

Imaging in Genitourinary malignancies

- The evolution of imaging techniques .
- Imaging techniques used as tools for
 - Diagnosis
 - Staging
 - Follow up

- Diagnostic tool - Clinically efficient & cost effective manner .
- The ultimate goal of imaging –
 - Safe and effective examination.
 - Clinically relevant information for the treatment .

Imaging modalities

- Plain skygram
- Intravenous urography
- Ultrasound
- Computed tomography
- Magnetic Resonance Imaging
- Positron emission tomography

- Strengths and weakness

Evaluation of GU neoplasm

- Combination of clinical and diagnostic imaging methods
- Role of imaging are :-
 - Detecting & Characterizing mass.
 - Supplementing clinical staging
 - Pre-operative planning
 - Assessment of Tumor recurrence.

Kidneys

- Sky gram KUB



- Bean shaped retroperitoneal organs

- Location D12-L1 level

Ultrasonography

- Extensively used and widely available method.
- Often first step in diagnostic workup.
- Sensitivity is less than CT. Still questions can be answered.

Ultrasonography

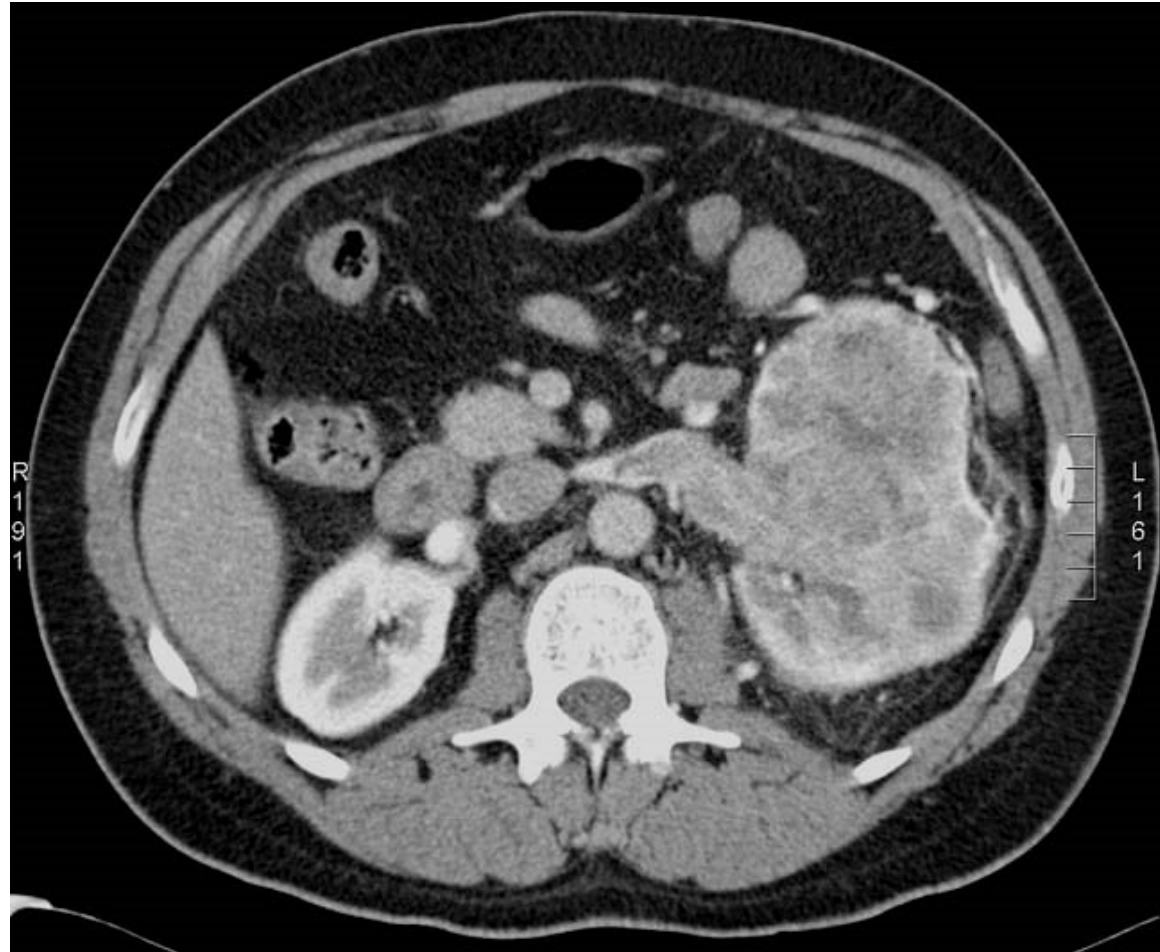
- Solid mass
- Cystic lesions diagnosis is based on Bosniak Classification System



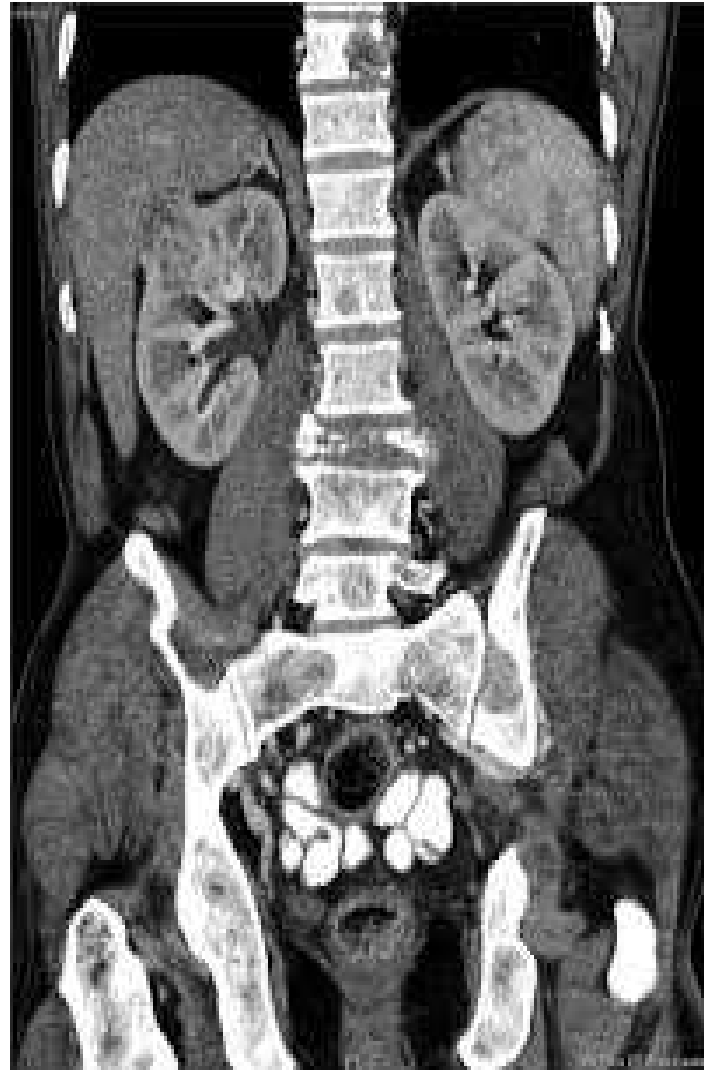
Kidney tumour

- Diagnostic Modality of choice MDCT(multiphase contrast enhanced CT)
- Staging of tumour .
- Digital elements and post processing features.
(multiplane reconstruction . 3D or virtual urography images can be generated any time from the primary database)

