



KARNATAKA RADIOLOGY EDUCATION PROGRAM

Anatomy and Applied Radiology Kidneys – 4

CT KUB

Computed tomography of kidneys, ureters and bladder (CT KUB) is a quick non-invasive technique for diagnosis of urolithiasis.

It is usually considered the initial imaging modality for suspected urolithiasis in an emergency setting.

Procedure:

- **Preparation:** Before the scan, you may be asked to fast for a certain period (usually 4-6 hours) and to drink plenty of water.
- **Contrast injection:** A contrast agent (usually an iodine-based dye) is injected into a vein in your arm.
- **Lying on the table:** You will lie on a CT scan table, and the table will move you into the scanner.
- **Image acquisition:** The scanner will take a series of X-ray images from different angles.
- **Post-scan:** You will be monitored for any adverse reactions to the contrast dye.

Risks and Considerations:

- **Radiation exposure:** CT scans involve radiation exposure, although the amount is generally considered low.
- **Contrast dye reactions:** Some people may experience allergic reactions to the contrast dye, although these are usually mild and can be managed.
- **Kidney function:** If you have kidney problems, the contrast dye may worsen your kidney function, so your doctor will assess your kidney function before the scan.

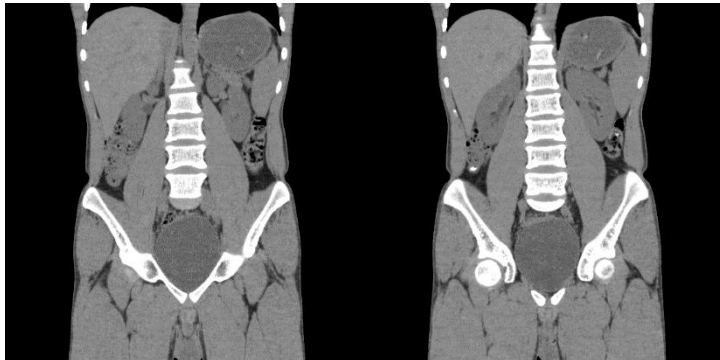
For Plain KUB CT study

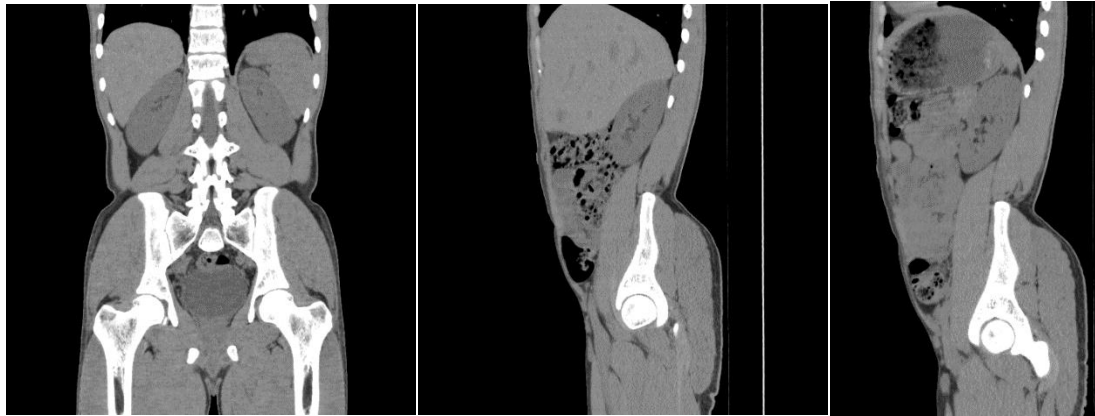
Technique

- patient position : supine with their arms above their head
- scout : above the diaphragm to the below pubic symphysis
- scan extent : above kidneys to below pubic symphysis
- scan direction : caudocranial
- contrast injection considerations : non-contrast
- scan delay : minimal scan delay
- respiration phase : inspiration

Practical points

- prone has the advantage of assessing stones near the vesicoureteric junction which may have just passed
- some institutions may perform a limited pelvic scan in prone if the supine scan shows a calculus near the vesicoureteric junction
- stone composition assessment can be done with dual energy CT





