College of Health and Medical Technologies
Department of Radiology Technologies
Radiological procedures- 1

MAGNETIC RESONANCE URINARY TRACT

2 nd stage

LECTUER 9

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MSc Radiographic Imaging

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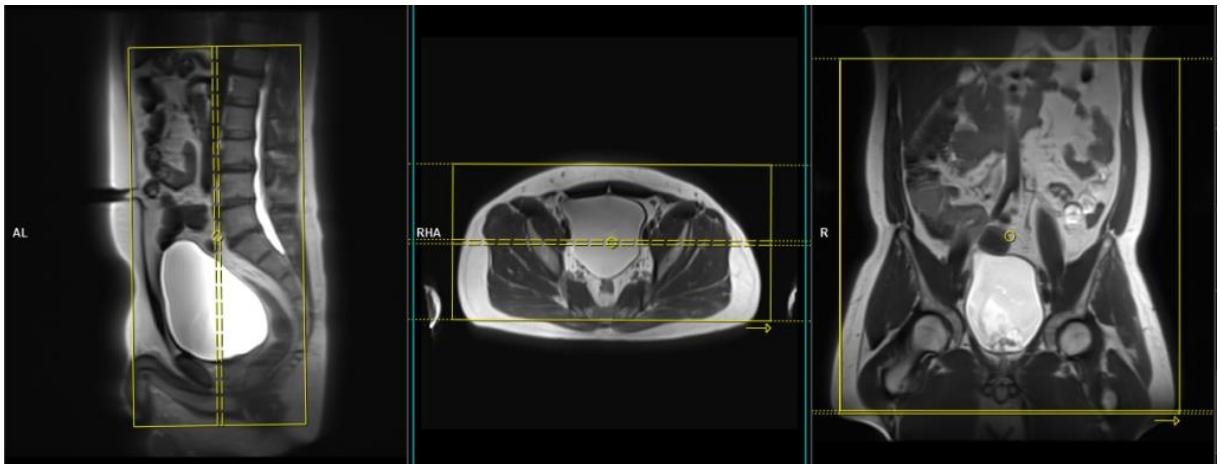
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MAGNETIC RESONANCE URINARY TRACT

Indications

1. Local staging of prostatic cancer

2. Local staging of bladder cancer

3. Staging of pelvic lymph nodes

4. Renal mass

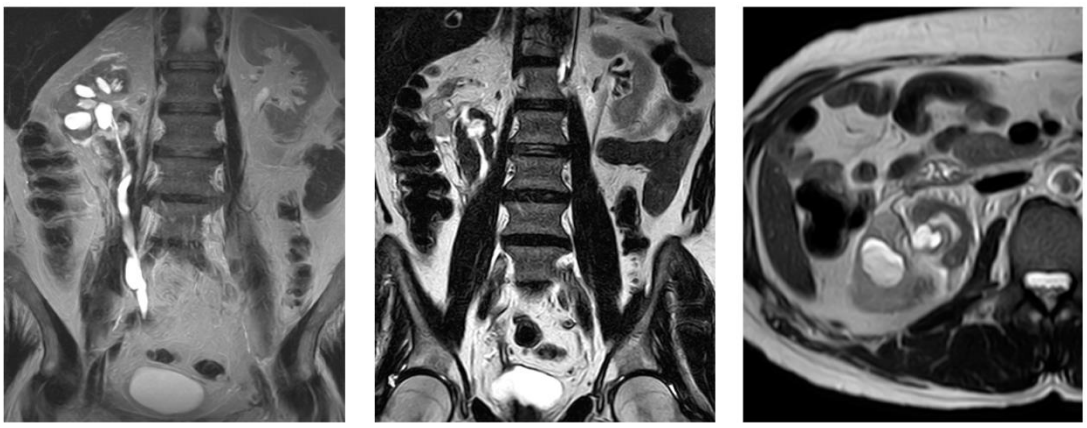
5. Screening of patients with von Hippel–Lindau disease or their relatives, or other genetic conditions

6. MR urography where i.v. or CT urography contraindicated

7. MR angiography: potential living related donors, suspected renal artery stenosis

Technique

Technique will be tailored to the clinical indication. MR of the kidneys and upper abdomen will generally include T1 and T2 weighted sequences in axial and coronal planes with or without fat saturation; with pre- and postcontrast T1 weighted imaging at 30 and 70 s. MRI of the abdomen and pelvis can be obtained to assess retroperitoneal lymphadenopathy as part of the staging investigations for patients with bladder and prostate cancer, but CT is often used for this purpose with MRI reserved for local staging.