Renal mass invading left renal vein



Renal mass



MRI

- Can be used with similar diagnostic efficacy
- Advantages and disadvantages

Radiological diagnostics of collecting
system disease ,Ureters and urinary
bladder

Ureters

- Physiological stenosis
- Ureters are in retroperitoneum
- Cross superficial to iliac arteries
- Crosses posterior to the testicular artery/ovarian artery
- Also pass dorsally to uterine artery and spermatic cord

Radiologic imaging

- Needs contrast filling of the ureters
- It is achieved by
 - anterograde or retrograde filling of the ureters by catheter insertion
 - In cross-sectional imaging technique (CT,MR) timed image acquisition is conducted in excretory phase (app 8-10 minutes)

Warning: Not for diagnostic use





Urinary Bladder

- Is Pelvic Organ in undistended condition
- Extends to abdomen when fully distended
- Divided into Vertex, Corpus and fundus
- Ureters enter the bladder through the posterocaudal part of the fundus (vesical trigone)

Radiographic imaging

- Definitive diagnosis can be established with Cystoscopy and biopsy .
- Imaging plays an important role in early detection and staging of the disease

IVU



- Bladder mass

Ultrasound

- Pre requirement is full distention of lumen
- Normal wall thickness is 3mm.

MDCT & MRI

- Extent of propagation of disease
- Nodal involvement
- Distant metastasis
- Virtual endoluminal images can be reconstructed from excretory phase series

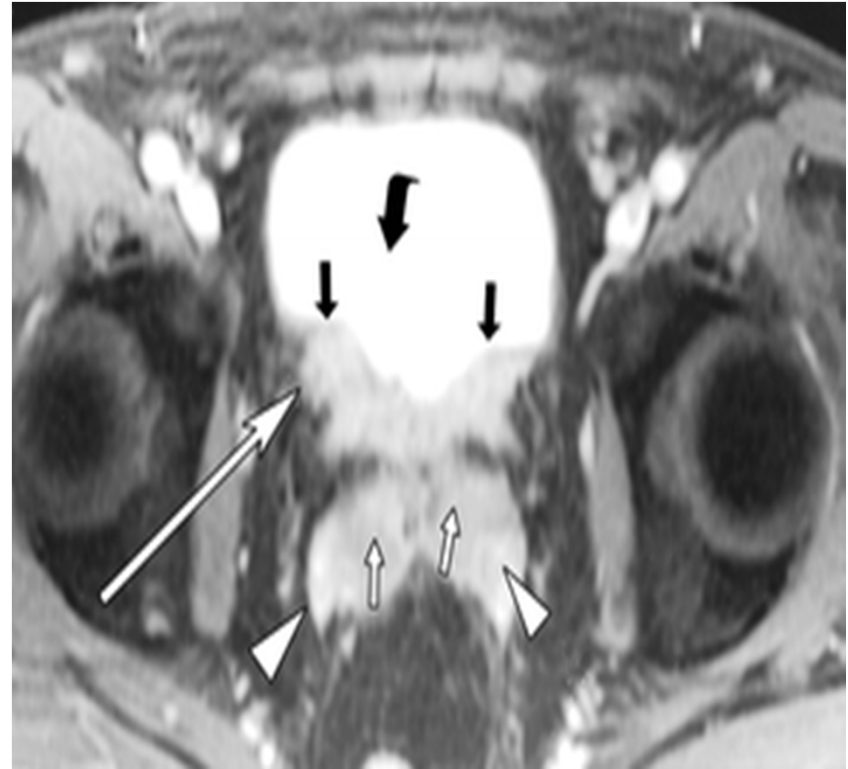
Urinary bladder mass



Urinary bladder mass



Urinary bladder mass



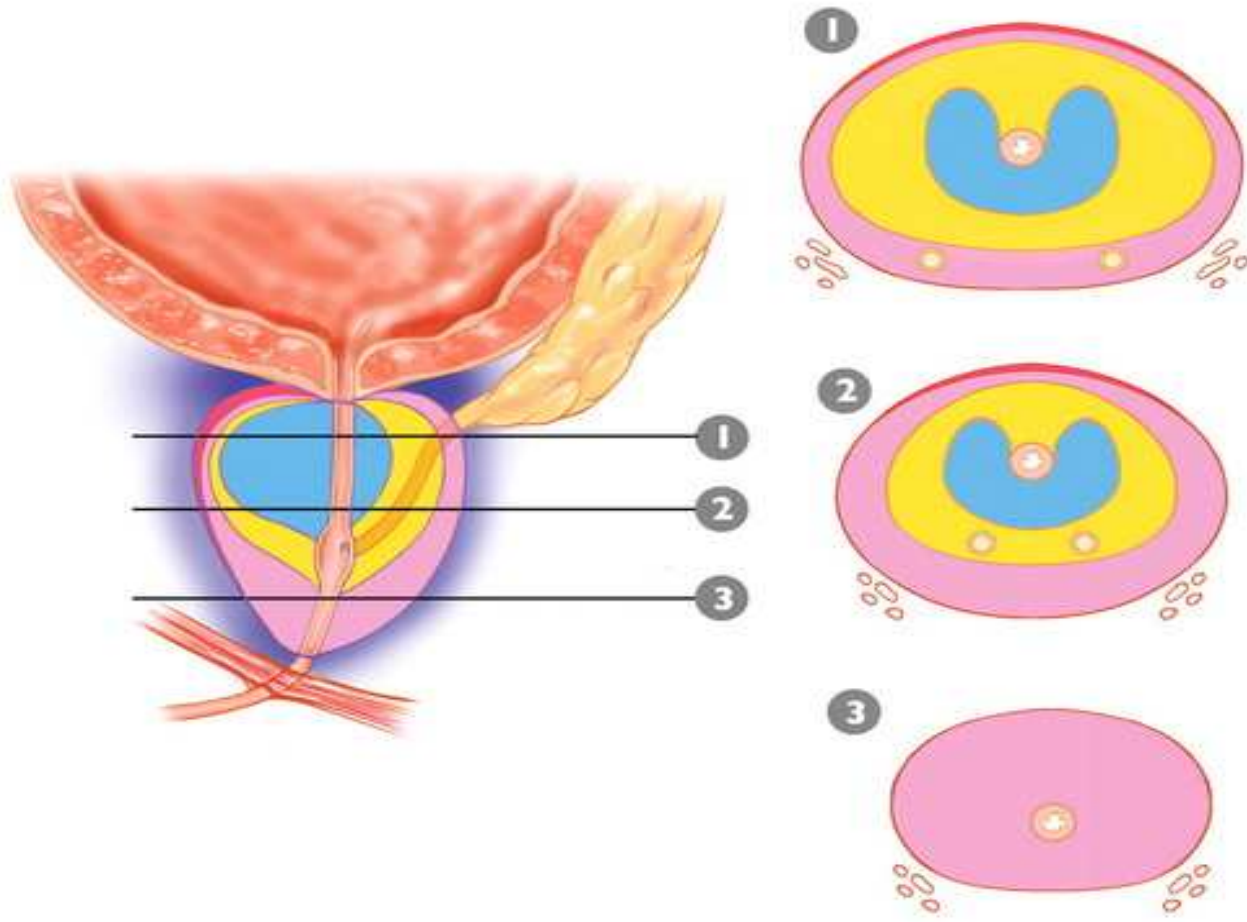
Prostate (USG)