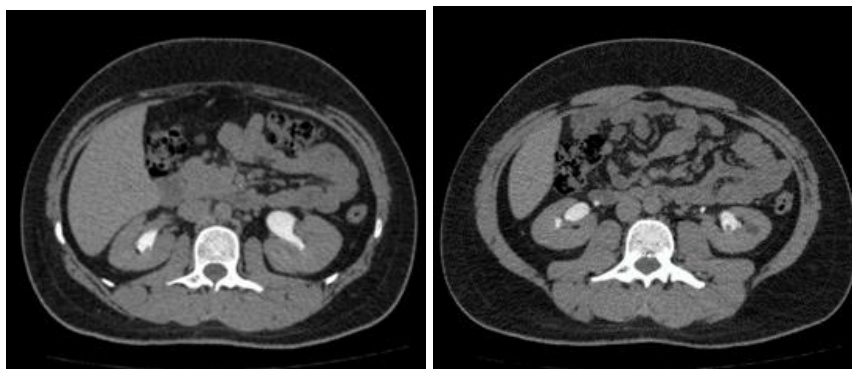
Both kidneys are normal in size, shape, and position. No radiodense calculus or hydronephrosis is seen.

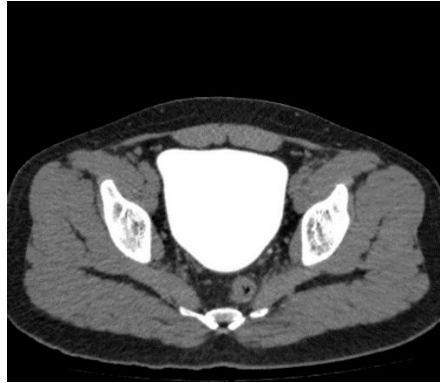
Urinary bladder is normal.

CT urography (CTU or CT IVU), also known as CT intravenous pyelography (CT IVP), has now largely replaced traditional IVU in imaging the genitourinary tract. It gives both anatomical and functional information, albeit with a relatively higher dose of radiation.

