URINARY TRACT IMAGING

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Mu'tah university

Urinary tract investigation

Plain film:

- Renal calculi or calcification
- Stones in the ureters
- Bladder calcifications and calculi
- Bone abnormality or metastasis


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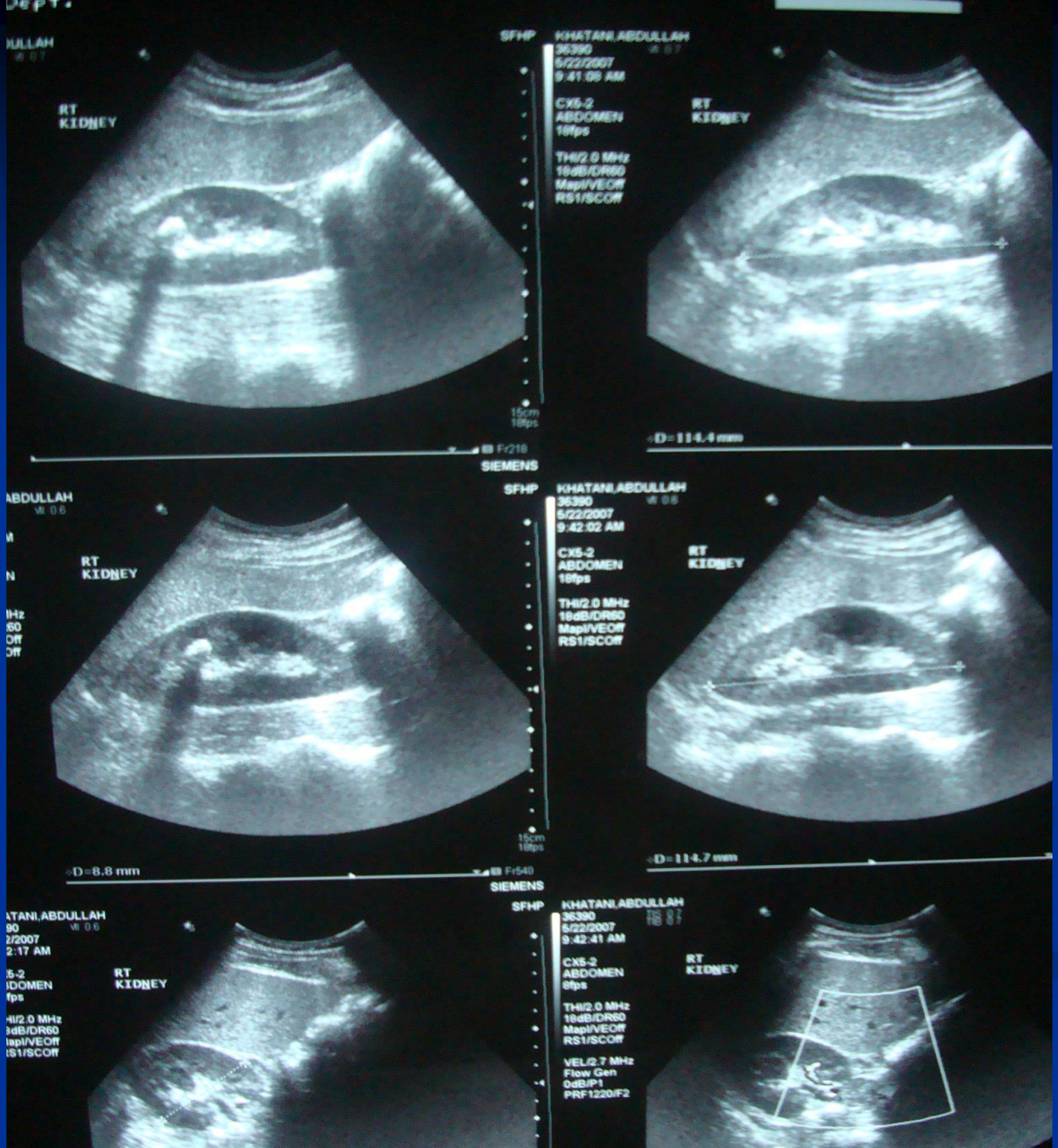
Ultrasound of the urinary tract

- Ultrasoud is one of the most valuable investigations of the urinary tract and the investigation of choice in children.

- It is very effective in evaluating renal size, masses, renal obstruction, bladder residual volume and prostatic size.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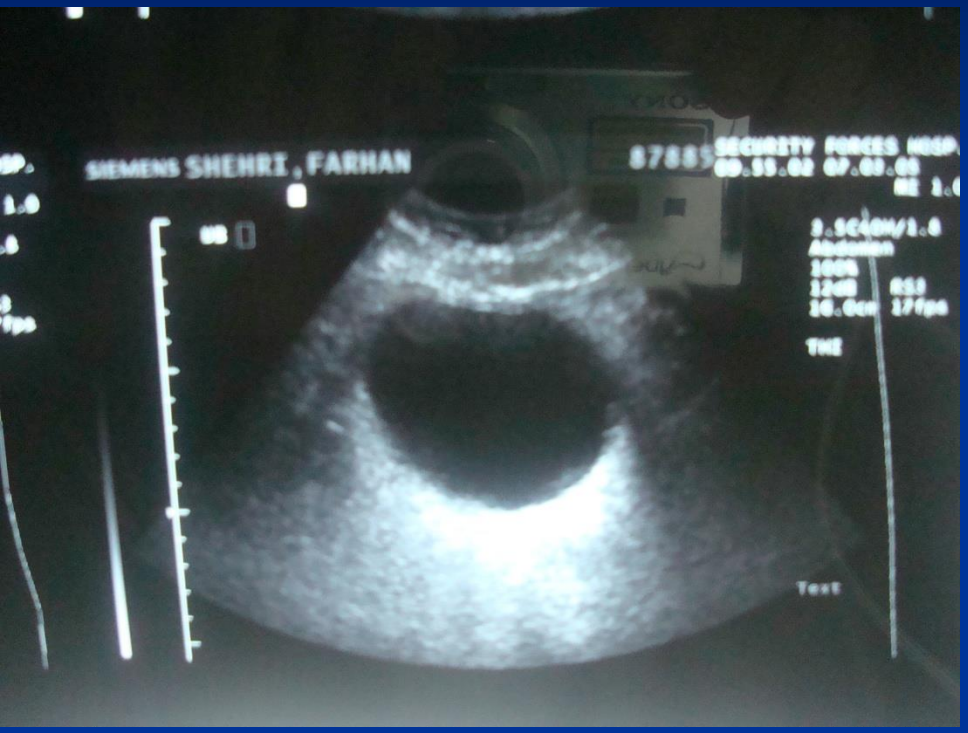
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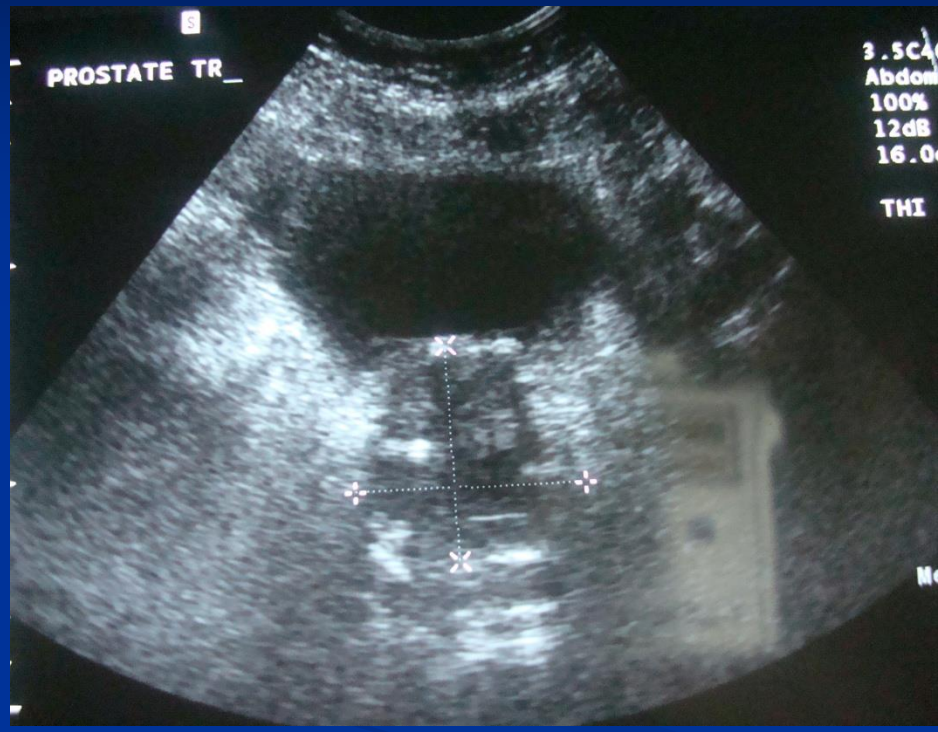
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CT of the urinary tract

CT is excellent modality for assessment of:

- Renal masses.
- Obstruction.
- Retroperitoneal disease.
- Staging of renal and bladder neoplasms.
- Tumor invasion into the renal vein or IVC
- Evaluation after trauma or surgery.