- The base line imaging modality
- It is performed
 - Perabdominal
 - Transrectal route (TRUS)
- Elastography
- TRUS guided biopsy

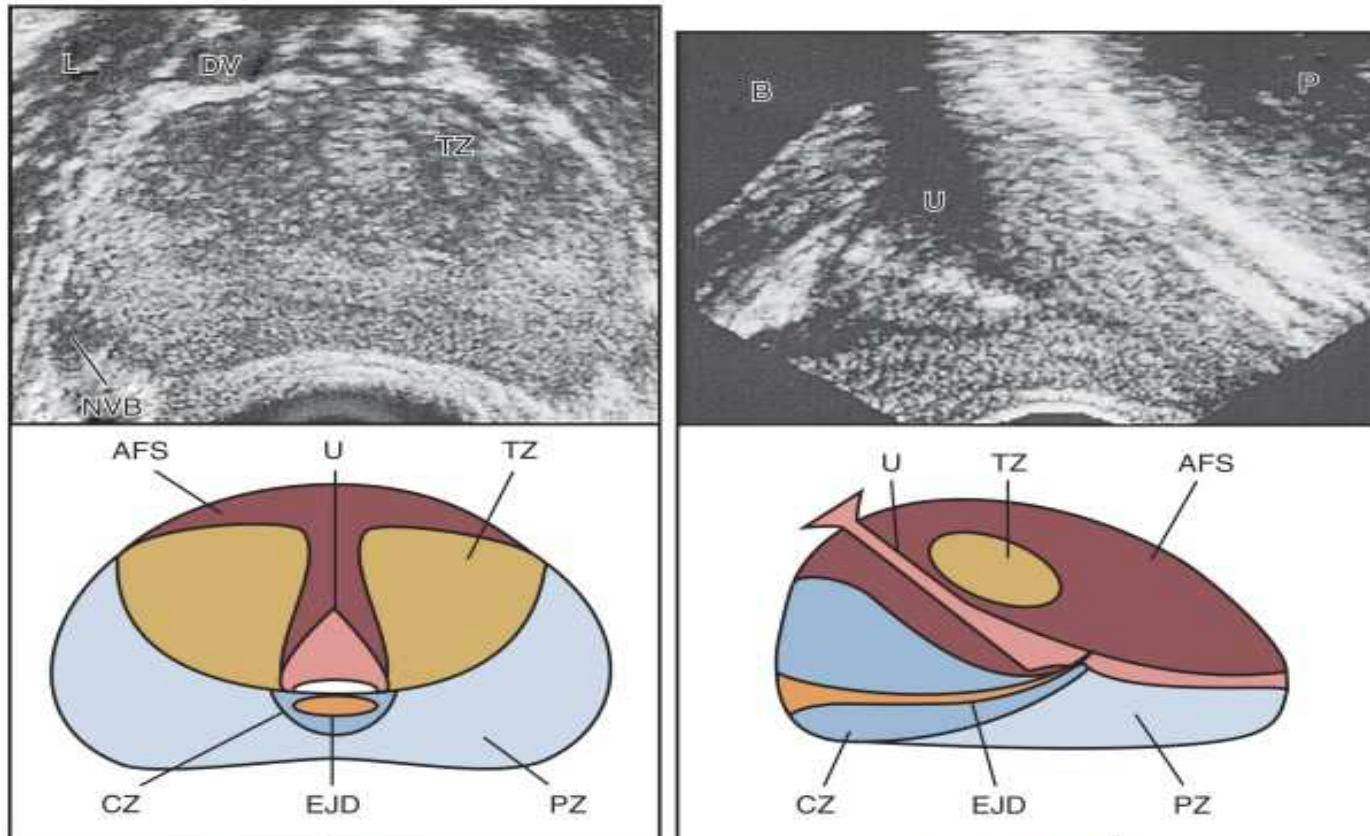
PROSTATE

- Familiarity with Zonal classification of prostate is necessary for the understanding of basic clinical and radiological concepts of prostatic disease.

Prostate



Prostate



A A, Transverse view.

B B, Sagittal view.

AFS, anterior fibromuscular stroma; CZ, central zone; DV, dorsal vein complex; EJD, ejaculatory ducts; NVB, neurovascular bundle; L, levator muscles; PZ, peripheral zone; TZ, transition zone; U, urethra.

CT Scan

- Poor in delineating zonal anatomy
- Strength is in evaluating regional and distant metastasis

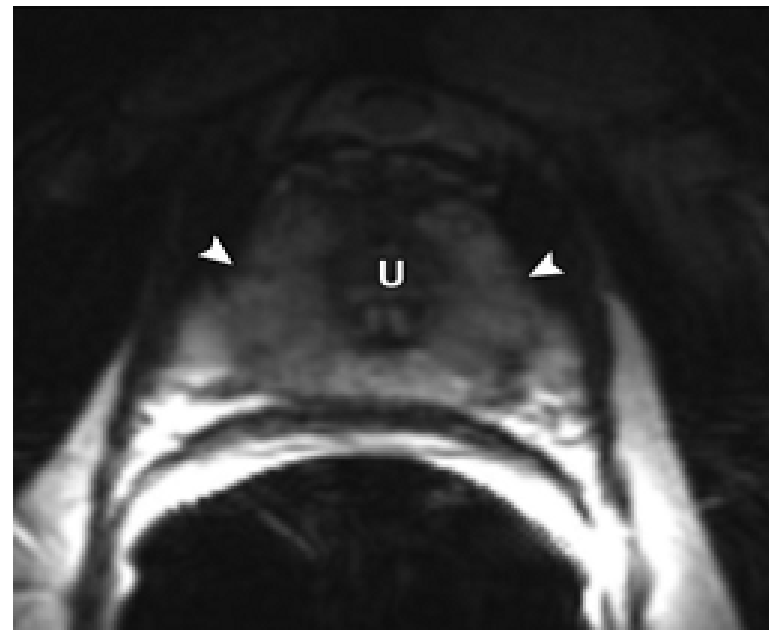
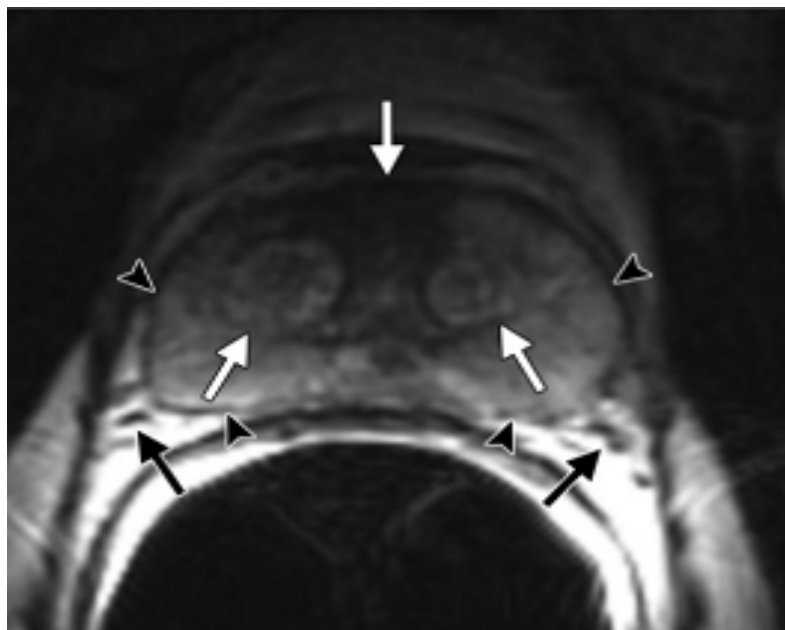
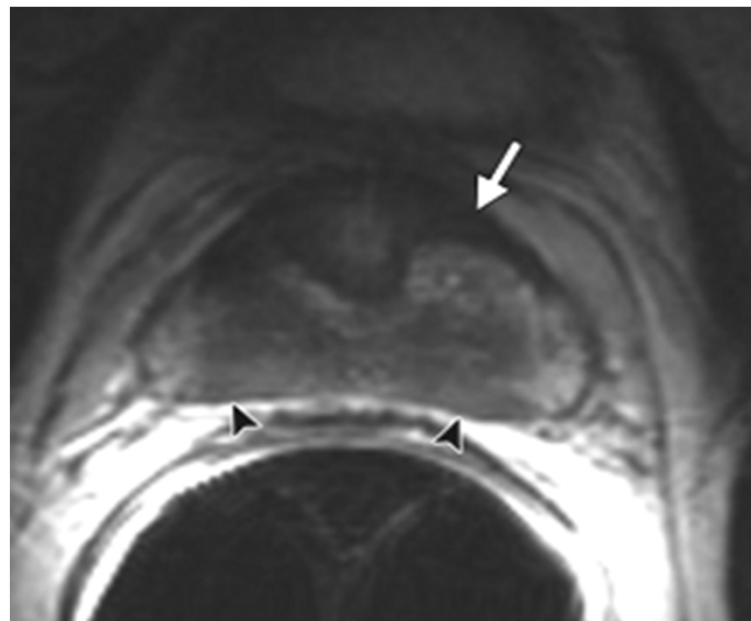
MRI