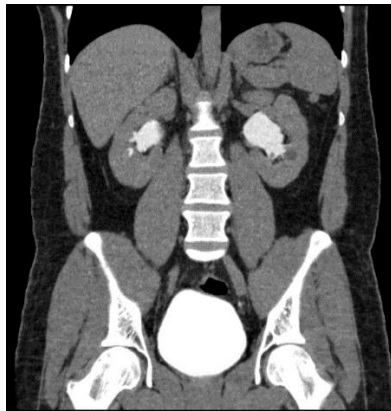


Axial contrast portal venous phase





Axial contrast delayed



Coronal delayed



MIP

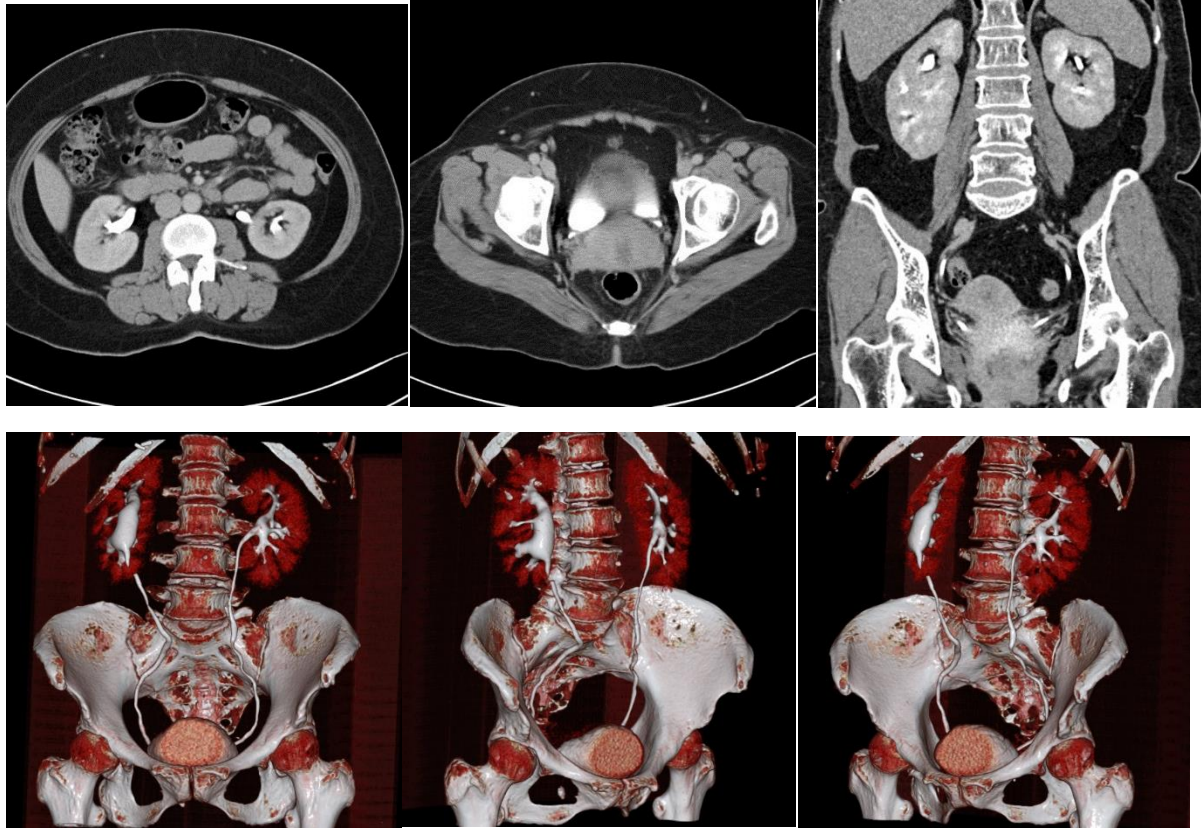


Technique

A variety of techniques have been described . A CTU may be performed along with other CT studies of the genitourinary tract, such as a 3 or 4 phase or split bolus study.

The split bolus technique is a CT imaging investigation used in patients with hematuria aiming to put together, in a single image acquisition, both the nephrographic and renal excretory phases and thus reducing the radiation dose of the study. It is a CT protocol adopted for some institutions for assessing a patient with hematuria .

Usually, a prior unenhanced study of the abdomen and pelvis in the form of a CT-KUB has been performed or undertaken before the split bolus component, excluding nephrolithiasis as the cause of the hematuria. Then, the patient receives 50 mL of IV contrast followed by an additional 50 mL eight minutes later. Images are then acquired 55 seconds following the second dose of IV contrast. In some centers the patient may be asked to lie in a prone position.



VRT

MRI

Magnetic resonance urography (MR urography) is a MRI study that predominantly used to image congenital abnormalities of the urinary system. There are two types of MR urography: static fluid-sensitive urography that is heavily T2-weighted to image the fluid-filled urinary system and excretory MR urography that is T1-weighted that image the urinary system after intravenous gadolinium administration.

Indications

- **to demonstrate the urinary system or the level of obstruction in a poorly functioning kidney or urinary system obstruction**
- **congenital abnormalities of the urinary system**
- **assessment of the renal transplant donor**

Technique

- patient lies down in supine position with an empty urinary bladder. A moderately filled bladder may be preferred when the urinary bladder is of interest
- MR sequences that can be used are: single-shot fast spin-echo (SSFSE), half-Fourier rapid acquisition with relaxation enhancement (HASTE), and single-shot turbo spin echo (SST-TSE)
- other measures such as intravenous or oral hydration, diuretics, or using a compression band may help to distend the urinary system further.
- after this, excretory MR urography is performed by administering 0.1 mmol/kg intravenous gadolinium. The patient is imaged at 10 to 20 minutes using a breath-hold, T1-weighted, 3D gradient echo sequence
- contrast administration can enhance the T2* decay in the gradient echo sequence, suppressing signal intensity from the urine. This problem can be solved by administering lower dose of gadolinium. However, low gadolinium dose may compromise the signals from soft tissues.

Advantages:

Radiation-free: MRU avoids the risks associated with radiation exposure.

Comprehensive evaluation: It provides detailed anatomical and functional information about the urinary tract.

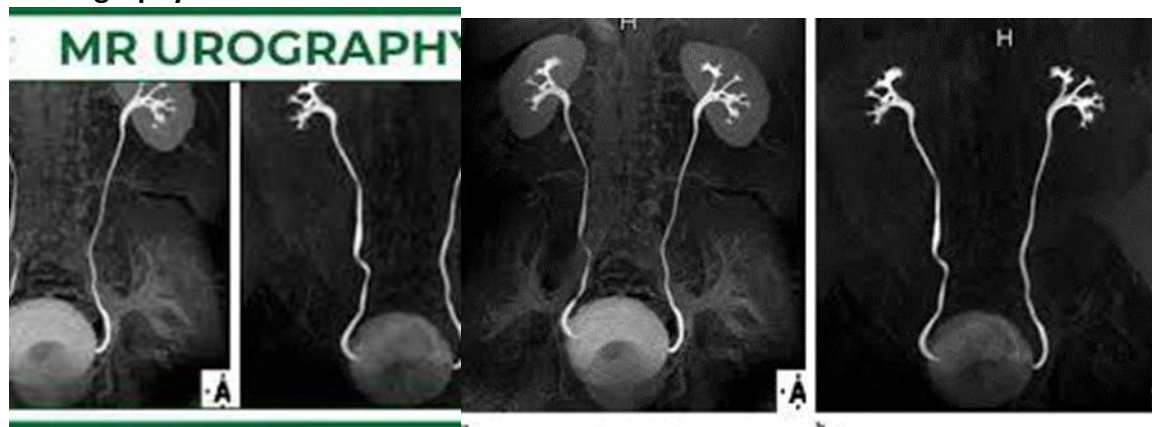
Good for pediatric and pregnant patients: MRU is a safe option for these populations.