When should MRI be used to evaluate the kidneys ?

- When a renal mass or abscess is suspected but itravenous contrast cannot be administered, because of either contrast allergy or abnormal renal function, in this case MRI can be performed.
- Gadolinium, the contrast agent for MRI, can be safely administered in such circumstances.

Intravenous urography (IVU)
Intravenous pyelography (IVP)

Is a radiological procedure used to visualized abnormalities of the urinary system, including the kidneys, ureters, and bladder by using intravenous contrast.

Indication:

- Haematuria
- Renal colic or calculi
- Suspected stone in the ureters
- Renal trauma

IVU /continuation

- After a preliminary control film of the abdomen, 50ml of contrast medium is injected intravenously.
- Contrast is excreted by glomerular filtration.
- Films after 5, 10, and 15 minutes are taken and reveal contrast in the pelvi-calyceal systems, ureters, and in the bladder.
- Post-micturition film is taken to assess bladder residual volume.
- Renal obstruction may require a delayed films.


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Micturating cystogram

- Is the study of the urinary bladder and urethra with contrast medium.
- The bladder is filled with contrast via a urethral catheter. Films of the bladder are obtained.
- After removal of the catheter, patient is asked to void and films are taken during micturation to assess the bladder neck and urethra, as well as reflux.
- Examination of the urethra in oblique position is necessary, particularly in suspected posterior urethral valves in infants and small children, as they are usually only demonstrated during micturation.


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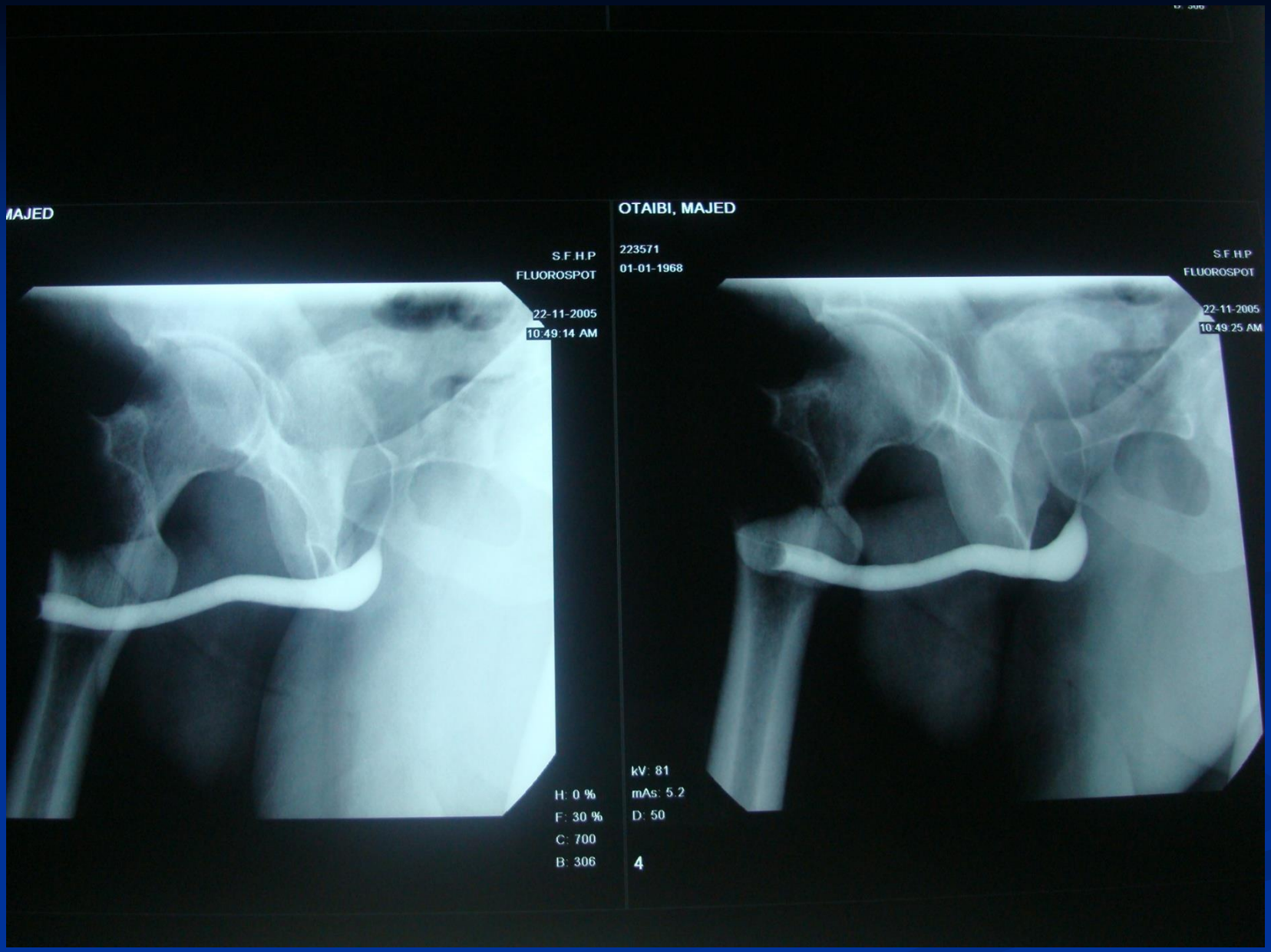
Urethrogram