- Delineates zonal anatomy well
- Provides most accurate information to date about anatomy and location of tumour .
- Capsule invasion
- Seminal vesicle invasion
- Bony metastasis

Normal MRI appearance of Prostate

- Normal prostate has homogenous low signal on T1WI
- Zonal anatomy is best demonstrated on T2WI
- Comprise of low signal central zone and higher signal peripheral zone
- TZ and CZ appears similar in SI and loosely termed the central gland

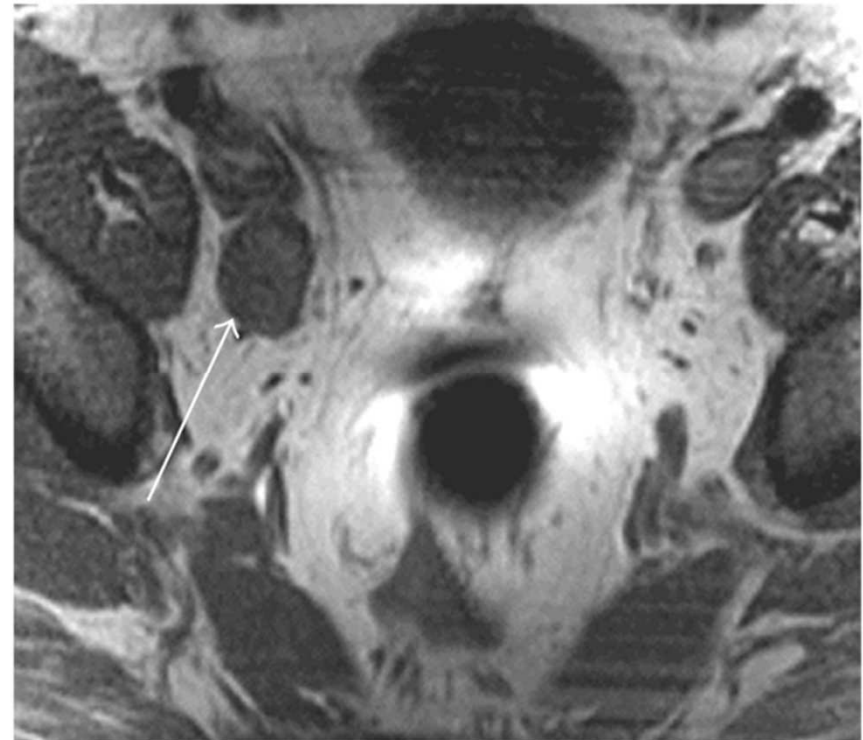
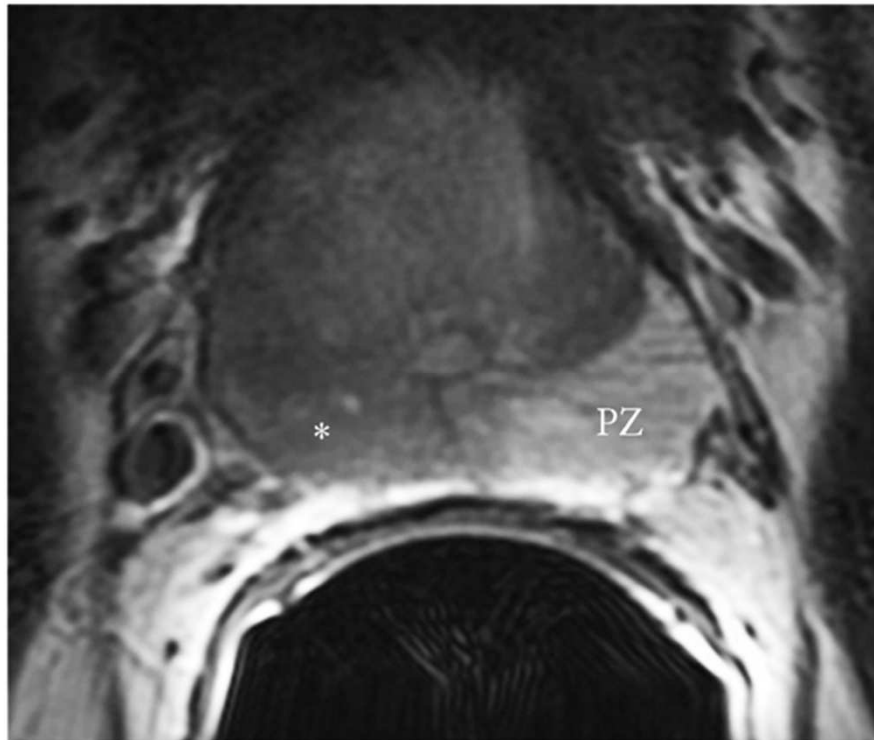
Normal T2 appearance of Prostate