Limitations:

Longer examination time: MRU can take longer than CT urography.

Decreased spatial resolution: MRU may not be as good at visualizing small details as CT urography.

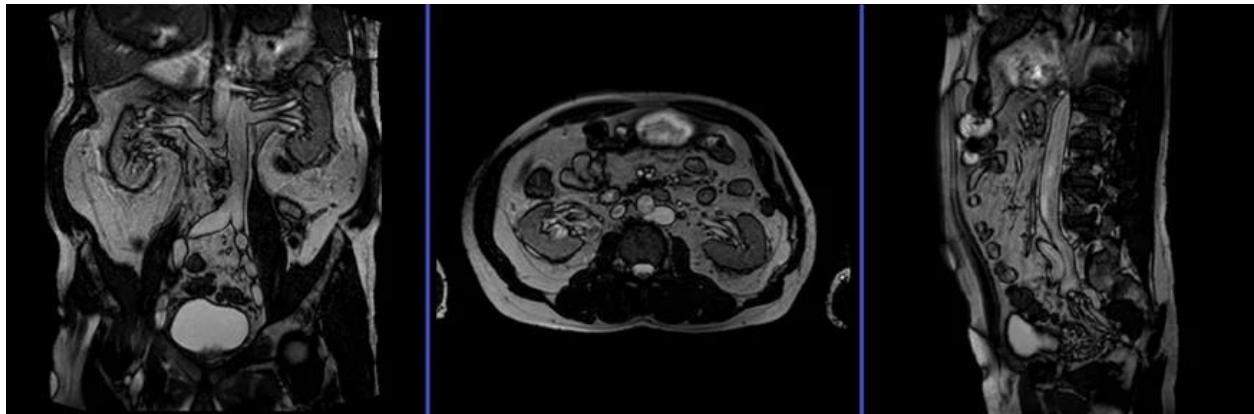
Inability to depict calcifications and calculi: MRU may not be as good at visualizing stones as CT urography.