- The adult male urethra can be studied by ascending urethrogram.
- Contrast is injected through foley catheter inserted into the meatus, and its balloon inflated with 1 to 2ml of sterile water placed in the navicular fossa.
- Films are taken to the urethra in oblique position during contrast injection.
- The most common indication for urethrogam is urethral strictures.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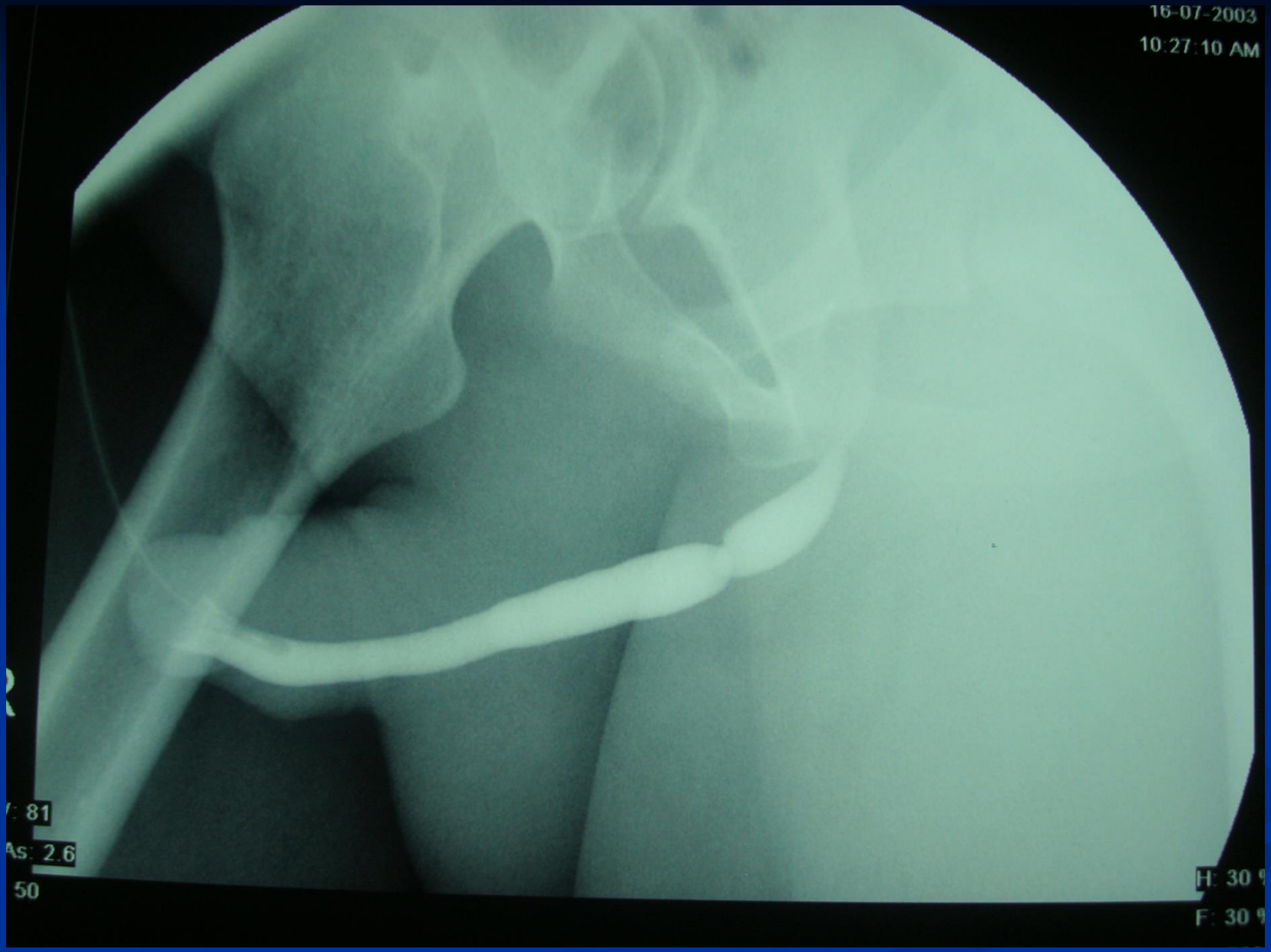
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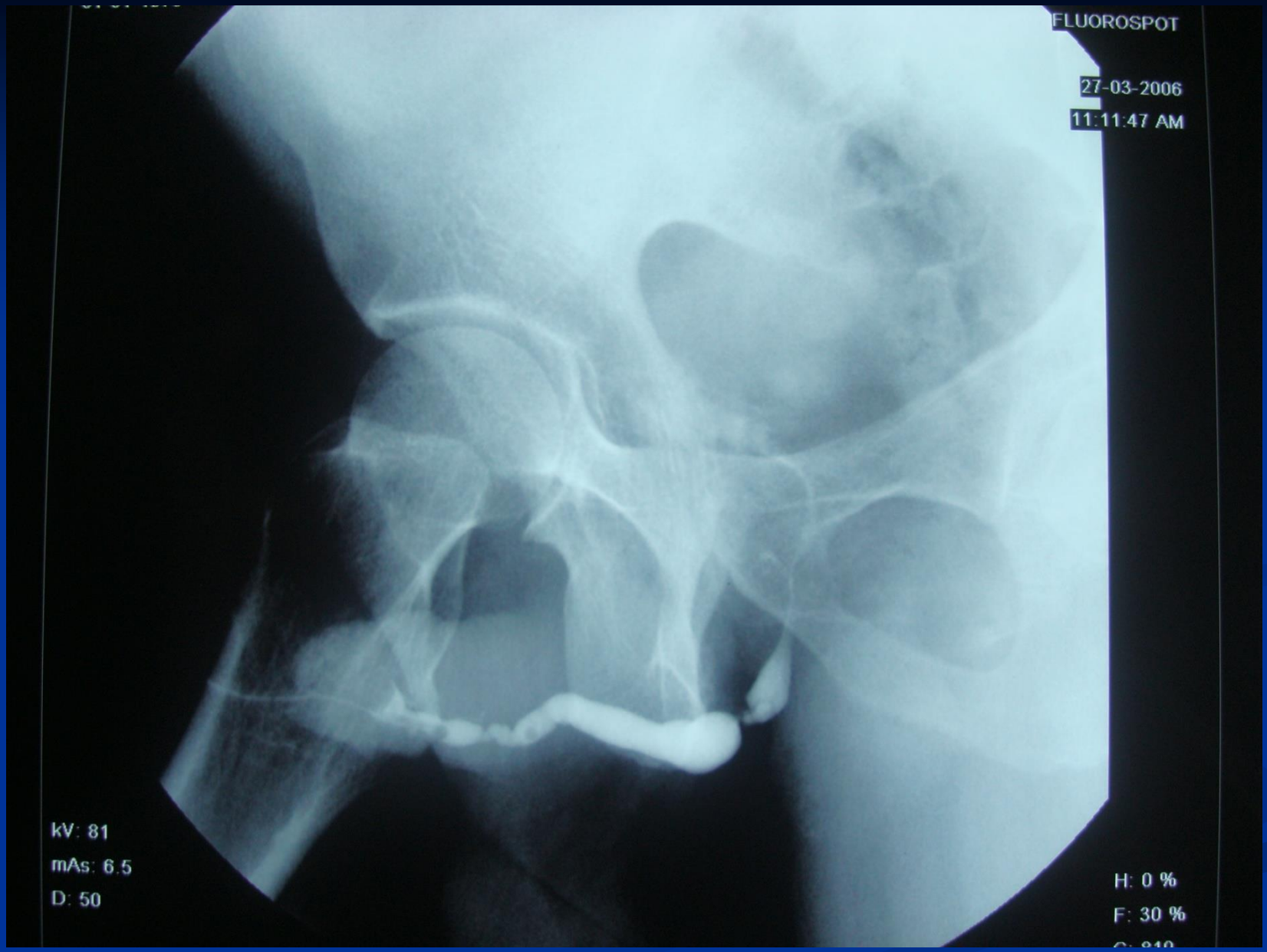
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Congenital renal anomalies

1- **Unilateral renal agenesis**

2- **Renal hypoplasia**

the kidney is small but perfectly formed

3- **Duplex kidney**

Is the commonest renal anomaly with avariable degree of duplication ranging from minor changes of duplication in the renal pelvis , to a total duplication (complete) of the renal pelvis and ureters.

Congenital renal anomalies/2

4- Renal Ectopia

- ✓ Refers to a birth defect in which a kidney is located in an abnormal position usually in the pelvis
- ✓ The ectopic kidney is frequently malrotated and small in size.

5- Crossed fused renal ectopia

- ➢ One kidney is displaced across the midline and fused to the other normal kidney .
- ➢ The ureteric orifice lie in a normal position .

Congenital renal anomalies / 3

6- **Horse shoe kidney**

- Is a fusion anomaly in which the lower poles of the kidneys fuse across the midline .
- The connective tissue may be functioning or non functioning (fibrous tissue)
- In horseshoe kidney , there is increased incidence of infection and stone formation.