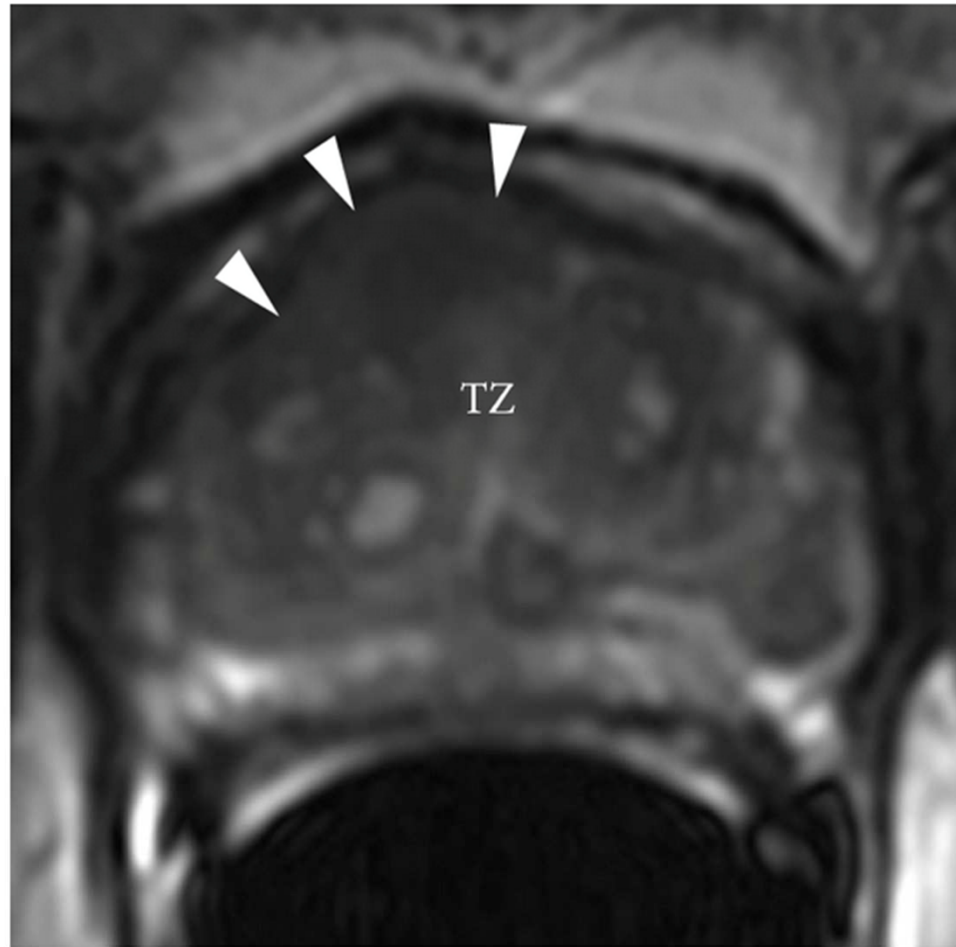
Strength of MRI

- Contrast enhanced dynamic scan
- MRS
- Diffusion Imaging
- Biopsy

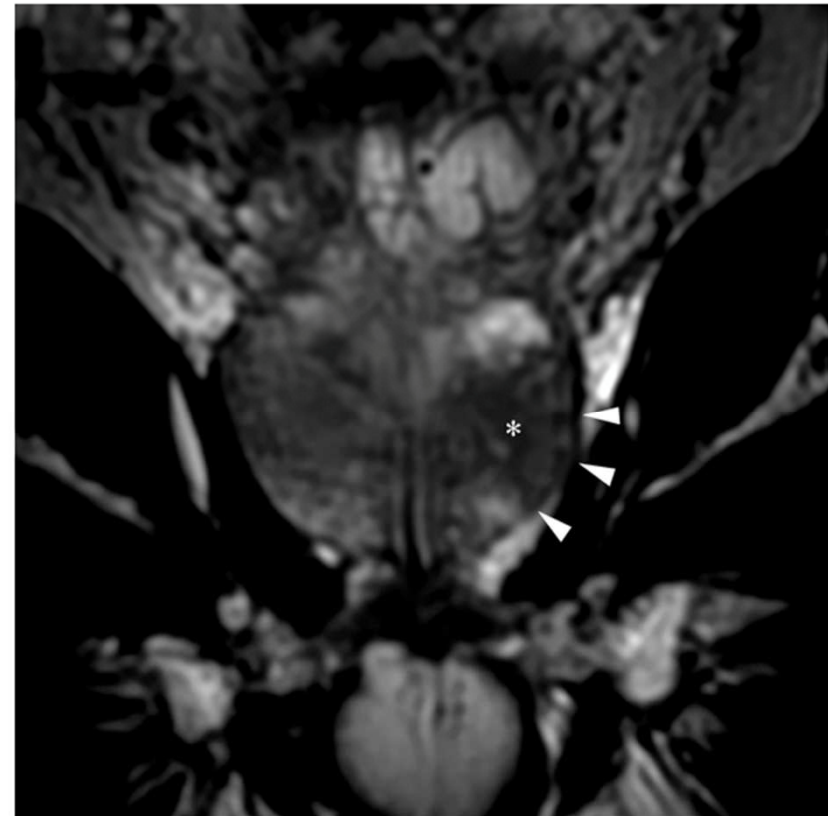
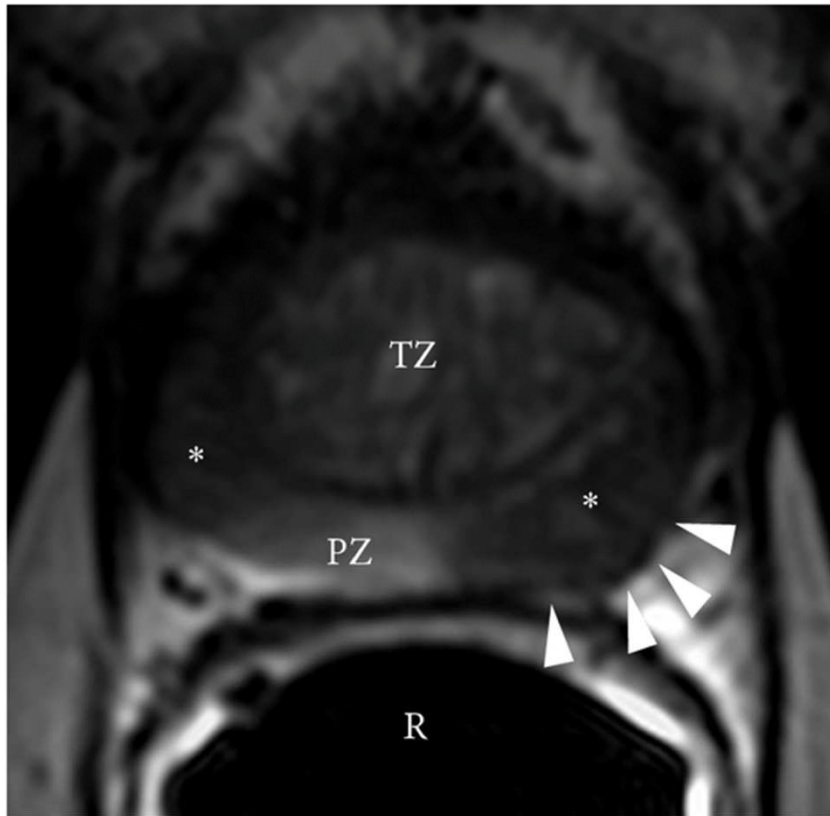
50-year-old male with prostate cancer.



Axial T2WI showing a right anterior transitional zone tumor within the midgland with the tumor creating a slight anterior bulge.



