Urinary system imaging

lecture (1)
5TH stage

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Aims of our lecture:

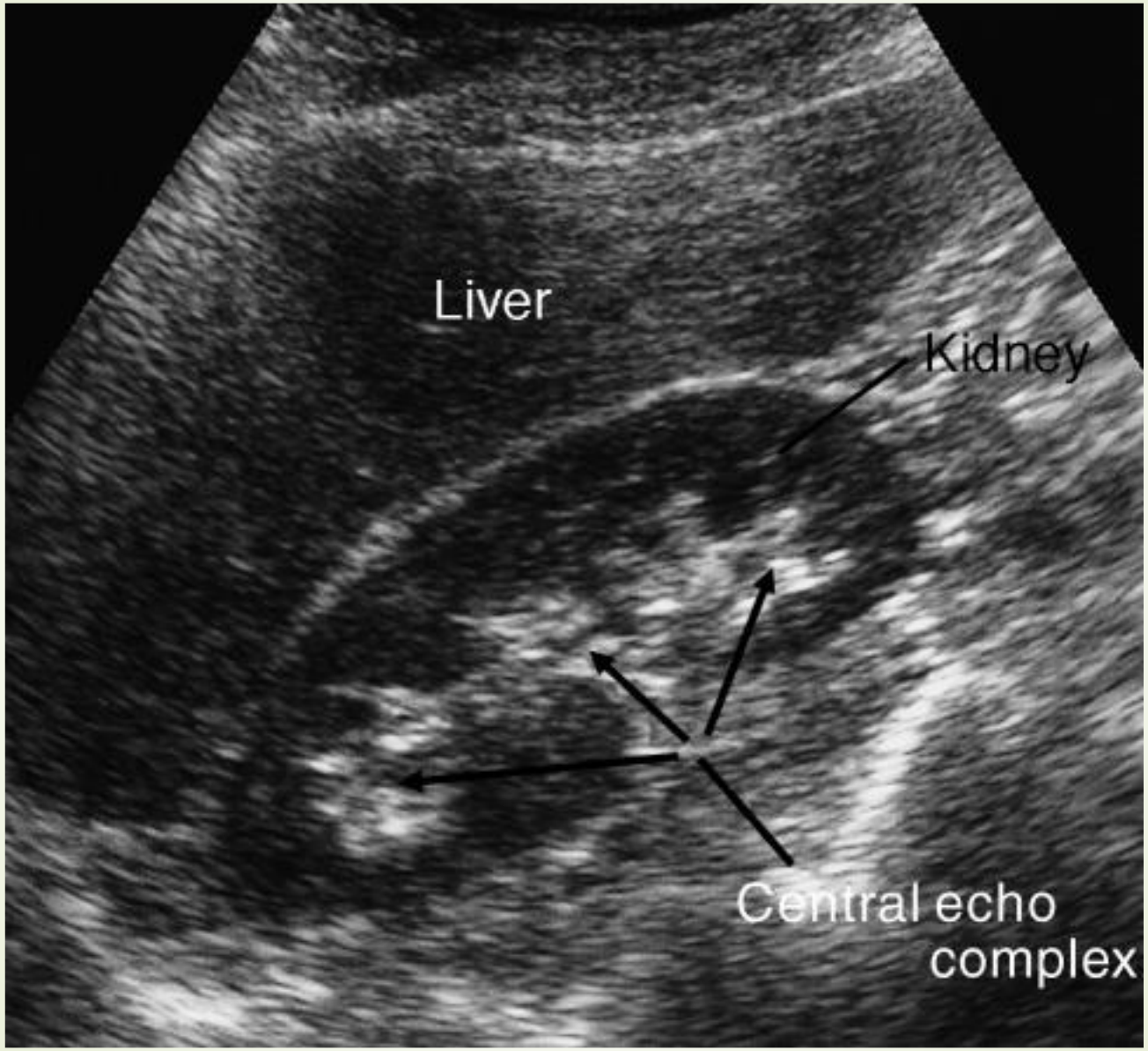
- To know the different radiological techniques used in urinary tract
- To know different renal pathologies.
- Urinary bladder diseases
- Prostate and urethra disease
- Scrotal and testicular disorders
- Female genital organs imaging

I) Radiological techniques used in urinary tract imaging:

- Ultrasonography
- Urography
- CT scan
- MRI
- Radionuclide scanning
- Special techniques:
  - Retrograde and antegrade pyelography
  - Voiding cystourethrogram (micturating cystogram) and videourodynamics
  - Urethrography
  - Renal arteriography.

Ultrasonography:

- Investigate patients with symptoms thought to arise from the urinary tract.
- Demonstrate the size of the kidneys and exclude hydronephrosis in patients with renal failure.
- Diagnose hydronephrosis, renal tumours, abscesses and cysts including polycystic disease.
- Assess and follow-up renal size and scarring in children with urinary tract infections.
- Assess the bladder and prostate.


Liver
Kidney
Central echo
complex

- The normal adult renal length, measured by ultrasound, is 9–12 cm.
- Renal length varies with age, being maximal in the young adult.
- There may be a difference between the two kidneys, normally less than 1.5 cm.
- A kidney with a bifid collecting system is usually 1–2 cm larger than a kidney with a single pelvicaliceal system.

Causes of small kidney

Diagnosis	
Unilateral but may be bilateral	Chronic pyelonephritis Tuberculosis Obstructive atrophy Renal artery stenosis or occlusion Hypoplasia Radiation nephritis
Always bilateral	Chronic glomerulonephritis of many types Hypertensive nephropathy Diabetes mellitus Collagen vascular diseases Analgesic nephropathy

Causes of large kidneys

Diagnosis	
Always unilateral	Compensatory hypertrophy
May be unilateral or bilateral	Bifid collecting system Renal mass Hydronephrosis Lymphomatous infiltration
	Renal vein thrombosis
Always bilateral	Polycystic disease Acute glomerulonephritis Amyloidosis

Urography:

Indications:

- When detailed demonstration of the pelvicaliceal system and ureters are required
- Suspected ureteric injury, e.g. following pelvic surgery or trauma
- Assessment of acute ureteric colic