(a) (b) (c)

MAGNETIC RESONANCE IMAGING OF THE PROSTATE

Technique/Example Protocol

1. Patient supine. Phased array body coil. The best images will be obtained with an endorectal coil, but many authorities do not use these. 1.5T or 3T scanners are both used. 3T scanners afford better signal-to-noise ratio, but may be subject to more artifacts—notably susceptibility.
2. Antiperistaltic drugs (hyoscine butyl-bromide or glucagon are recommended)
3. T1W and T2W axial scans whole pelvis
4. Thin-section (3–4 mm) small field of view T1-weighted spin echo (SE) scans in axial plane orthogonal to the axis of the prostate to evaluate for postbiopsy haemorrhage
5. Thin-section (3–4 mm) small field of view T2-weighted SE scans in transverse, sagittal and coronal planes orthogonal to the axis of the prostate
6. Multiparametric MRI—there is increasing use of the following functional studies:

(a) Diffusion weighted imaging b values 0, 100 and 800–1400 Sn mm−2 with apparent diffusion coefficient (ADC) map

(b) Dynamic contrast-enhanced (DCE) T1W imaging

(c) MR spectroscopy—citrate, creatine, choline

MAGNETIC RESONANCE UROGRAPHY

Indications

1. To demonstrate the collecting system/determine level of obstruction in a poorly functioning/obstructed kidney
2. Urinary tract obstruction unrelated to urolithiasis. Suspected renal colic from underlying calculus is better imaged with CT KUB.
3. Congenital anomalies
4. Renal transplant donor assessment (combined with MR angiography)

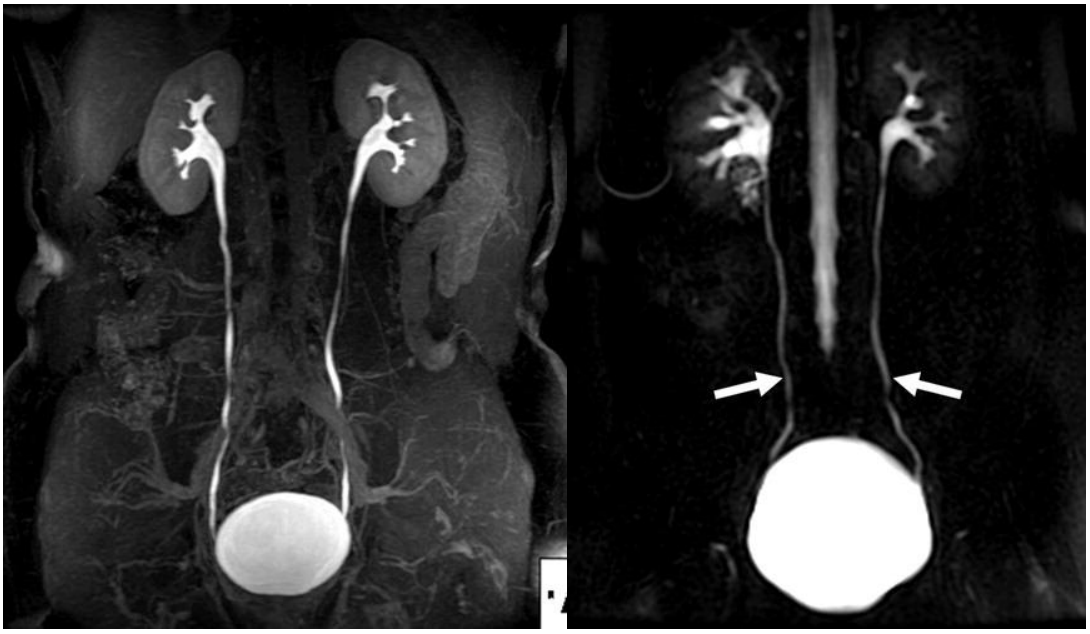
Technique

The two most common MR urographic techniques are:

• static fluid-sensitive urography using heavily T2-weighted MRI techniques to visualize fluid-filled structures (equivalent to magnetic resonance cholangio-pancreatography [MRCP])