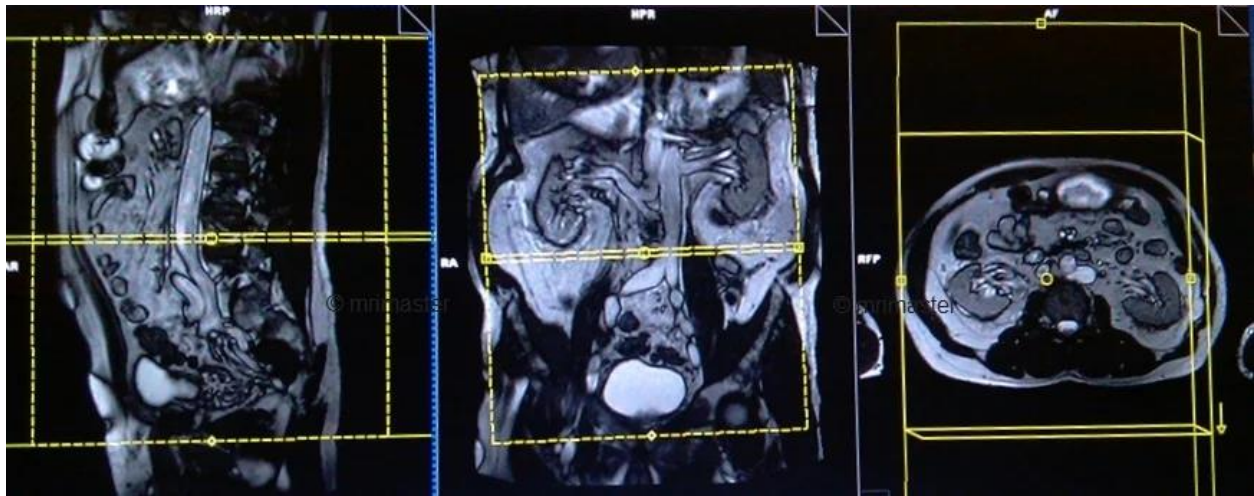


Recommended MRI Kidney Ureters and Bladder (KUB) Protocols and Planning

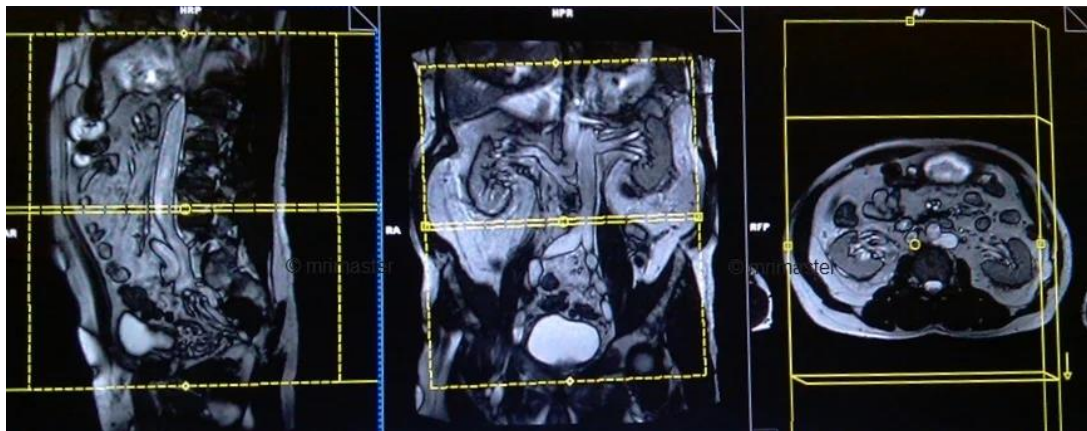
MRI KIDNEY URETERS AND BLADDER (KUB) LOCALIZER