Intravenous (Excretory) Urography

Preliminary

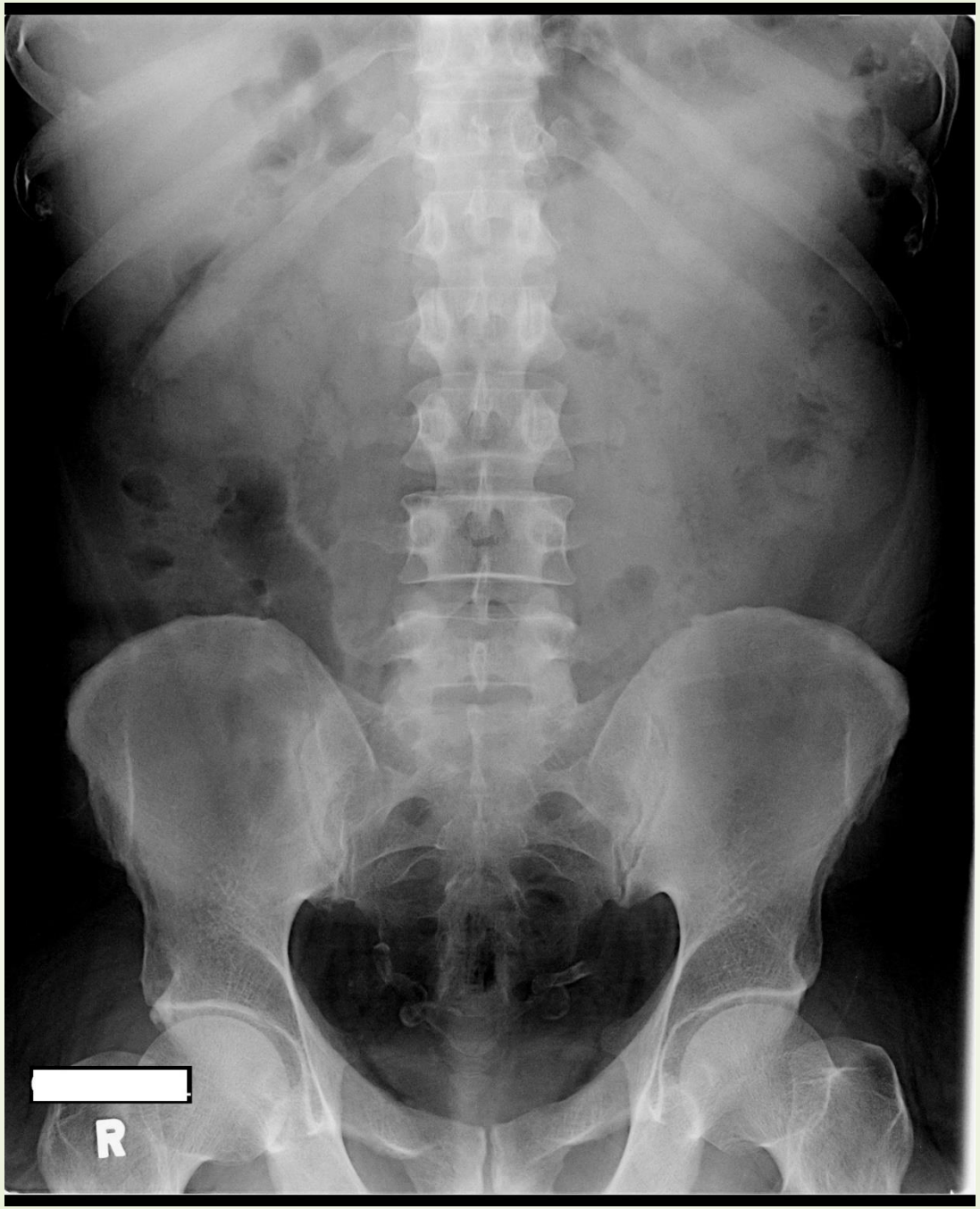
Immediate

5 minutes

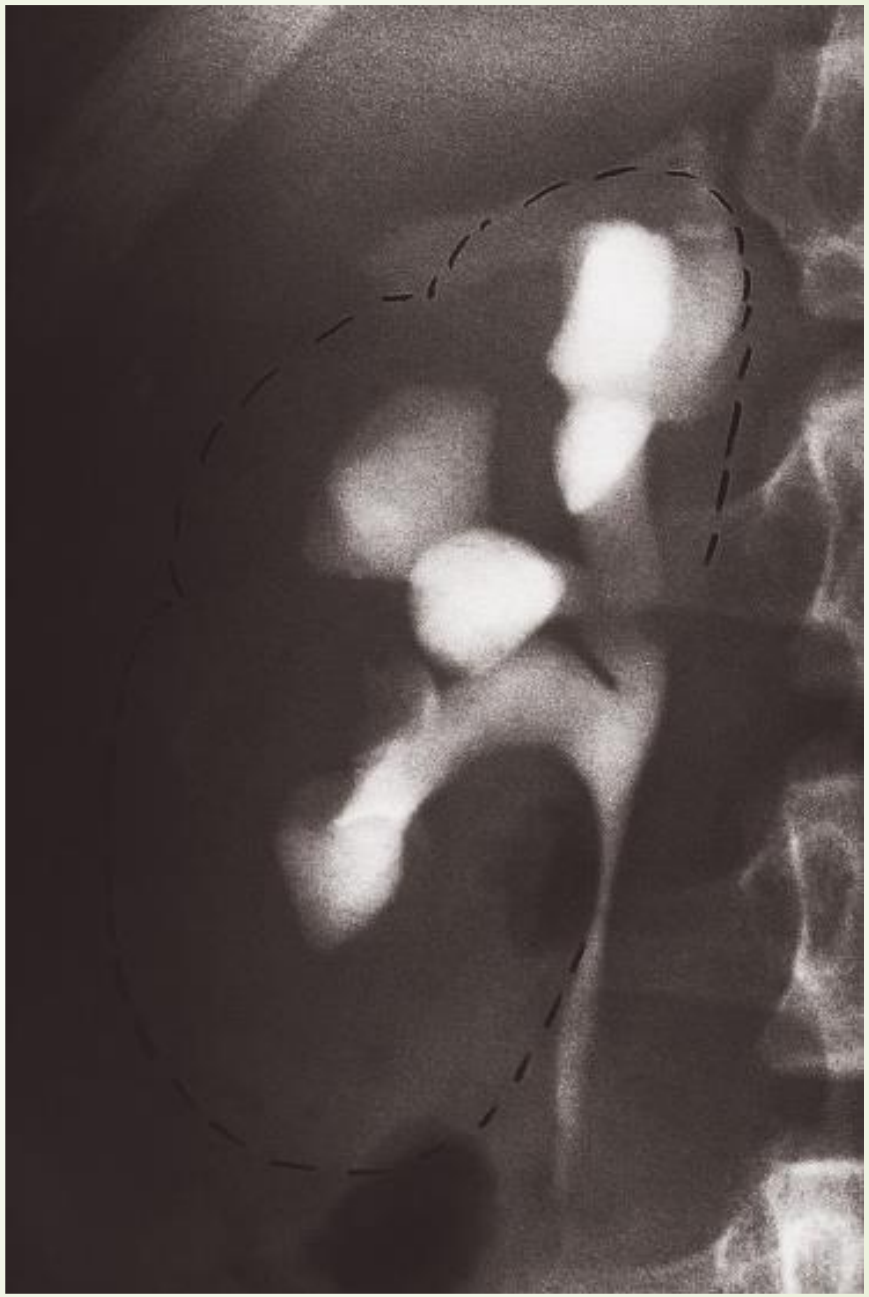
Compression

Release

Post -micturation


R

1. Check the Kidneys: outline, size, site
2. Check the calyces: **cupped**
3. Check renal pelvis and ureter
4. Check the bladder



Causes of calyceal dilatation:

A: Due to obstruction

1. **Within the lumen:**
   - I. calculus
   - II. blood clot
   - III. sloughed papilla
2. **Within the wall of the collecting system**
   - I. intrinsic pelviureteric junction obstruction
   - II. transitional cell tumour
   - III. infective stricture (e.g. tuberculosis or schistosomiasis)
3. **Extrinsic compression**
   - I. retroperitoneal fibrosis
   - II. pelvic tumour, e.g. cervical, ovarian or rectal carcinoma
   - III. aberrant renal artery or retrocaval ureter

B) Due to papillary atrophy or destruction:

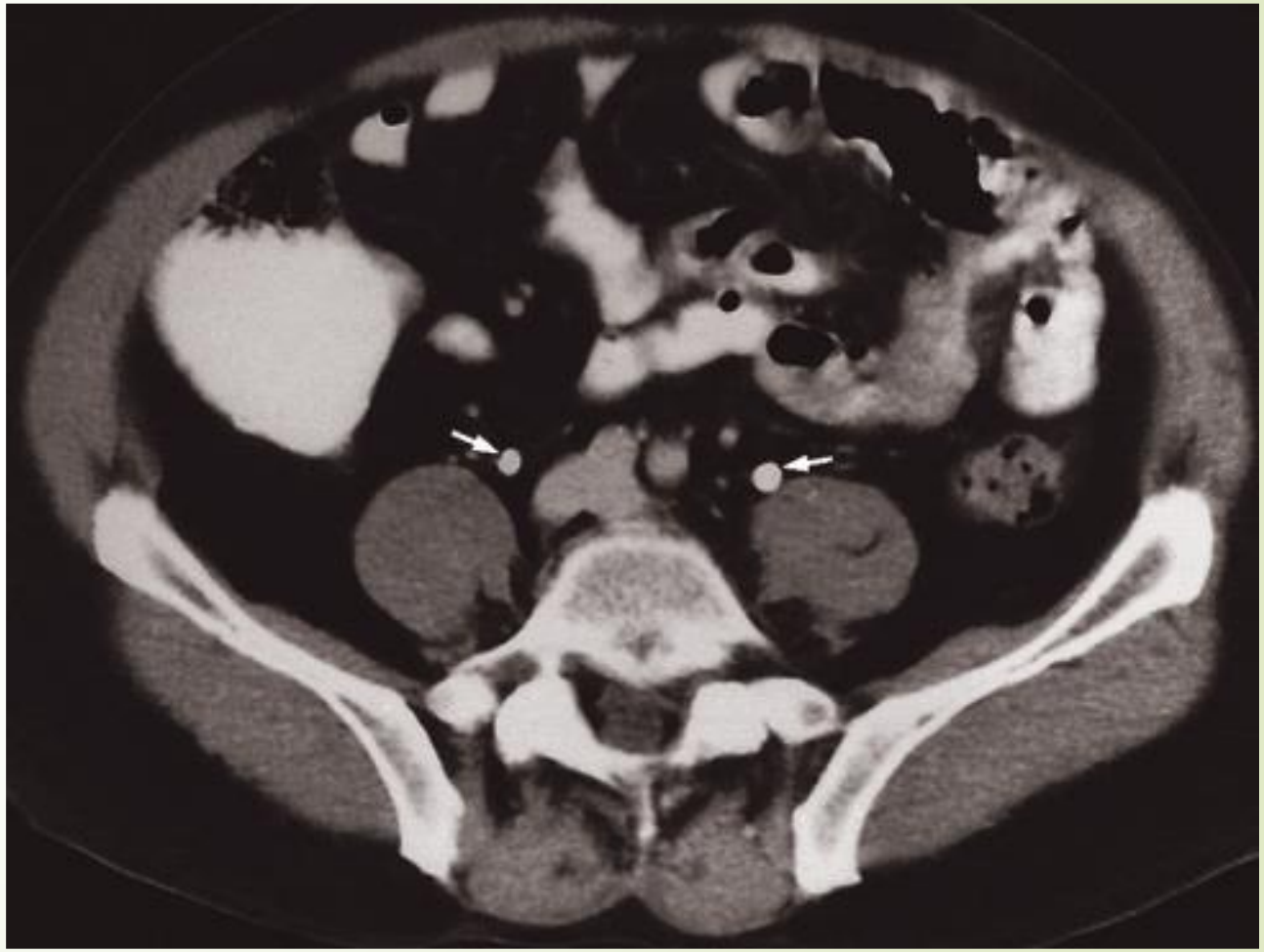
1. Reflux nephropathy
2. Papillary necrosis
3. Tuberculosis