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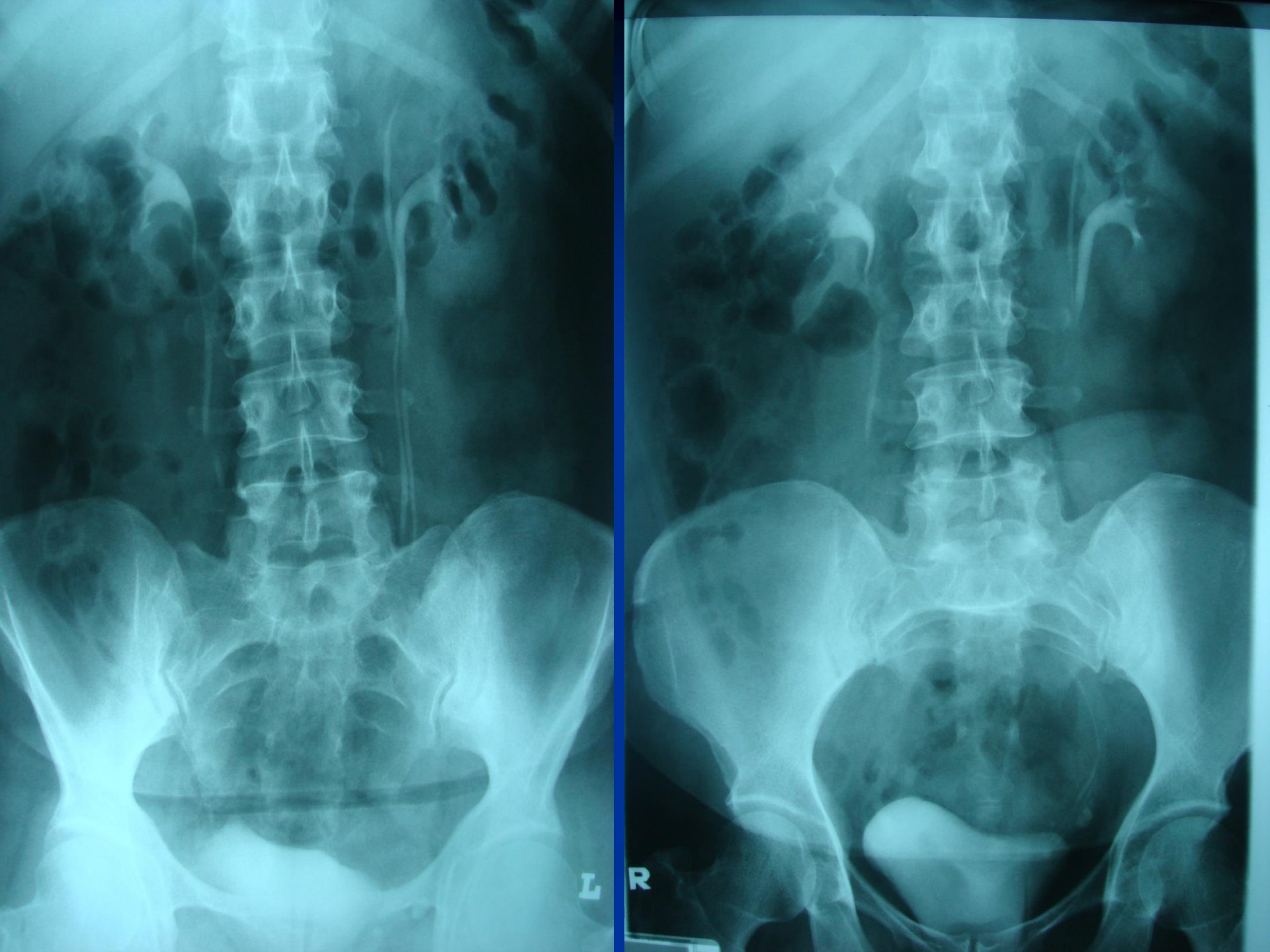
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Urinary tract calculi

- The majority of renal stones are composed of calcium (about 90 %) and are visible on plain film (radio-opaque) .
- Stones composed of uric acid are not visible on plain film (radiolucent) .
- Stones composed of cystine are minimally dense on plain film (semi-opaque) .

Urinary tract calculi / continuation

What is the initial imaging test usually ordered to find urinary tract stones ?

- ✓ Plain radiograph (KUB), because the majority of stones are radio-opaque
- ✓ Other calcifications may be confused with urinary tract stones such as a phlebolith in the pelvis , which is a venous calcification , often with a lucent center .


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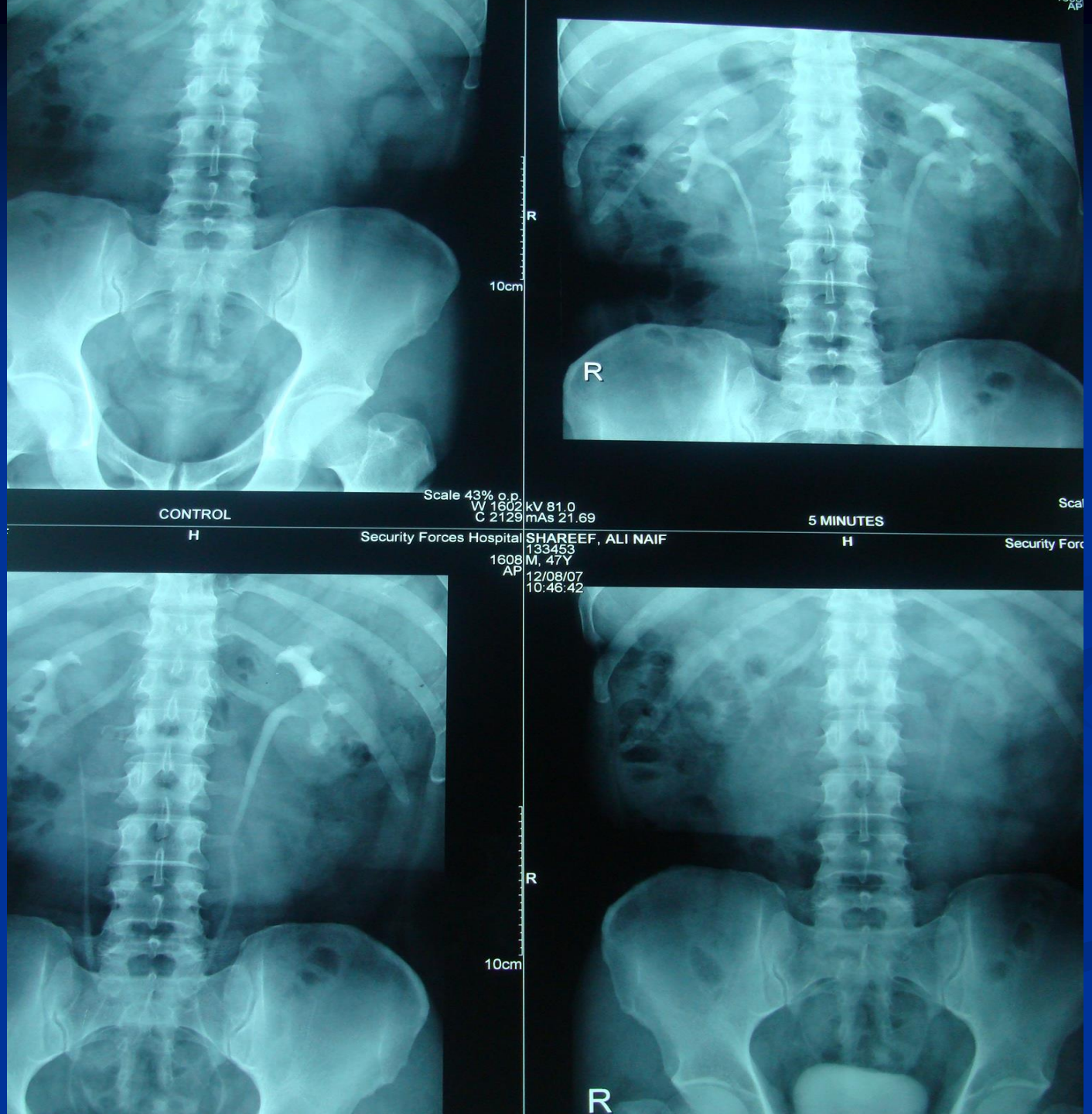
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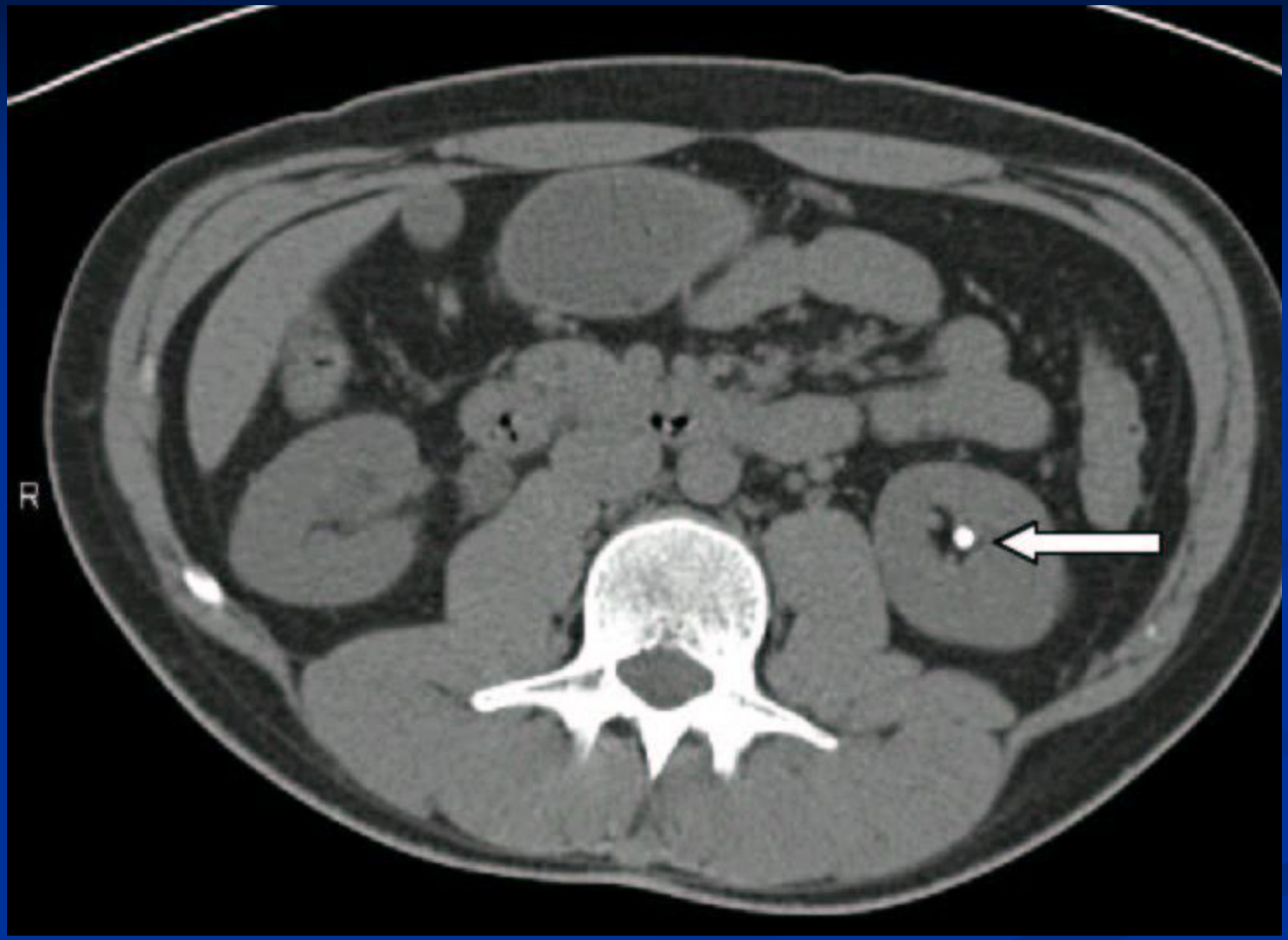
Urinary tract stones and CT