Multifocal peripheral zone tumors



MR SPECTROSCOPY OF PROSTATE

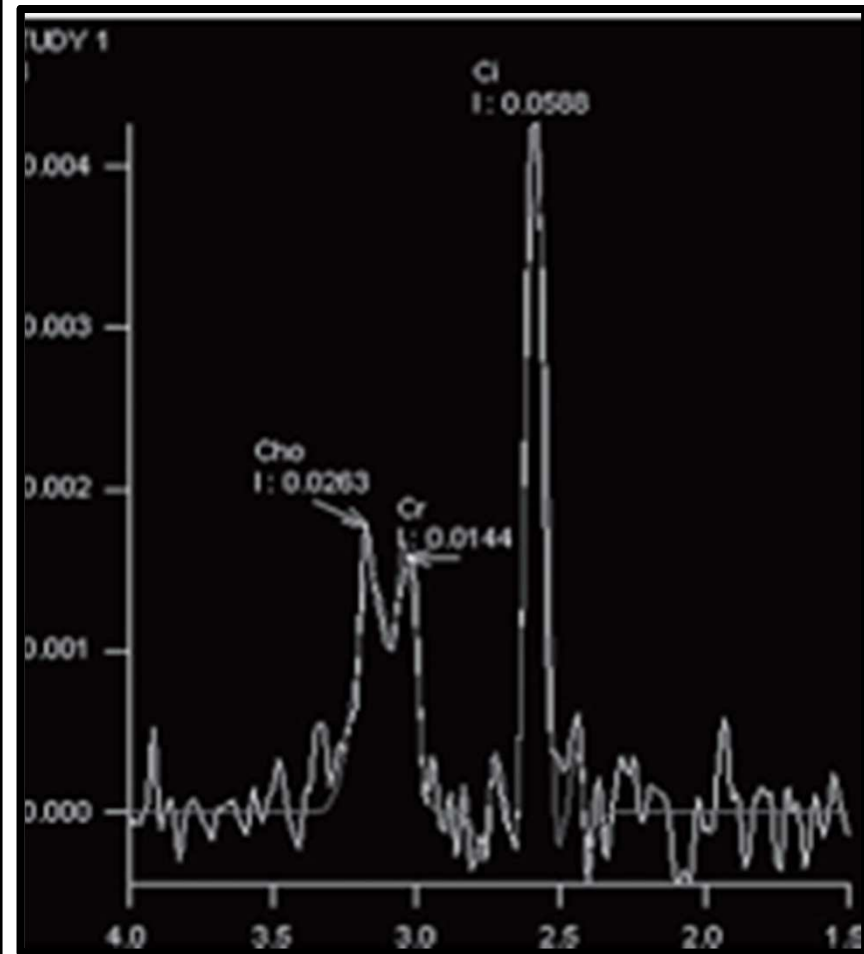
NORMAL METABOLITES OF PROSTATE

- Citrate : Produced by normal epithelial cells of prostate
Normal Peak at 2.6 ppm
- Choline : Precursor of phospholipids cell membrane
Normal Peak at 3.2 ppm
- Creatine : Involved in cellular energy
Normal peak at 3 ppm

Normal MR Spectroscopy



At 1.5 T

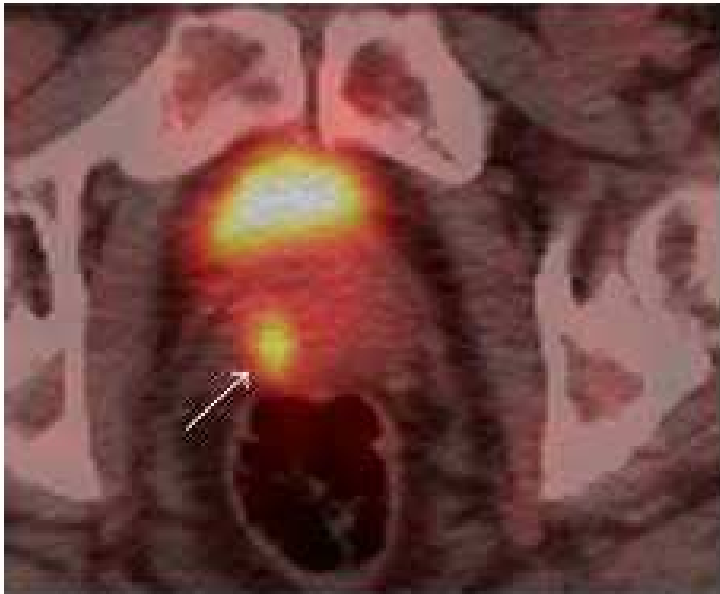


At 3 T

Radionuclide Scintigraphy

- For metastatic work up

PET CT



Testicular Imaging

- Ultrasonography is the best modality for rapid and accurately assessing scrotal masses
- Can determine truly intra or extra testicular masses
- Facilitates testicular examination in presence of hydrocele

chest skygram/CT/MRI

- 85-90% of lung metastasis is detected by skygram
- CT is the modality for evaluation of retroperitoneum
- MRI has no additional value

PET Scan

- Beneficial in evaluation of residual masses after treatment particularly viable carcinoma.