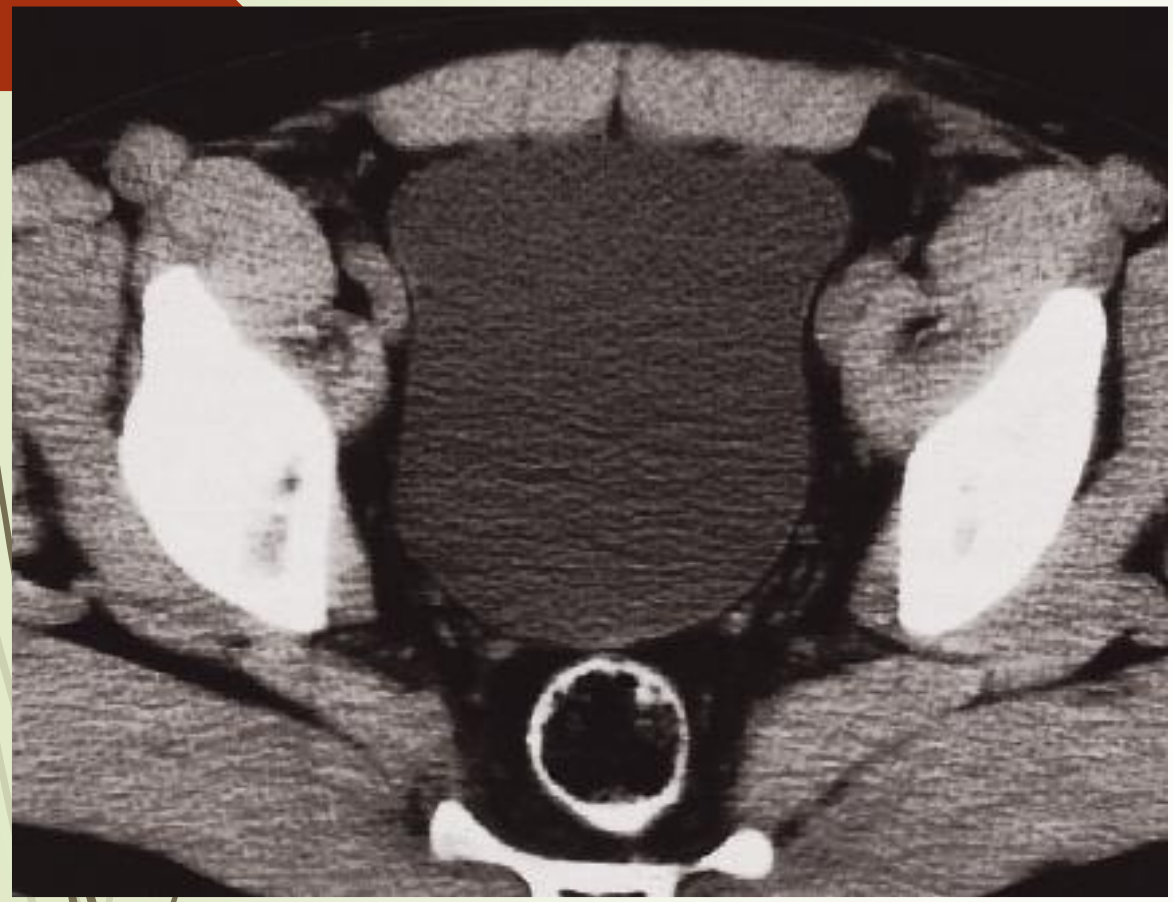
Indication of CT urography

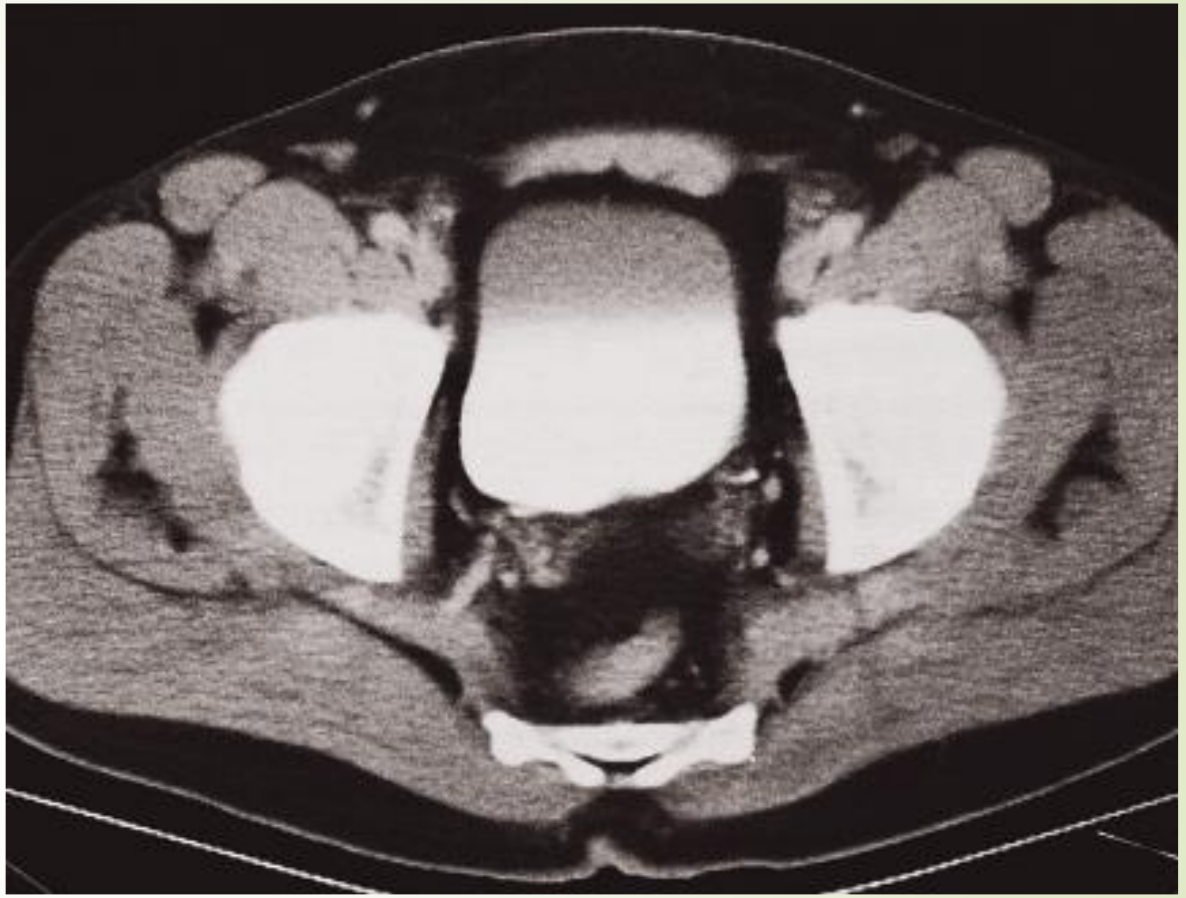
- Investigation of renal calculi
- Investigation of haematuria
- Characterization of a renal mass
- Staging and follow-up of renal carcinoma
- To delineate renal vascular anatomy (e.g. suspected renal artery stenosis or prior to live related kidney donation)
- To diagnose or exclude renal trauma