What is the most sensitive radiological test for urinary tract stone ?

CT , performed without contrast, is highly sensitive for detecting urinary tract stone.

Are any urinary tract stones radiolucent on CT ?

No , virtually all urinary tract stones , regardless of their composition are visible on CT .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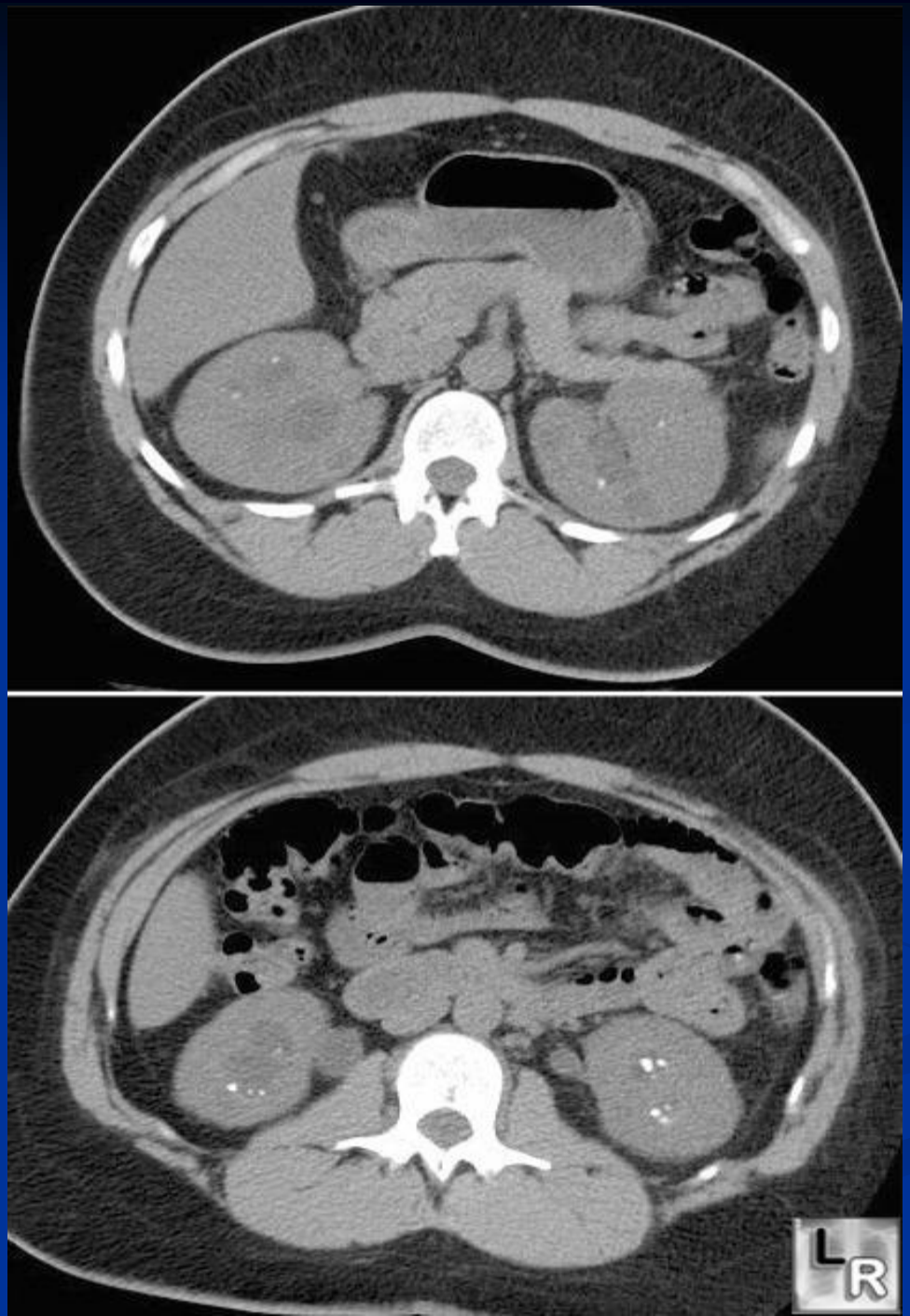
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URINARY OBSTRUCTION

- Obstruction of the renal tract may occur at many sites.
- The most common causes are:

- Urinary tract stones.
- Urinary tract strictures.
- Urinary tract tumors.
- Prostatic hypertrophy or cancer.

Urinary obstruction / 2

Why is it important to recognize renal obstruction ?

- Because over time, obstructed kidneys may lose function permanently.

What is the best initial imaging test for suspected renal obstruction ?

- Ultrasound. It is relatively inexpensive, save, and effective. The cause of obstruction also may be identified.


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Benign renal lesions

What is the most common renal mass ?

The most common mass is a simple cyst.

- They are more common in older patients and are found in approximately 50% of the population over 50 years of age.
- They are usually cortical in position and an incidental finding.