Uterus

- Ultrasound
- CT
- MRI

uterus



Uterus CT Scan



Endometrial carcinoma

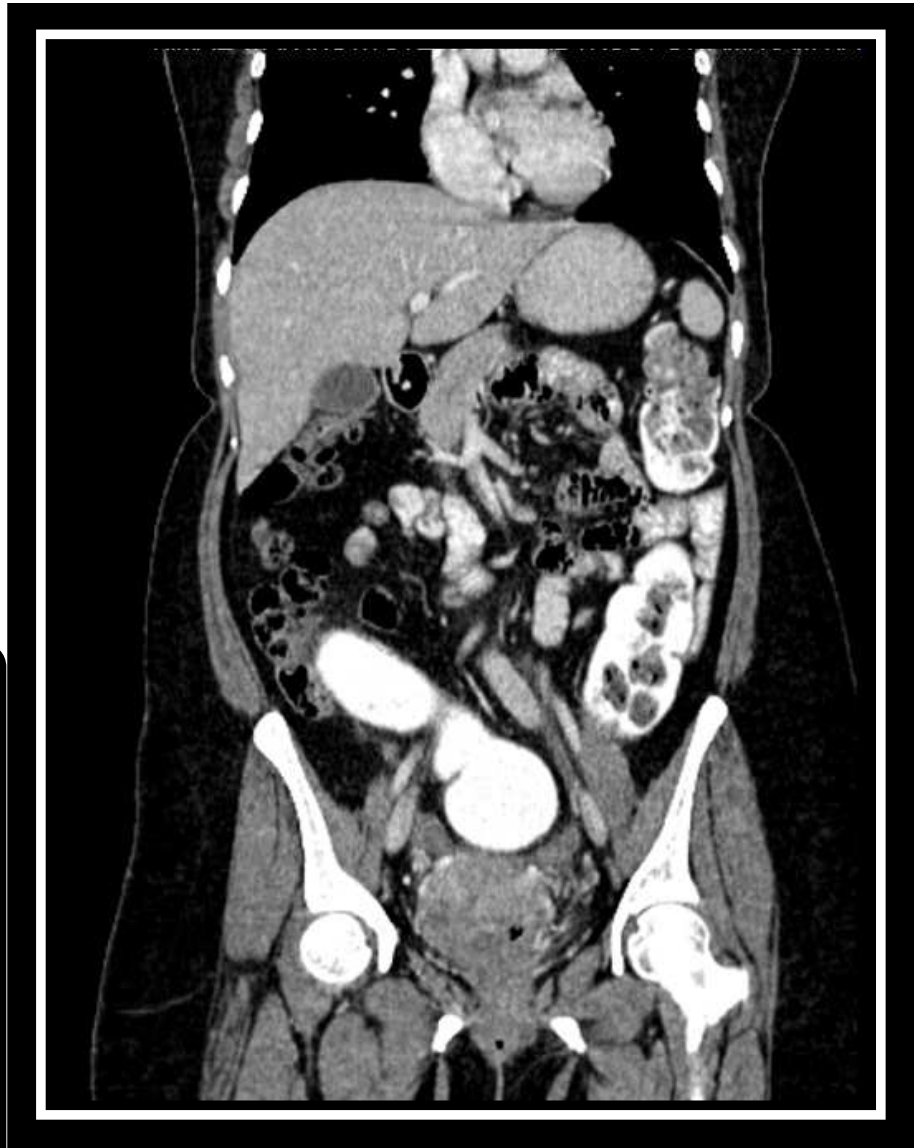
MDCT :-

- Thin slices ,isotropic database & reconstruction in multiple user defined planes.
- Can detect myometrial invasion.
- Assessment of nodes.
- Distant metastasis
- Recurrence.

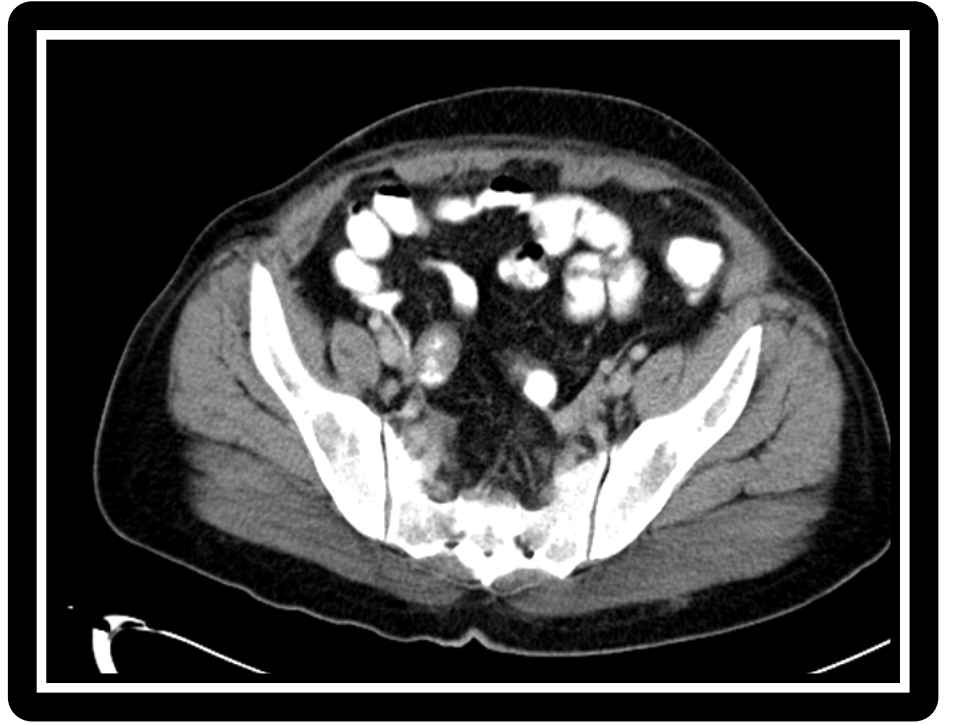
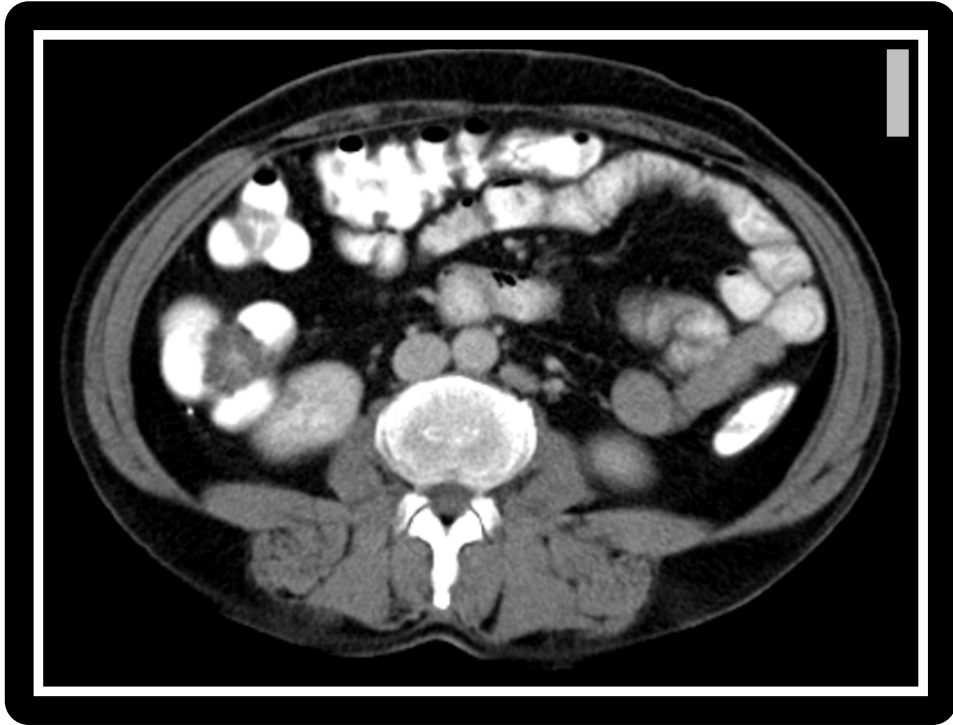


Uterine Cervical Carcinoma

- Lesion size
- Extension into the uterine corpus.
- Depth of stromal invasion .
- Parametrial spread.
- Loco-regional spread
- Pelvic lymphadenopathy
- Distant metastasis