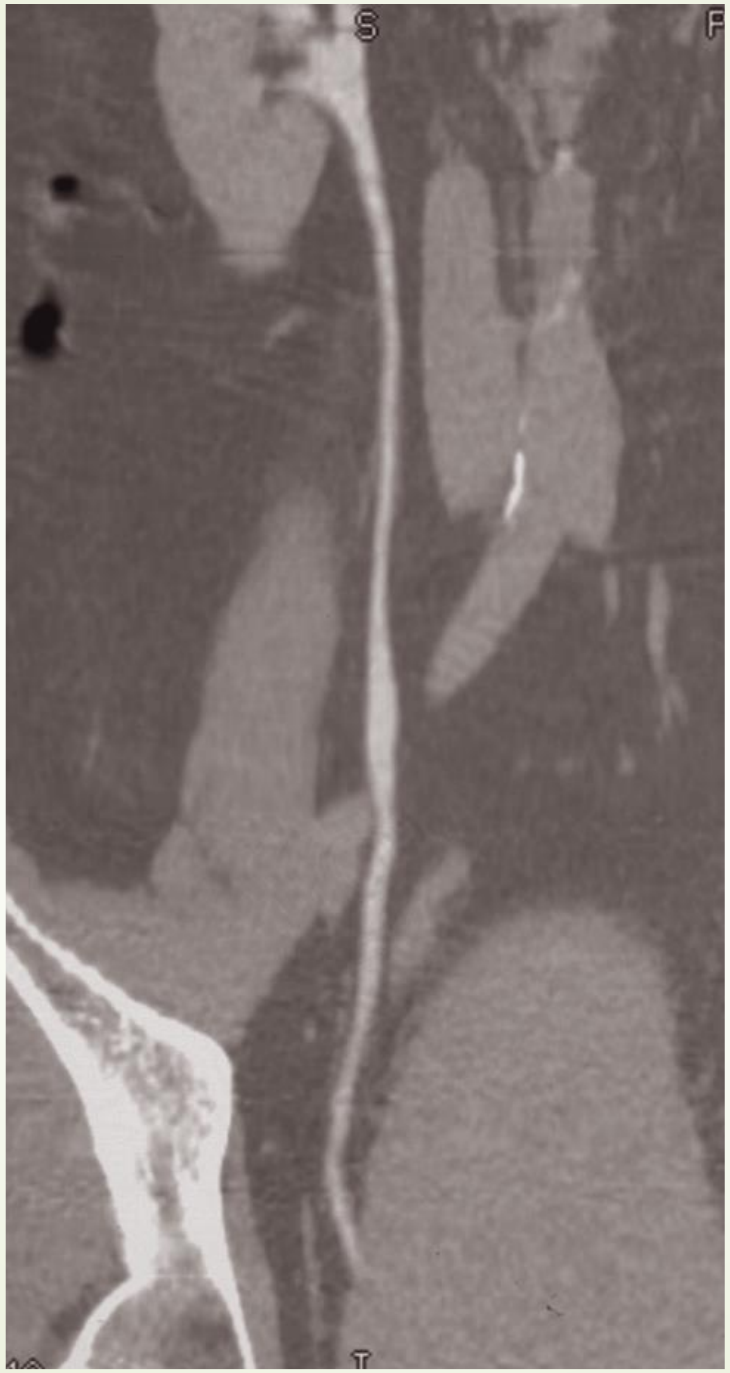
CT urography

CT urography

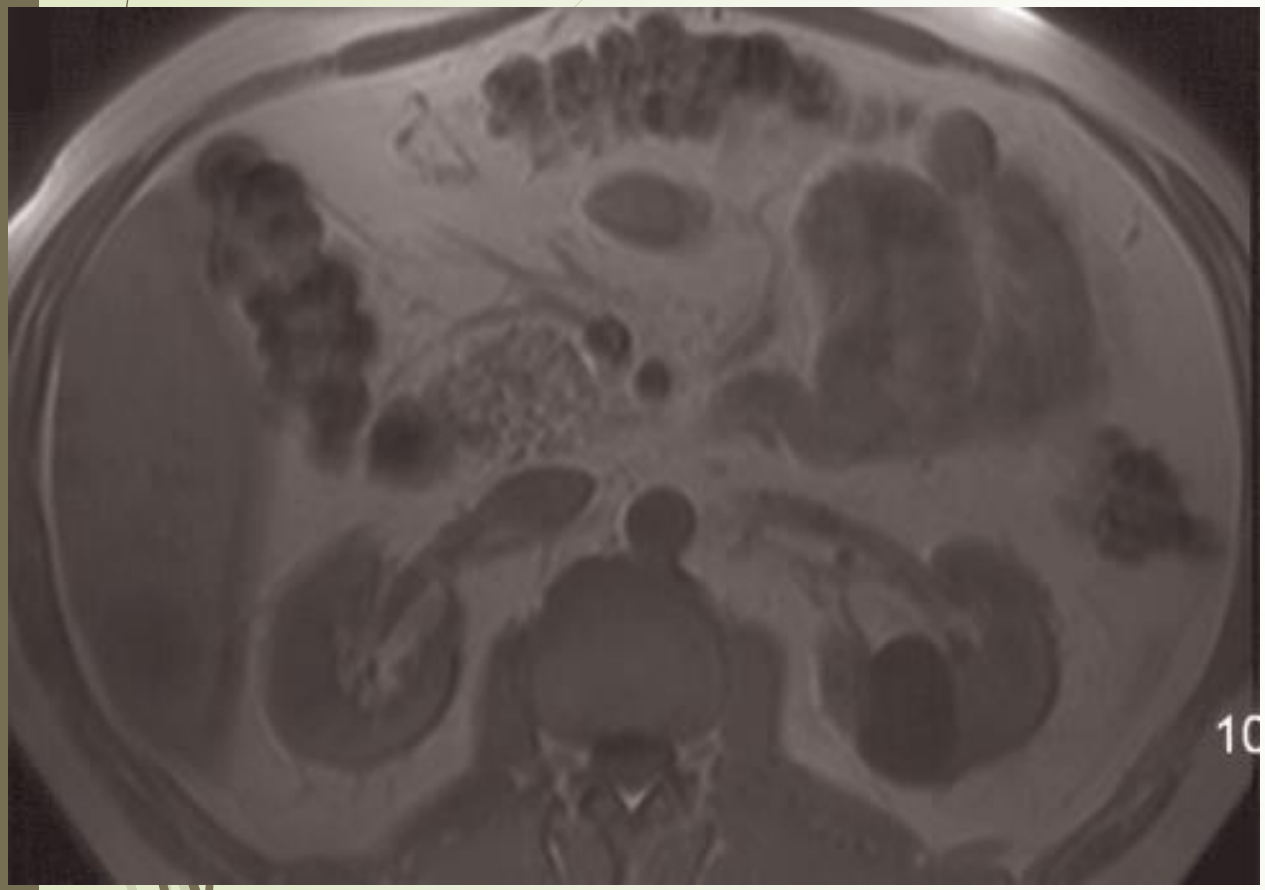


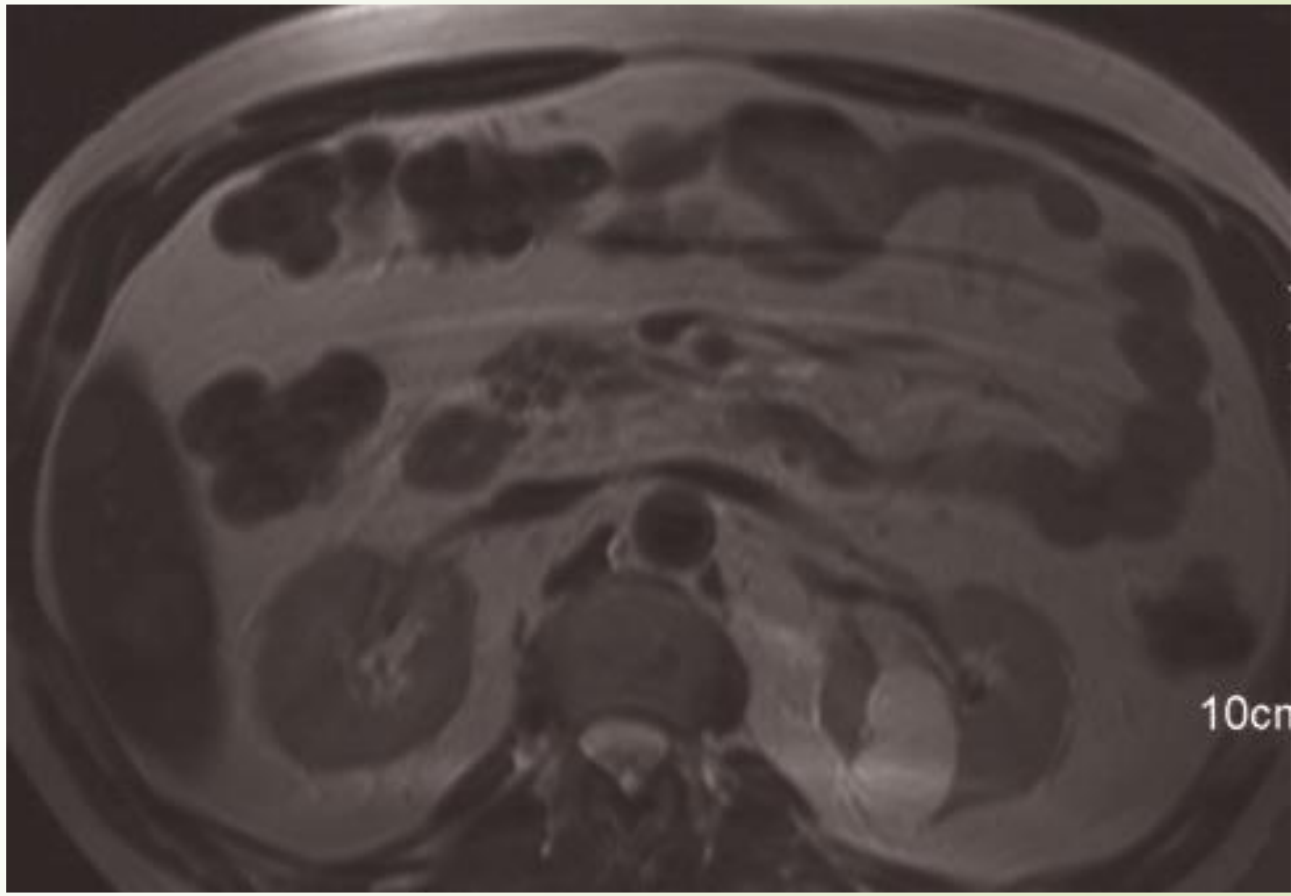





S
F

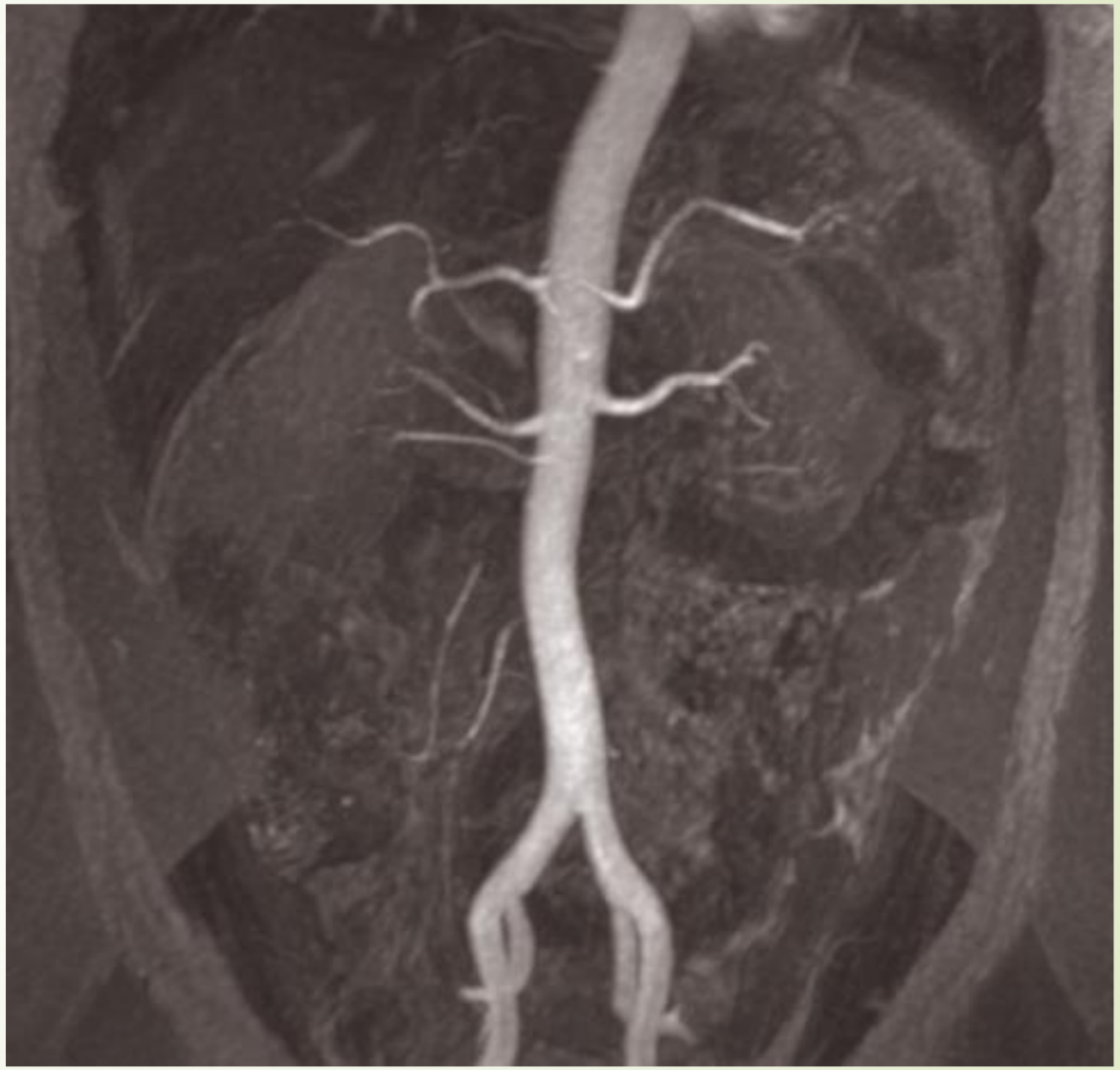