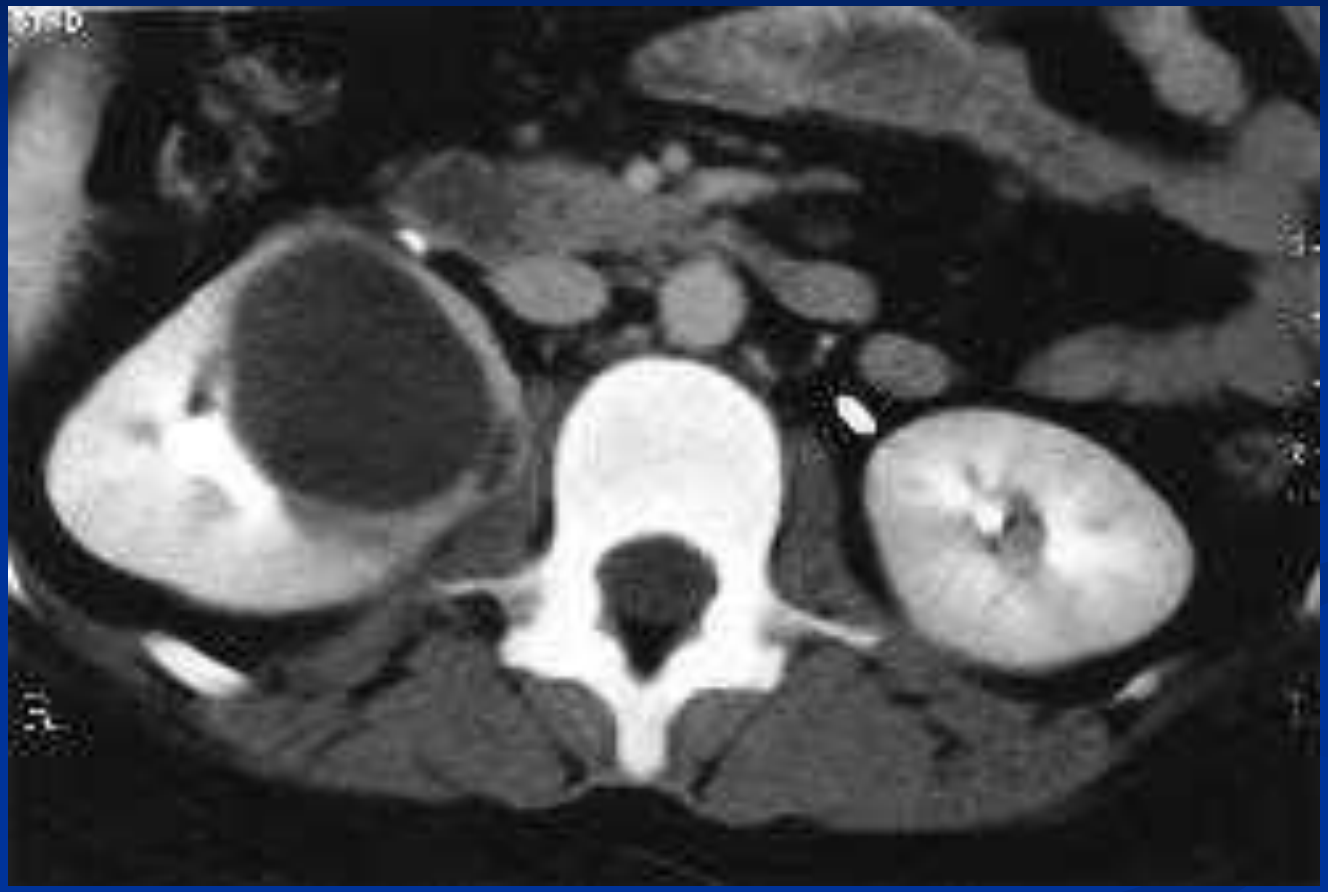
Benign renal lesions /2

- What is the best way to confirm that a renal mass is a simple cyst ?

  Ultrasound.

- The ultrasound appearance of a simple cyst is that of a well-defined round mass with very thin wall, smooth margin and no internal echoes.


Renal cyst



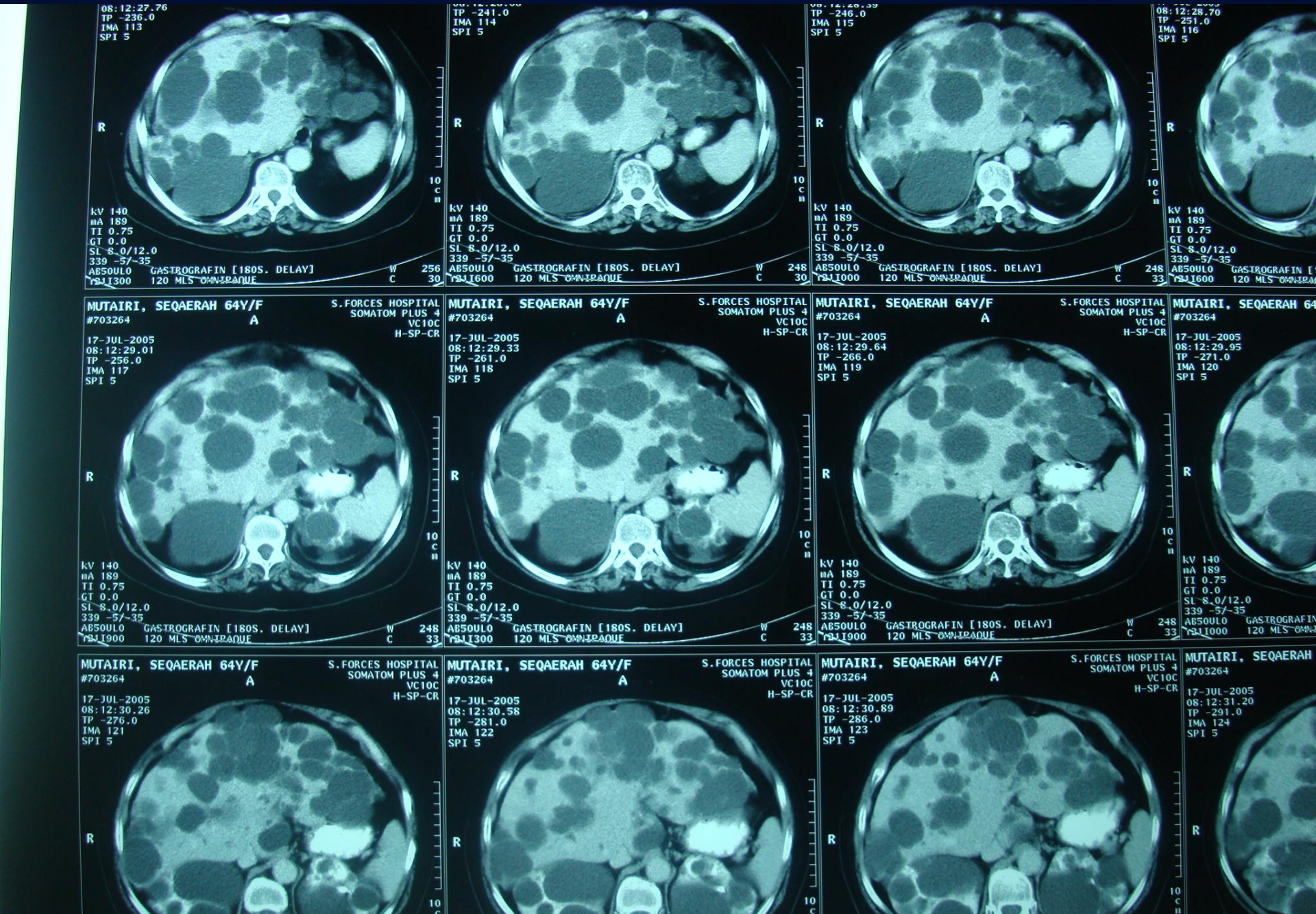
Polycystic kidneys disease

- Adult polycystic kidney disease is a congenital renal parenchymal disorder.
- Usually both kidneys are involved.
- In some cases, there is associated cysts in the liver and more rarely in the spleen and pancreas.

