoms of ureteric obstruction.



Radiographic features

Imaging with CT or IVU shows ureteric obstruction with medial deviation of the ureters.

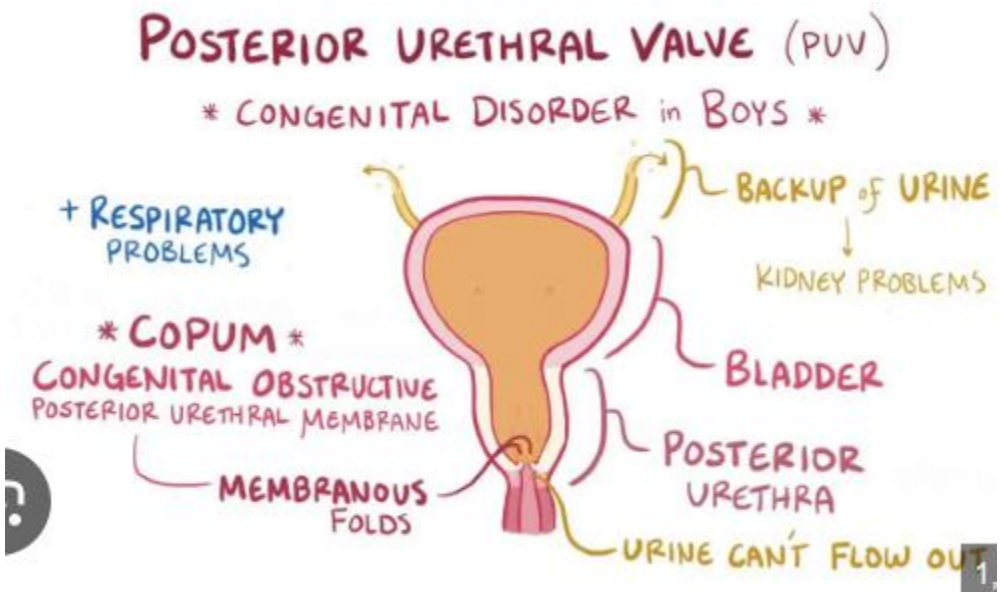


Management

- Idiopathic retroperitoneal fibrosis may respond well to glucocorticoids (with a reduction in inflammatory marker levels)
- But ureteric stenting is often necessary to relieve obstruction and preserve renal function.
- Failure to improve indicates the need for surgery (ureterolysis), both to relieve obstruction and to exclude malignancy.

Posterior Urethral Valves (PUVs)

PUVs represent congenital folds (thick folds > thin folds) located in the posterior urethra near the distal end of the verumontanum. Commonly discovered on prenatal US.