MRI



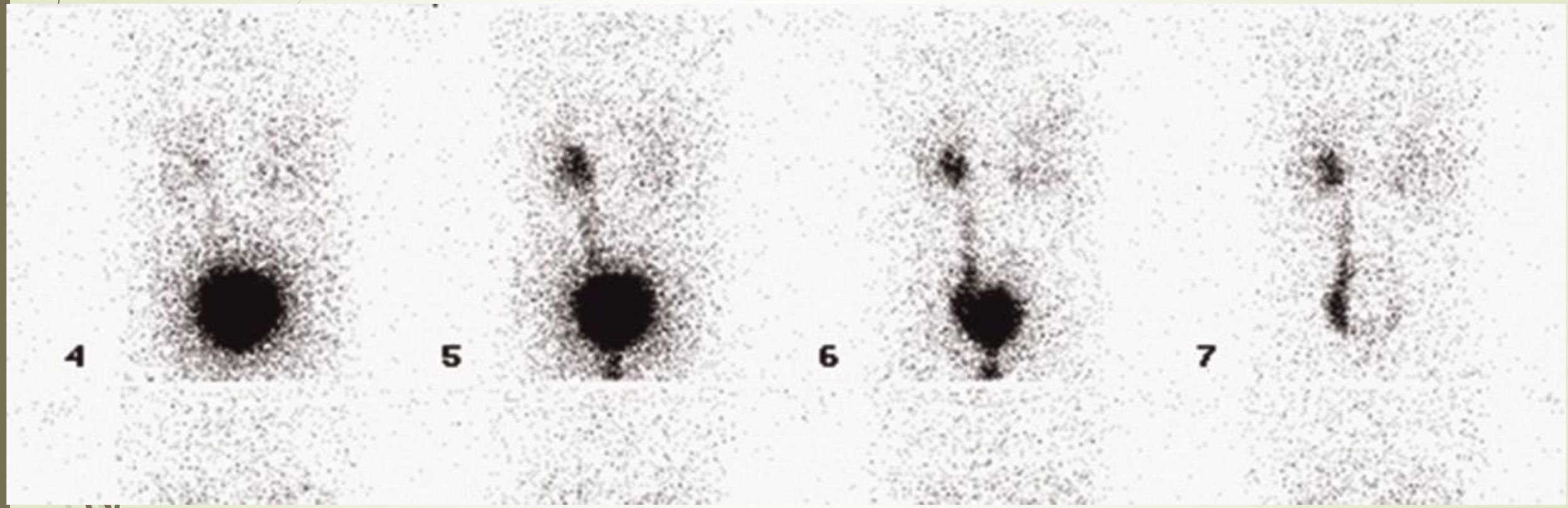


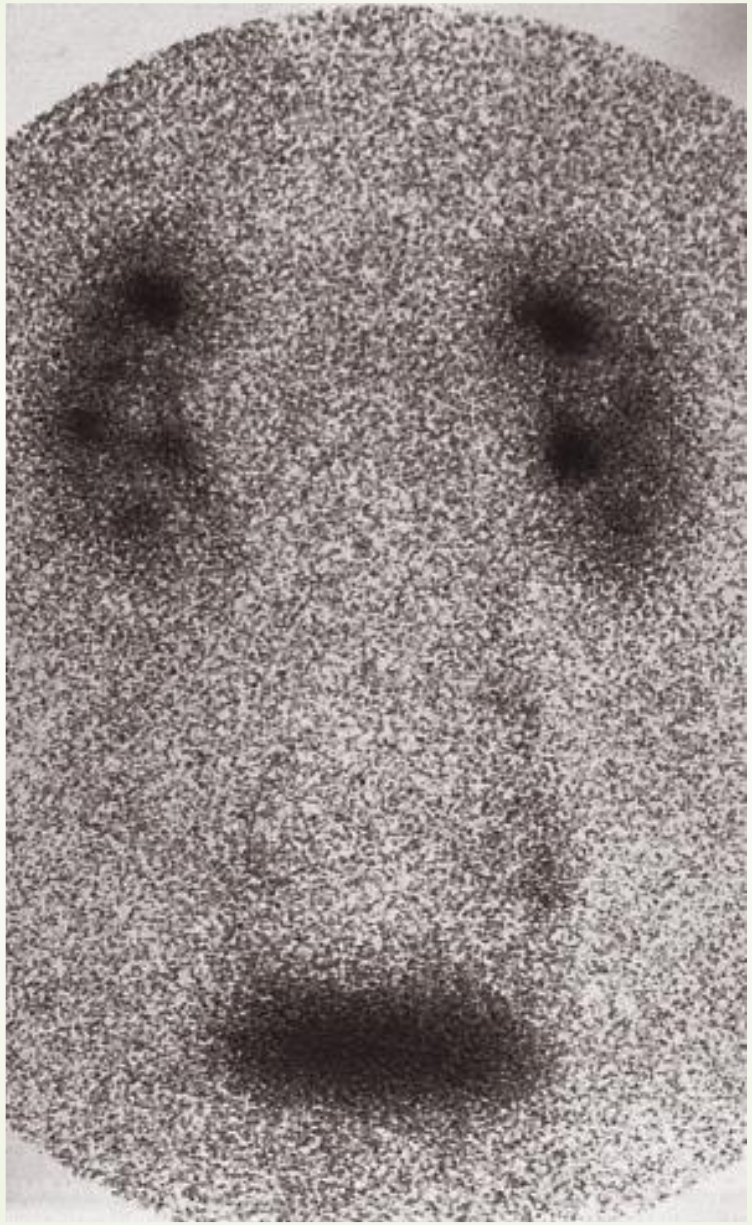
MRI

MRA



Radionuclide examination





Voiding cystourethrogram (micturating cystogram)