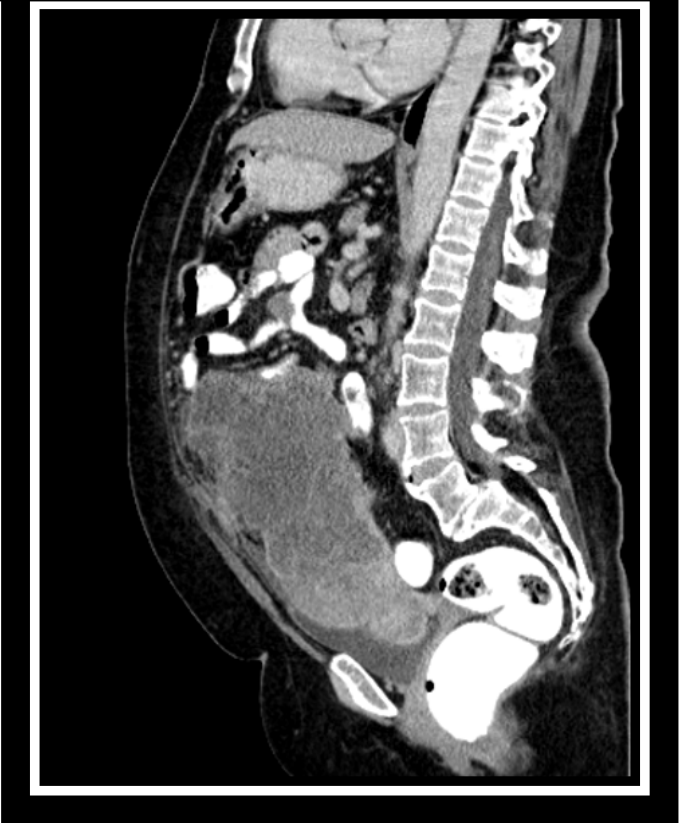
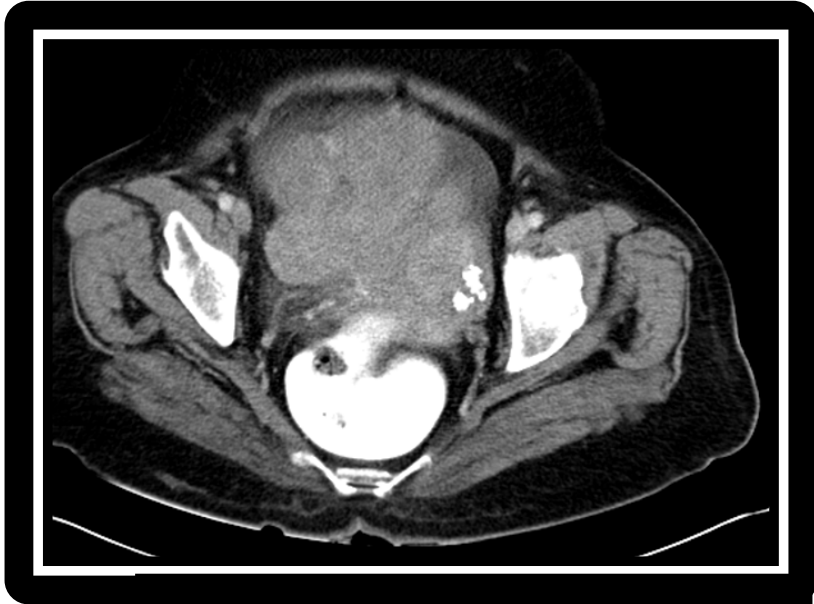




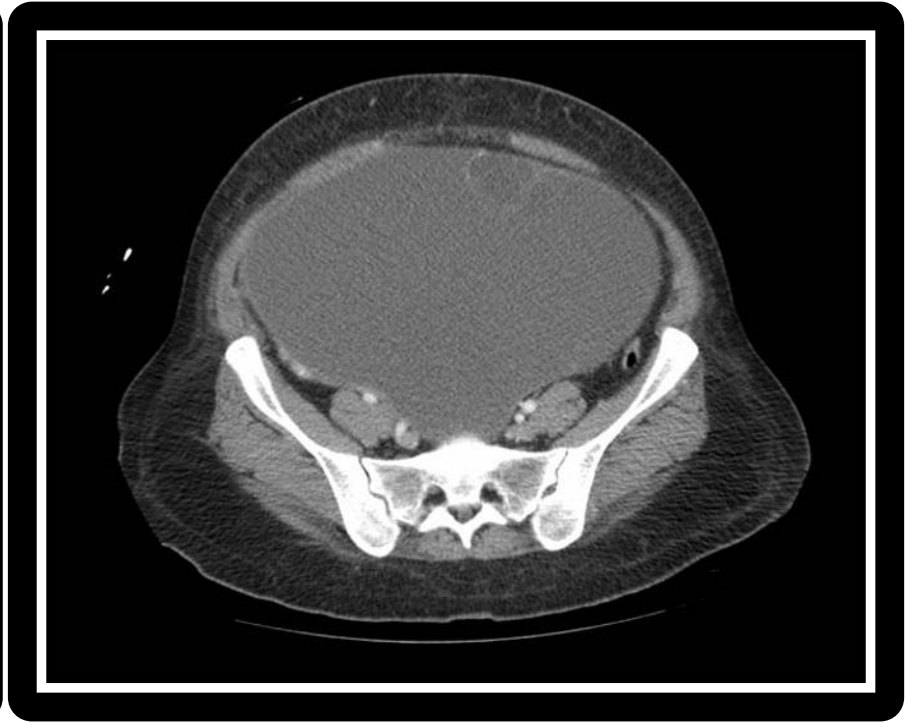
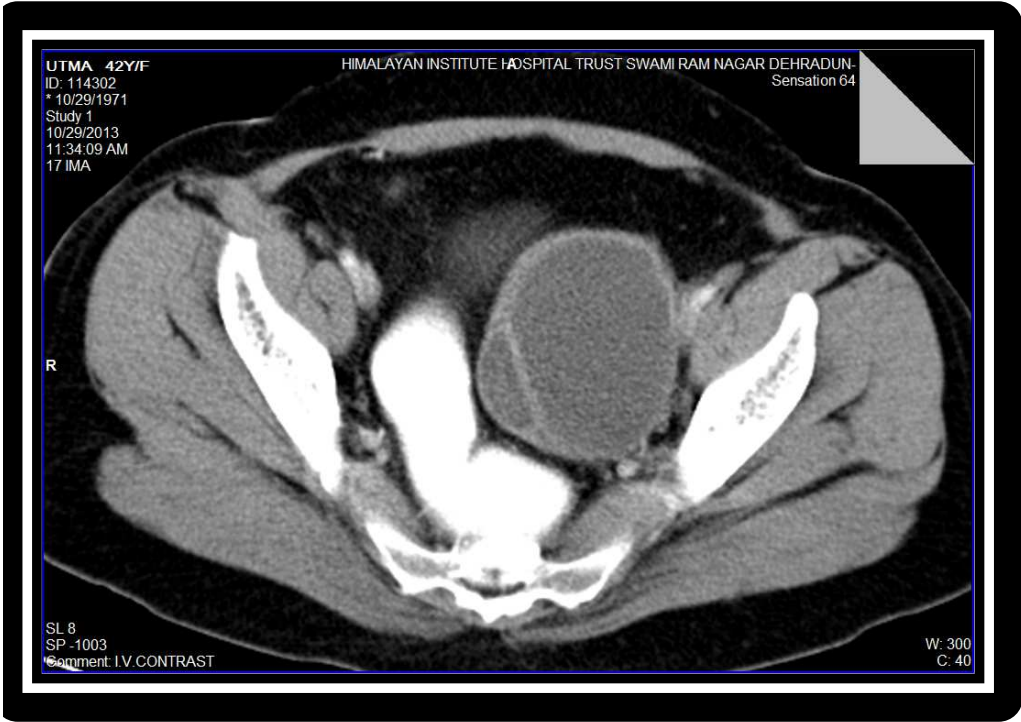


Ovarian tumors

- Adnexal masses are common findings and the key is to distinguish benign from potentially malignant .
- C.T is used to
 - Characterize an adnexal mass
 - Assess for metastatic disease
 - Stage patient for metastatic disease.







Conclusion

- Imaging is the key to evaluate the clinically diagnosed mass
- All modalities have their strength and weakness. we need to understand them.
- We have to be wise enough to use various modalities judiciously for ultimate benefit of the patient

Thank You!