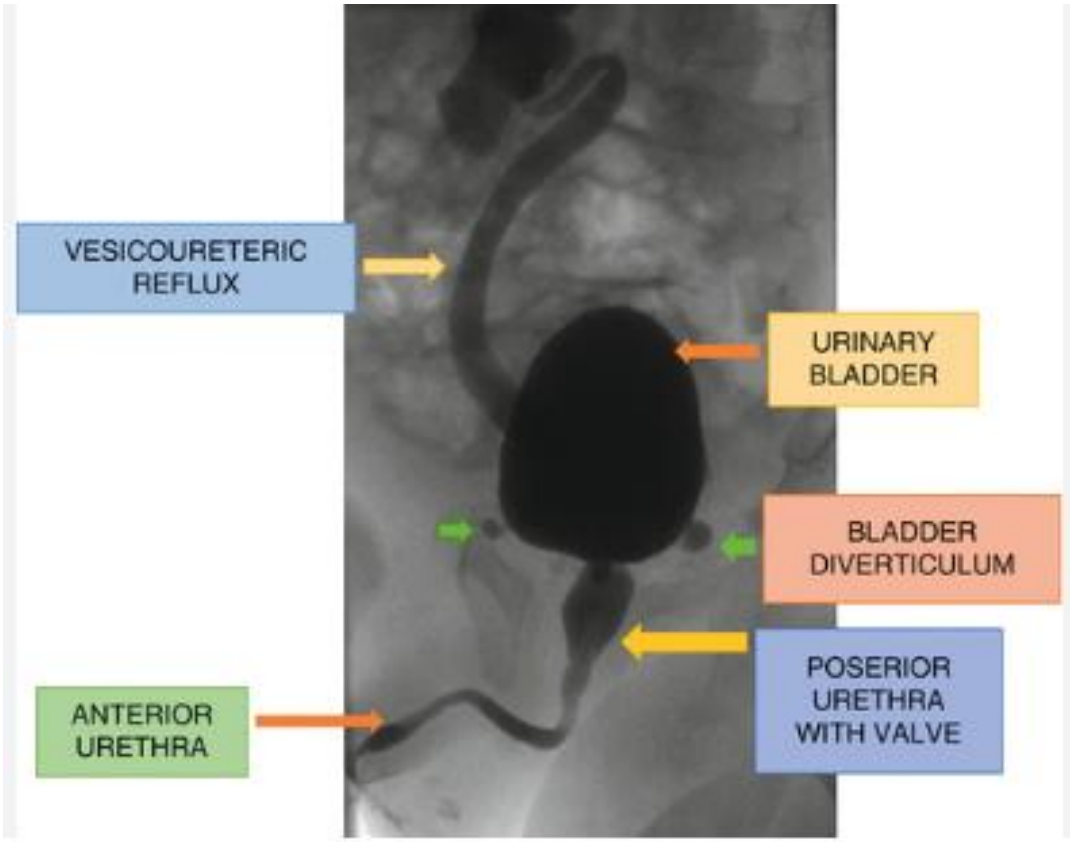


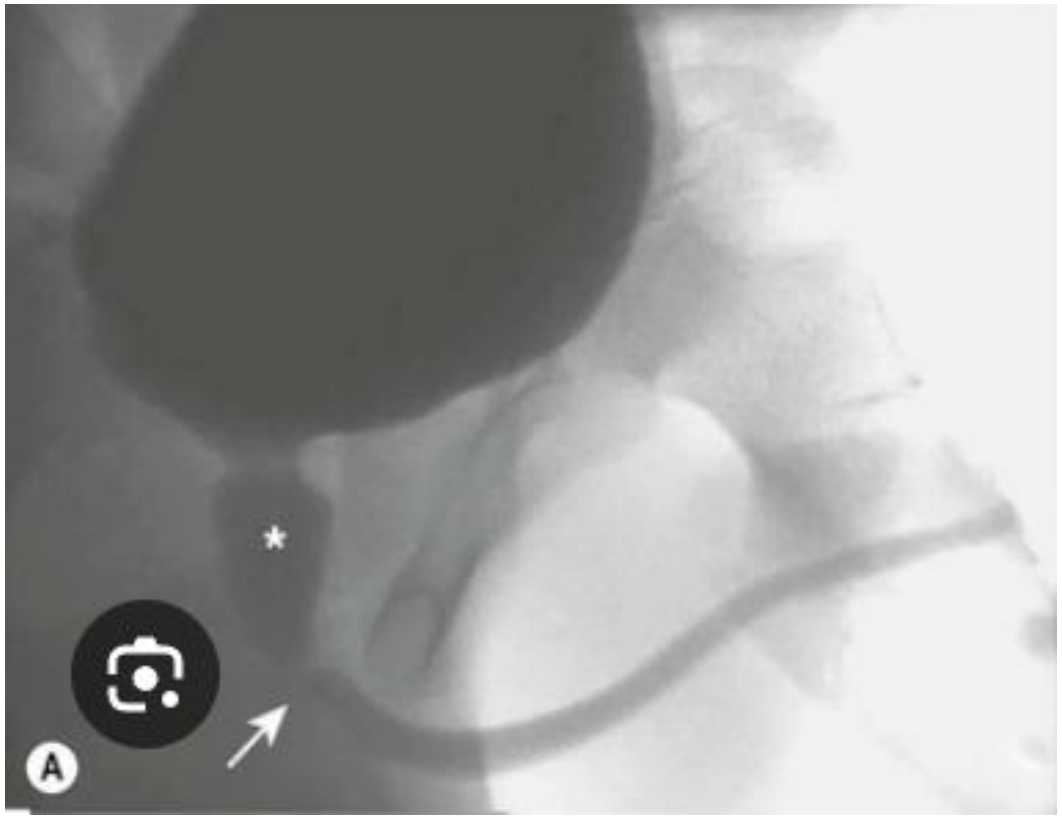
Clinical Findings

- PUVs are the most common cause (35%) of obstructive symptoms (hesitancy, dribbling, enuresis).
- UTI, 35%
- Palpable bladder or kidney in neonates, 20%
- Hematuria, 5%

Radiographic Features

- Windsock appearance .
- Posterior urethra above valves is dilated and elongated.
- Bladder trabeculation, saccules, and small diverticula
- VUR
- Hydroureter and hydronephrosis


VESICOURETERIC REFLUX
URINARY BLADDER
BLADDER DIVERTICULUM
POSERIOR URETHRA WITH VALVE
ANTERIOR URETHRA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