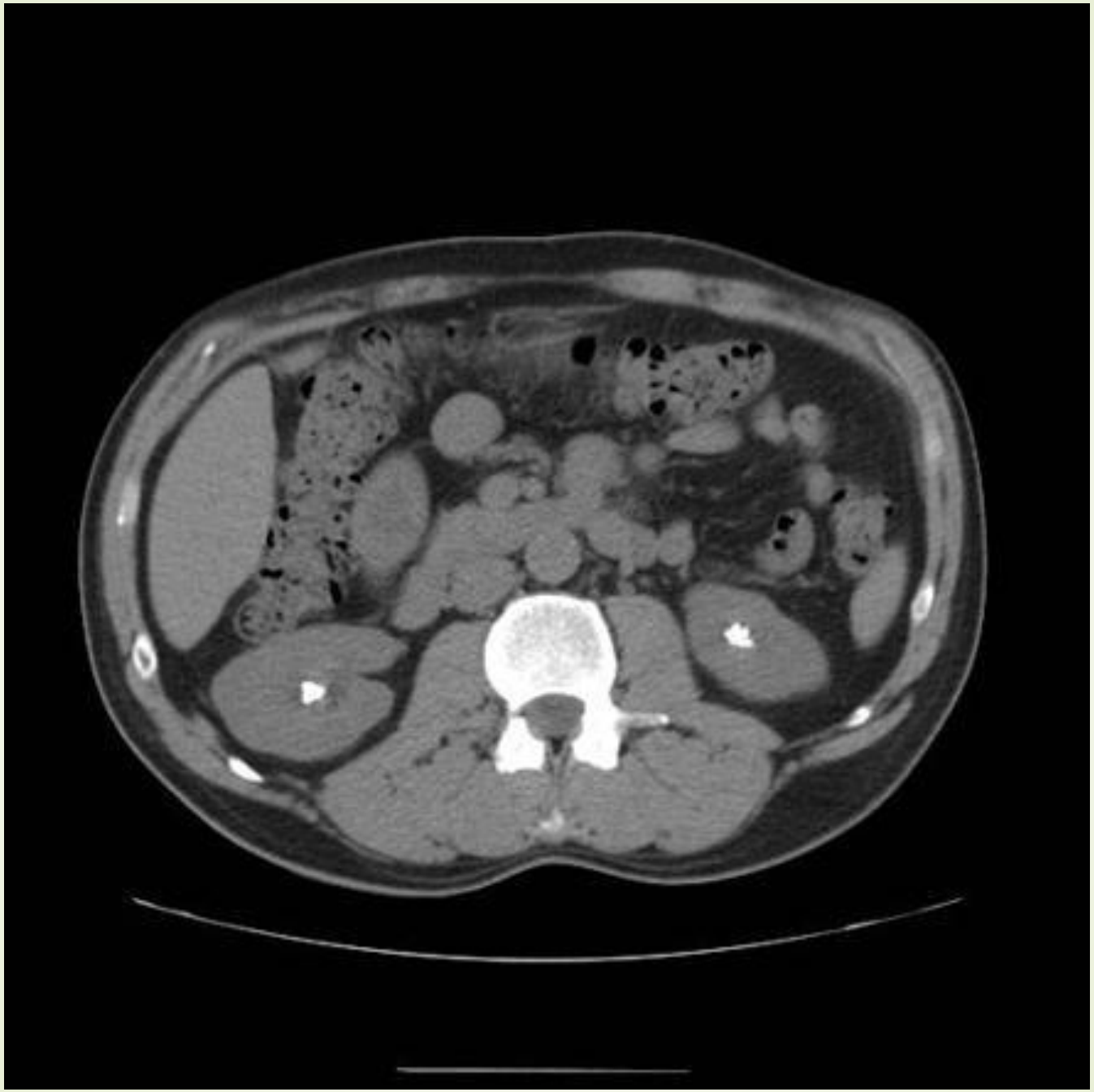
Retrograde urethrogram

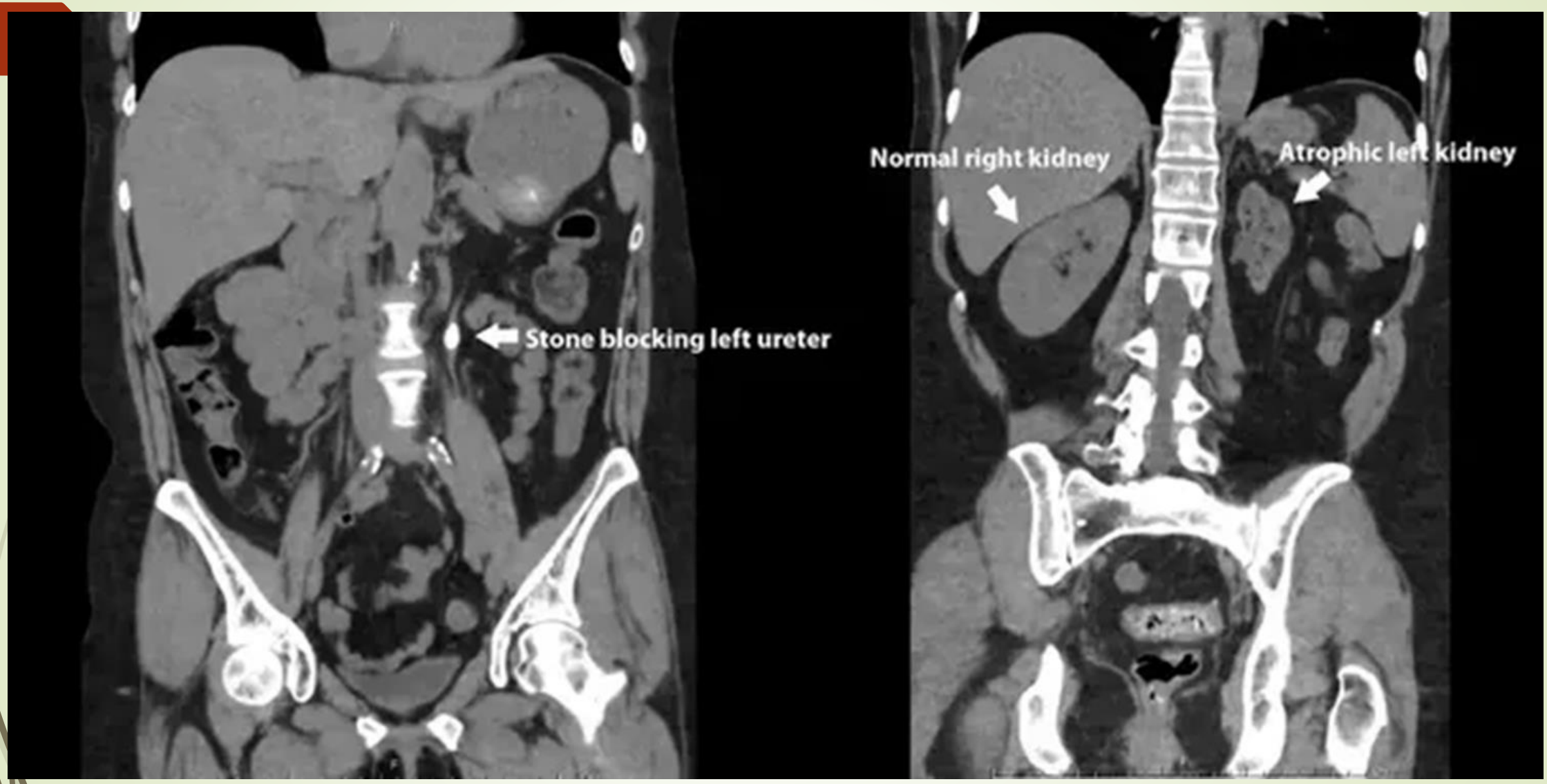
Urinary calculi


a
b


ACCUVIX
XQ
Abdomen
#73 / 15.0cm MI 0.8
C3-7IM / Gen TI 0.2
12:58:48 pm
[2D] G39 / 80dB
FA2 / P90
M
Renal stone


TOSHIBA
ULTRASCAN CENTRE, DR. JOE ANTONY.
© www.ultrasound-images.com
P100
6C3
T4.6
22fps
DR60
G00
0
5
10
RT. VUJ
CALC
Qscan
Dist A 4.8mm
CINE REVIEW




Stone blocking left ureter
Normal right kidney
Atrophic left kidney

Nephrocalcinosis

- Deposition of calcium salts in the medulla or cortex of the kidney.