Polycystic kidney disease / 2

Radiological features on Ultrasound and CT:

- Kidneys are enlarged with lobulated contours.
- The renal parenchyma is replaced by multiple cysts of varying size, causing distortion of the collecting system.
- Spontaneous hemorrhage into some of the cysts may occur.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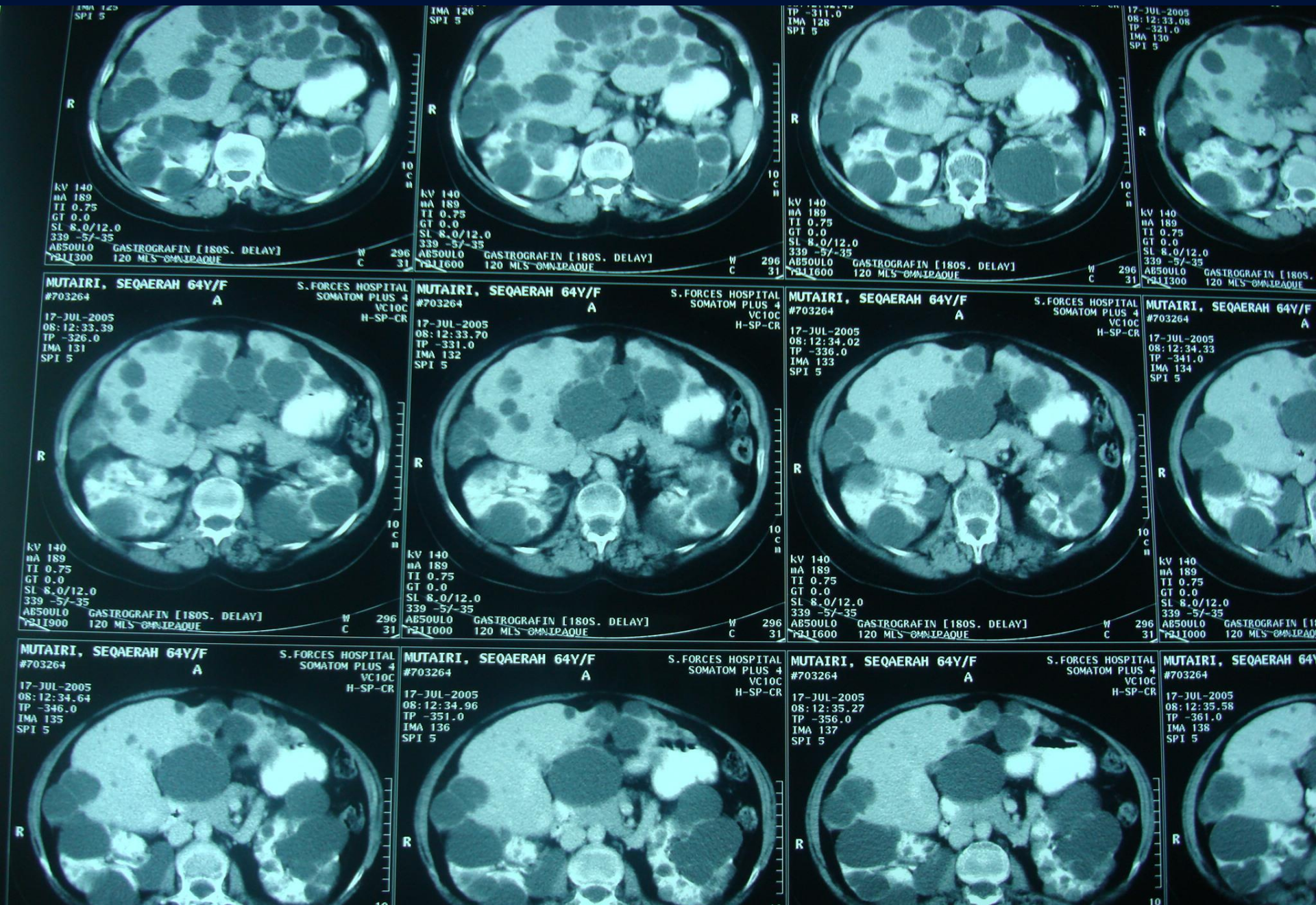
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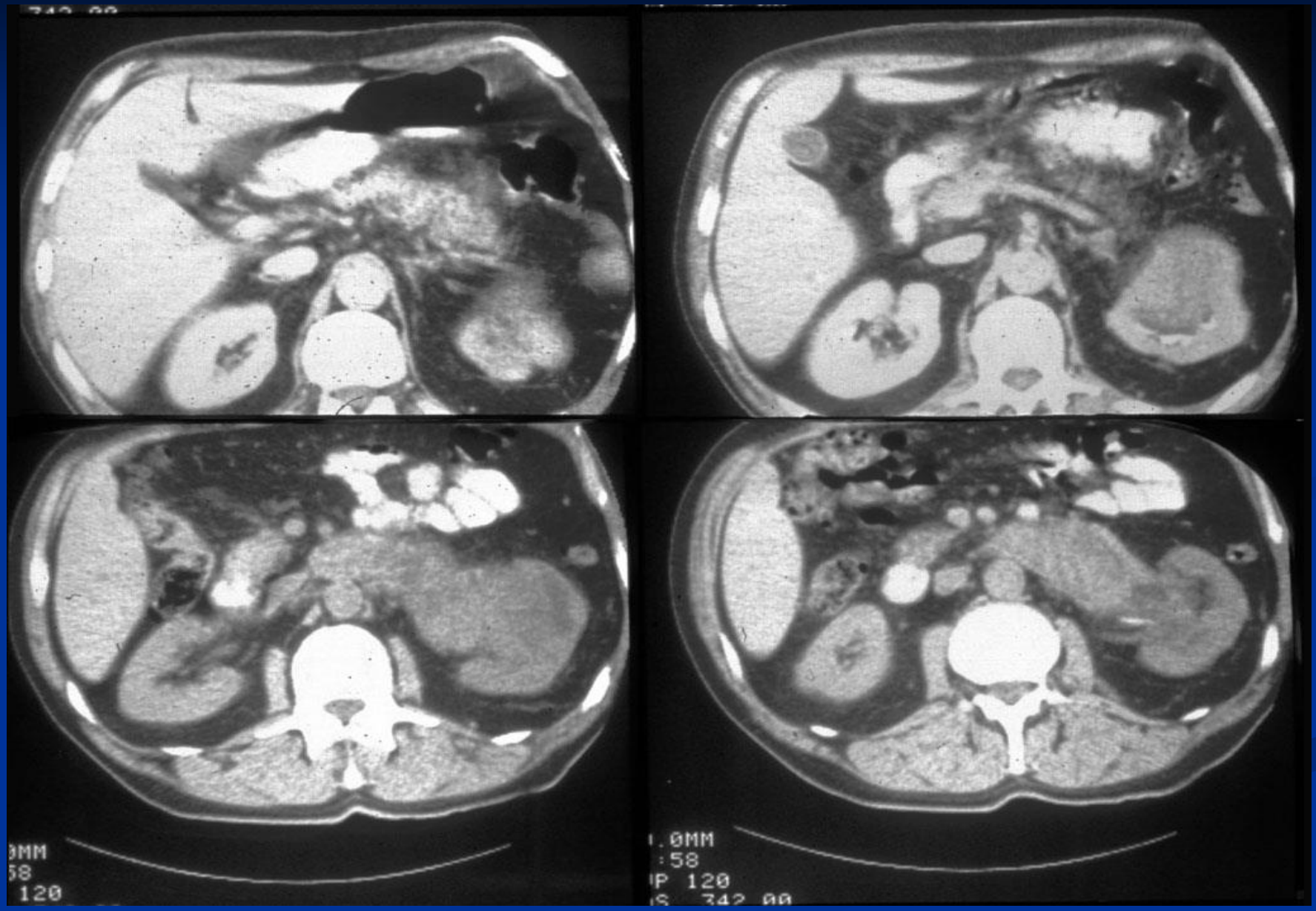
Benign renal tumors

The most common benign renal tumors are:

- Angiomyolipoma
- Adenoma

Malignant renal tumors

- Renal cell carcinomas (RCC) or Hypernephroma: account for 85% of renal tumors.
  - Are bilateral in 4% of cases.
  - Von Hippel- Lindau disease is associated with RCC in one third to one half of patients.
  - Patients with polycystic kidney disease and chronic renal failure may also be associated with RCC.
- Transitional cell carcinoma: are relatively rare and represent 7% of all renal tumors.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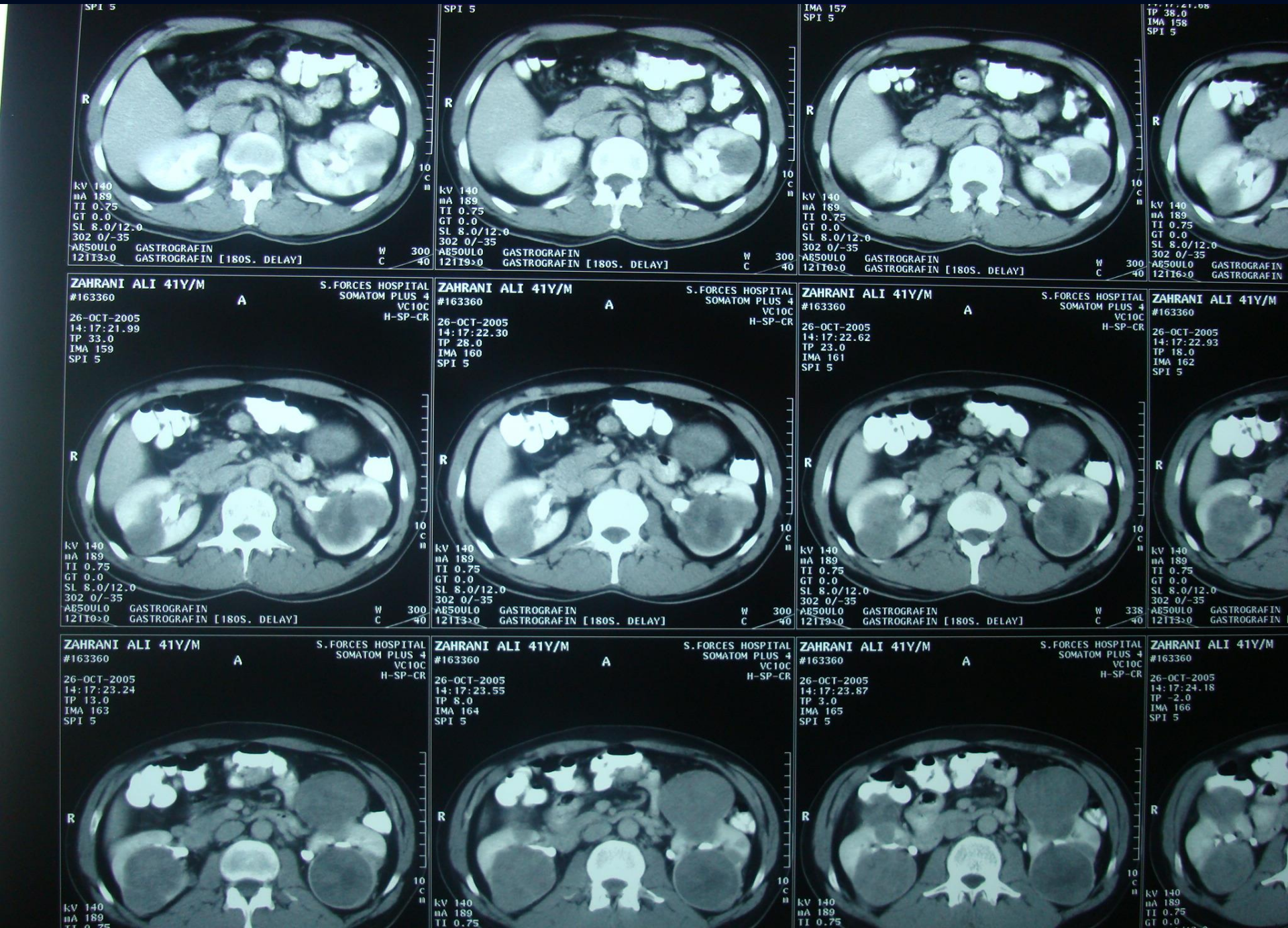
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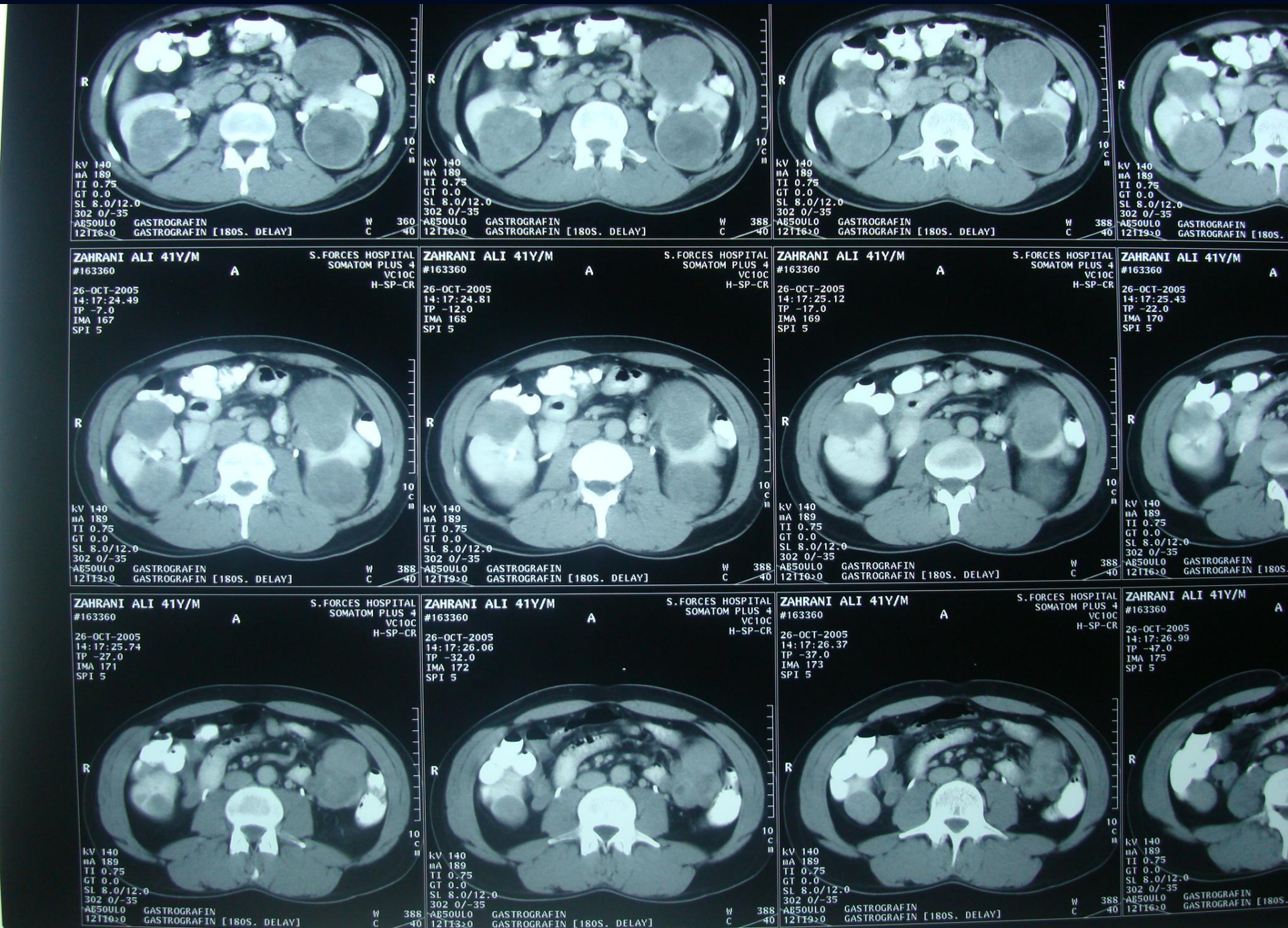
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