• excretory MR urography using T1-weighted sequences post gadolinium enhancement

1. Patient supine with an empty bladder for comfort. If the bladder is of interest, a moderately full bladder may be preferred.
2. Scout views are obtained.
3. Static MR urography may be performed prior to excretory urography. Thick-slab, single-shot, fast-spin echo or a similar thin-section technique, e.g. half-Fourier rapid acquisition with relaxation enhancement; single-shot, fast-spin echo; singleshot, turbo-spin echo. 3D respiratory triggered sequences may be used to obtain thin-section data sets that may be further postprocessed.
4. Oral or i.v. hydration, compression or diuretics may be used to enhance collecting system distension.
5. Excretory MR urography: a gadolinium-based contrast agent is administered i.v. using a dose of 0.1 mmol gadolinium kg−1 body weight. The collecting systems are imaged during the excretory phase (10–20 min) using a breath-hold, 3D gradient echo, T1-weighted sequence. Fat suppression will improve the conspicuity of the ureters. T2* effects from a high concentration of contrast agent may reduce the signal intensity of urine and potentially obscure small masses within the collecting system. This can be overcome by using a lower volume of i.v. contrast but may compromise soft-tissue imaging.



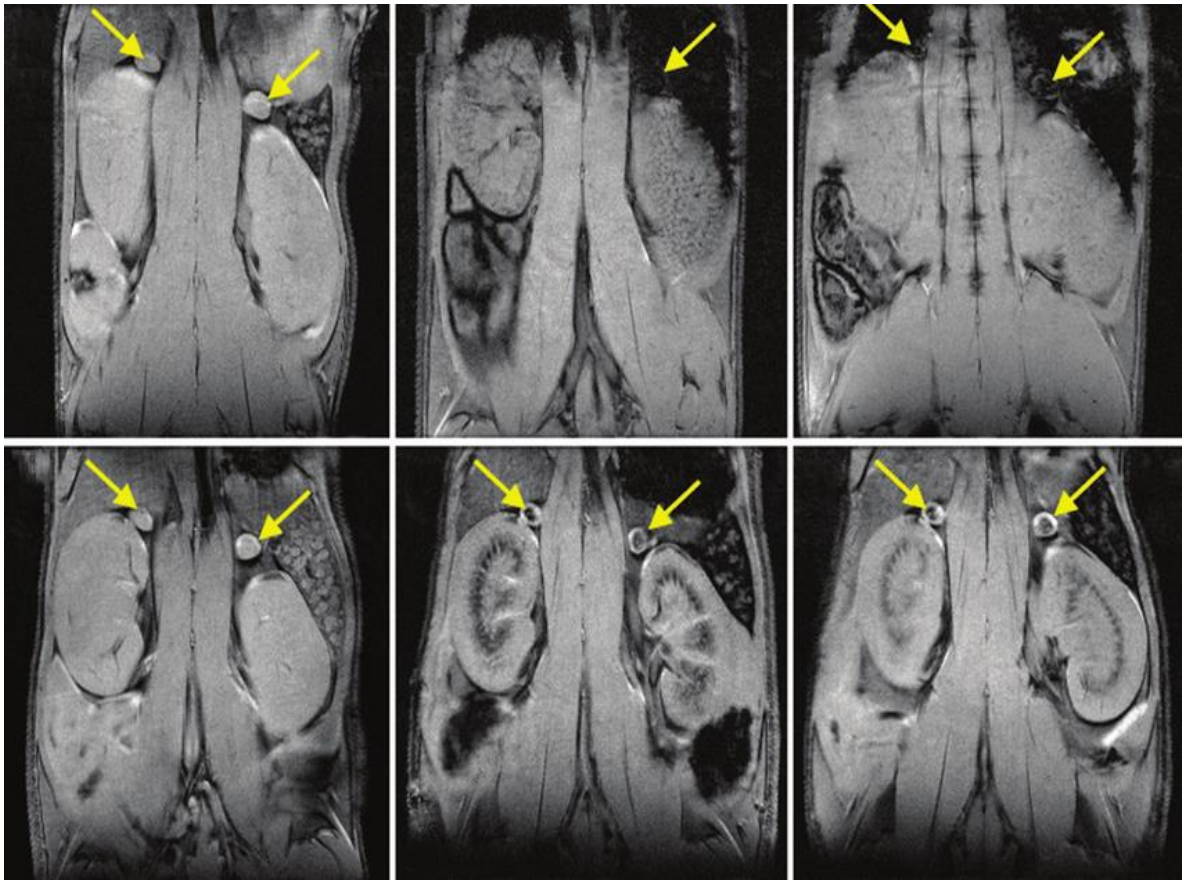
MAGNETIC RESONANCE IMAGING OF ADRENALS

Indications

Characterization of adrenal mass.