Causes of Nephrocalcinosis
Medullary
Disturbed calcium metabolism Hyperparathyroidism Sarcoidosis Milk-alkali syndrome Rapidly progressive osteoporosis Idiopathic hypercalciuria
Other tubular disease Distal (type 1) renal tubular acidosis Oxalosis* Dent disease (X-linked hypercalciuric nephrolithiasis) X-linked hypophosphatemic rickets Bartter syndrome Hypomagnesemia-hypercalciuria syndrome
Anatomic disease Medullary sponge kidney Papillary necrosis
Medications Acetazolamide Amphotericin B Triamterene
Cortical
Cortical necrosis
Transplant rejection
Chronic glomerulonephritis
Trauma
Tuberculosis
Oxalosis*

Medullary Nephrocalcinosis

Congenital intrinsic pelviureteric junction (PUJ) obstruction

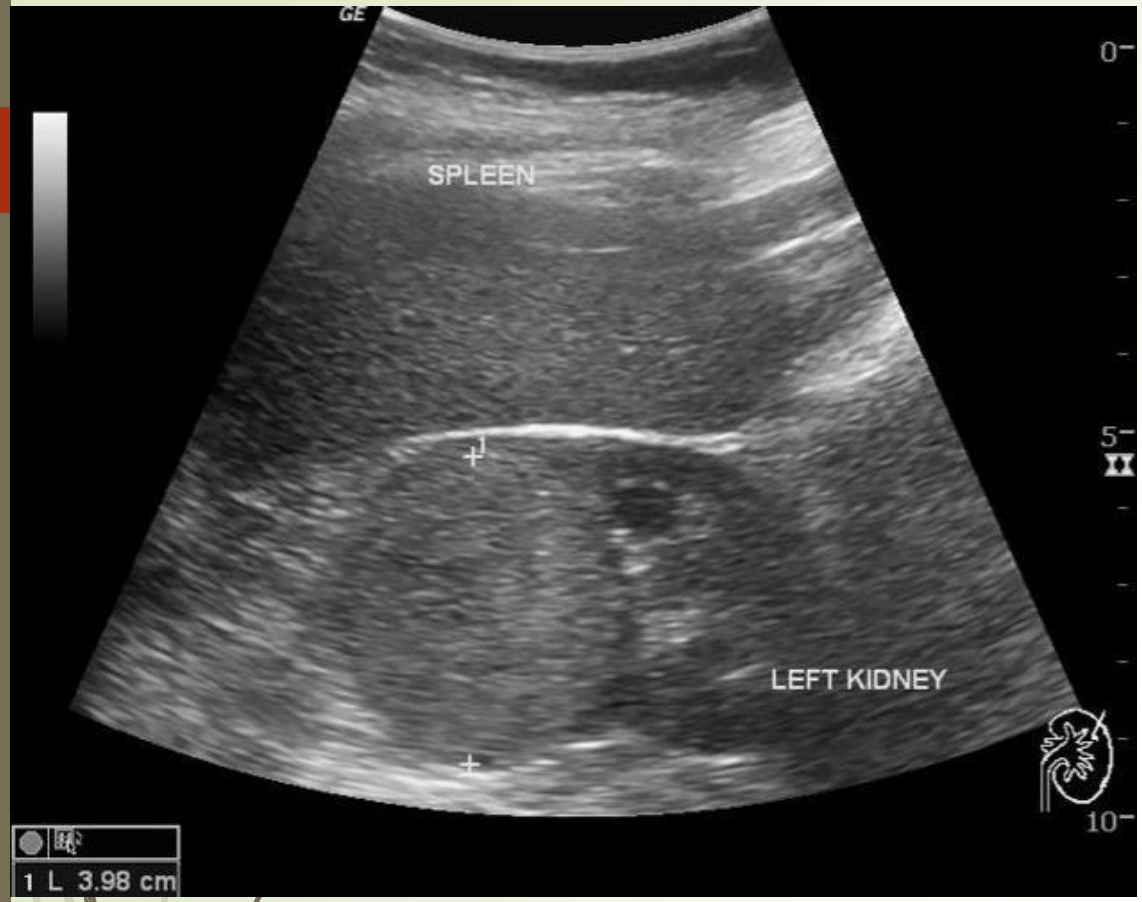
- In this disorder, peristalsis is not transmitted across the pelviureteric junction.
- Childern and young adult
- Dilatation of the pelvis and calices, with an abrupt change in caliber at the pelviureteric junction
- the ureter is either narrow or normal in size.

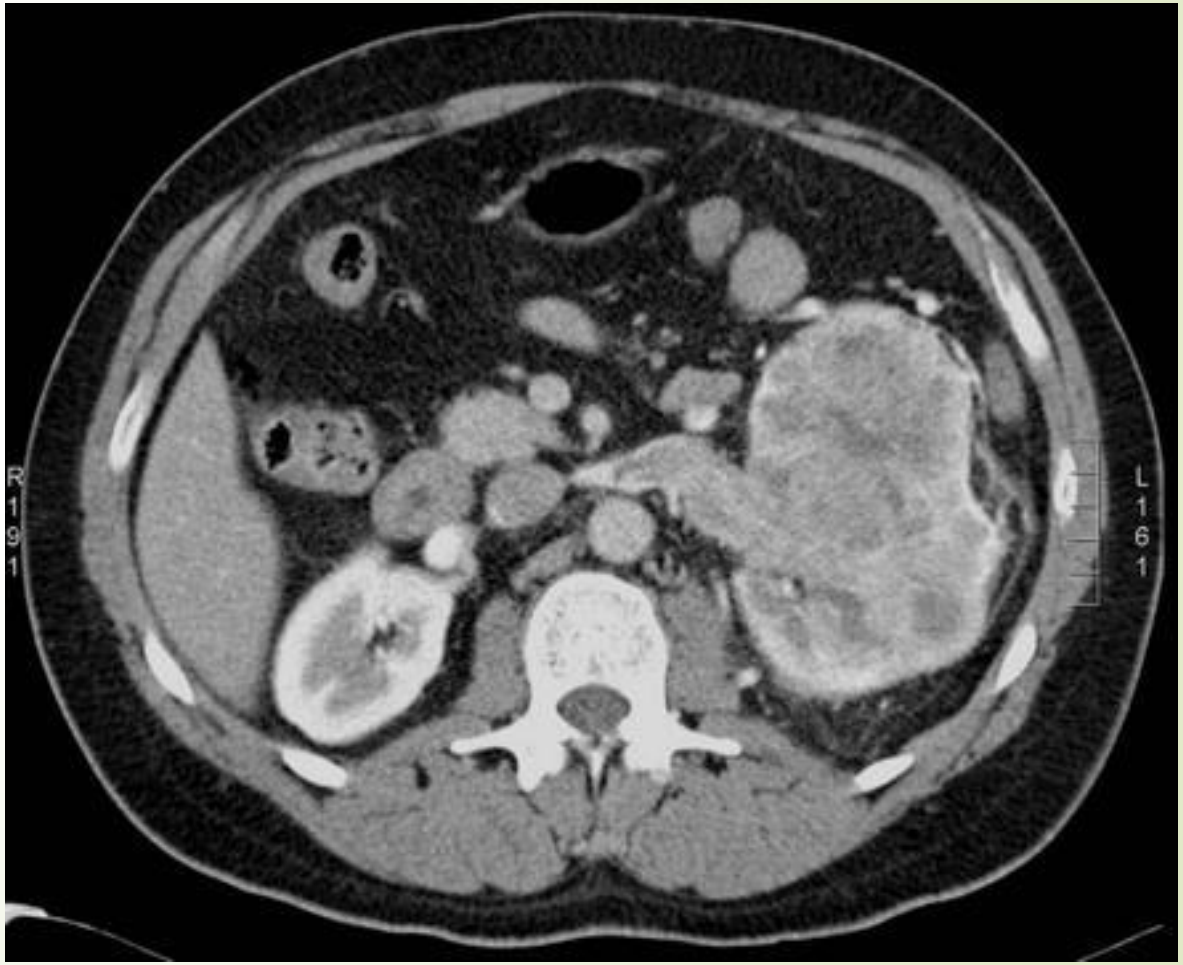
Renal parenchymal masses

- In adults, the most common malignant tumour is renal cell carcinoma, whereas in young children the common neoplasm is Wilms' tumour.
- Other masses: renal abscess, benign tumour (oncocytoma or angiomyolipoma), hydatid cyst, and metastasis.
- Renal cysts
- 'renal pseudotumour' or column of Bertin


F 3.5 MHz G 61%
D 15 cm XV 1
PRC 12-3-L PRS 3
PST 3


C


GE
SPLEEN
LEFT KIDNEY
0
5
10
1 L 3.98 cm


R
1
9
1
L
1
6
1

Multiple renal masses include:

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

Thank you