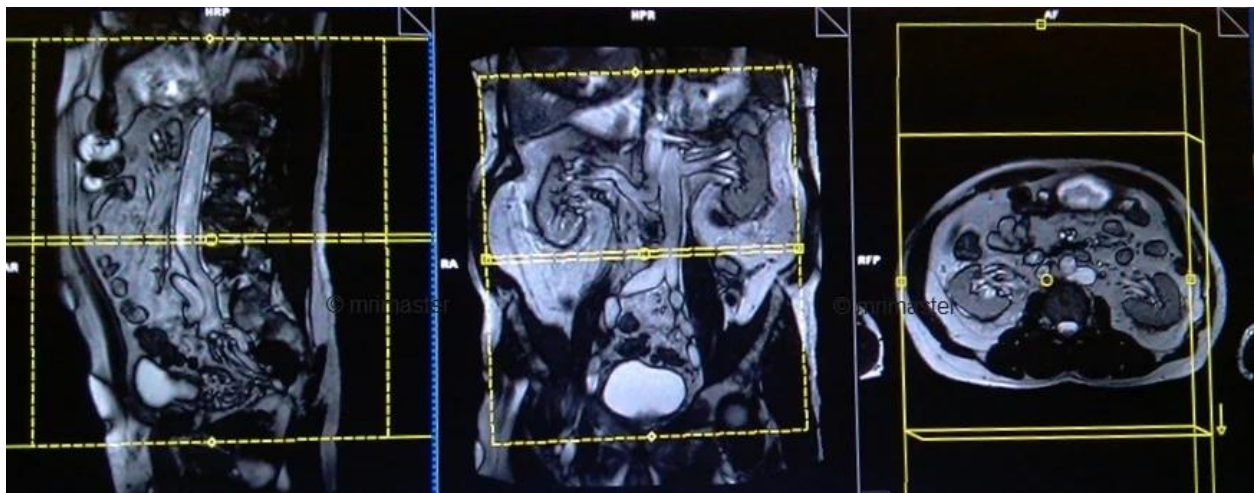
T2 HASTE\TRUFI AXIAL 4 MM



T2 HASTE\ TRUFI FAT SAT AXIAL 4 MM



T1 VIBE DIXON 3D AXIAL 4 MM



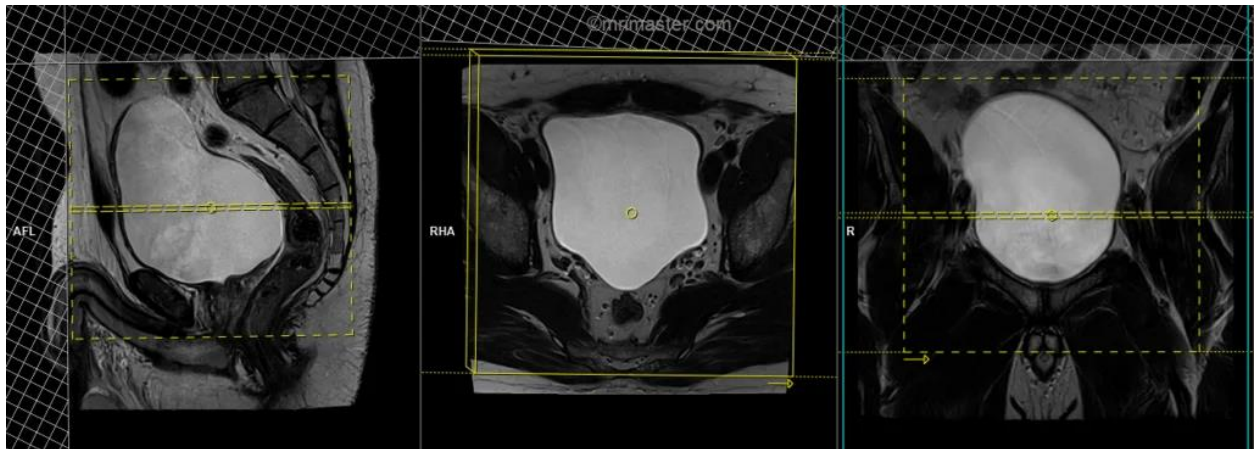
T1 VIBE DIXON 3D CORONAL 2MM



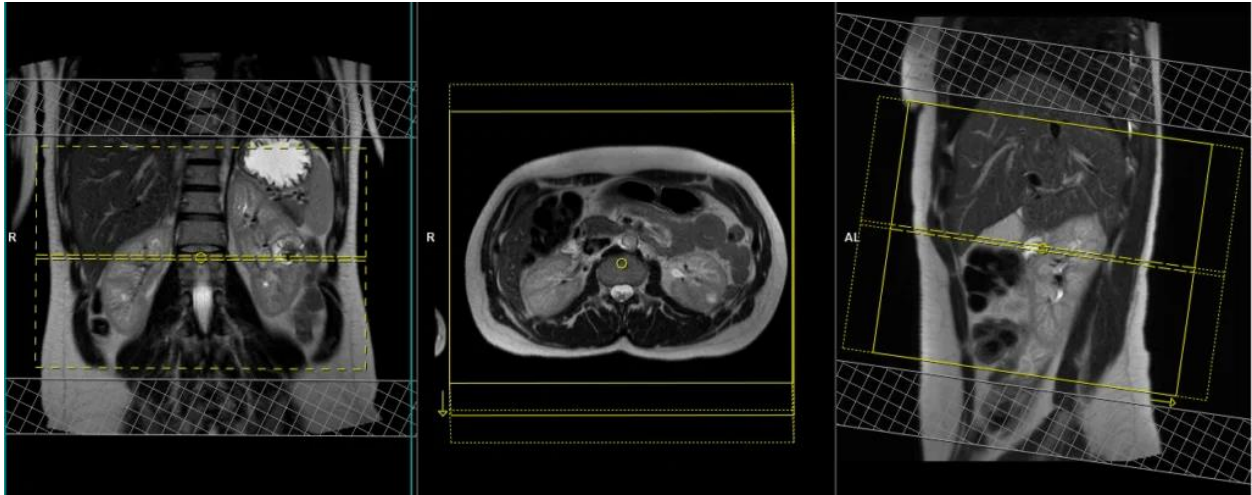
T2 HASTE FAT SAT CORONAL 3MM



T2 TSE AXIAL 3MM SFOV



T2 TSE\HASTE FAT SAT BREATH HOLD 4MM AXIAL



Compiled by: Dr Pravin G U Principal, Prof.RadioDiagnosis . Sri Chamundeshwari Medical college Hospital & Research Institute,Channapatna,Karnataka.President IRIA Karnataka

<https://radiopaedia.org/cases/normal-ct-kub-1> , <https://radiopaedia.org/?lang=us>