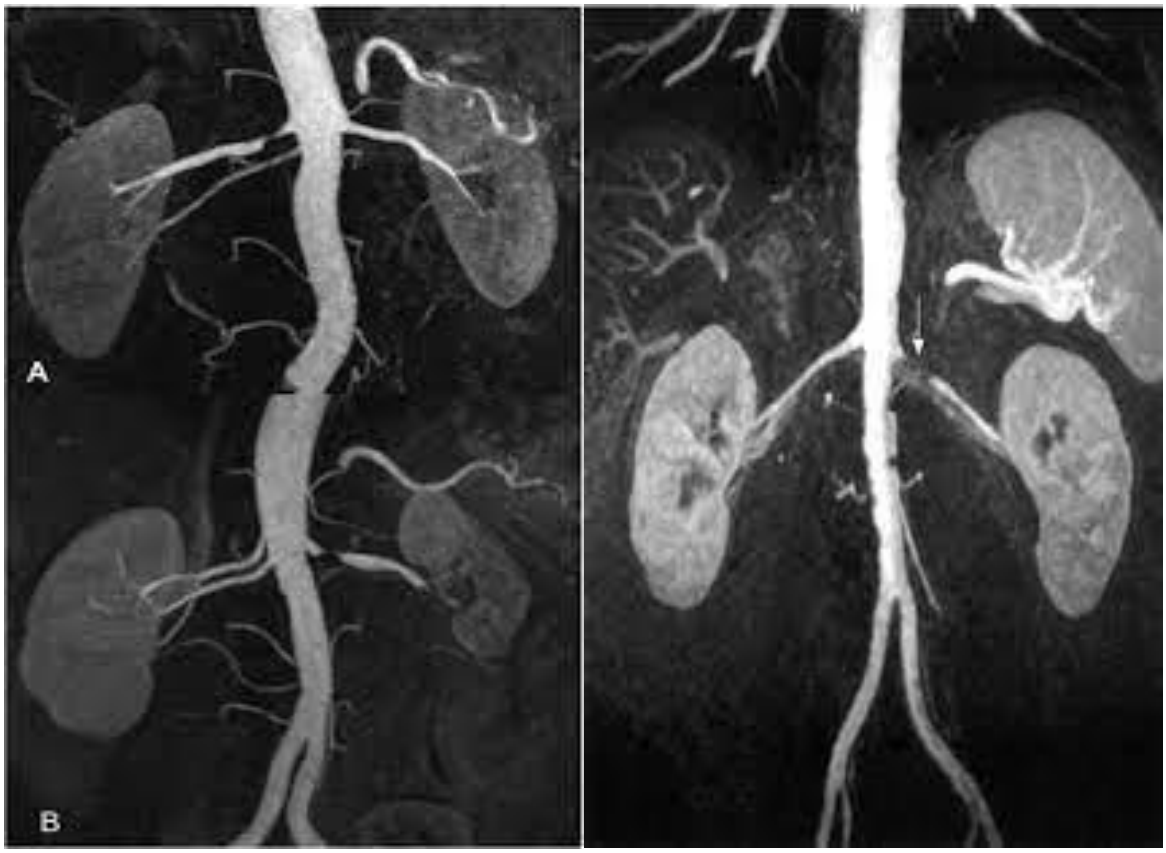
Technique

Chemical shift imaging: based on a high proportion of intracellular lipid causing alteration of the local magnetic environment within the voxel and hence resonant frequency of protons. Lipid-rich benign adenomas can be shown to lose signal on opposed phase T1W imaging compared with in-phase studies. This is highly specific. Alternatively, unenhanced CT can be used to characterize an adrenal mass as malignant, or 18-F fluorodeoxyglucose positron emission tomography (18-F FDG-PET) can be used to characterize an adrenal mass as malignant



MAGNETIC RESONANCE RENAL ANGIOGRAPHY

Principles of MR angiography



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