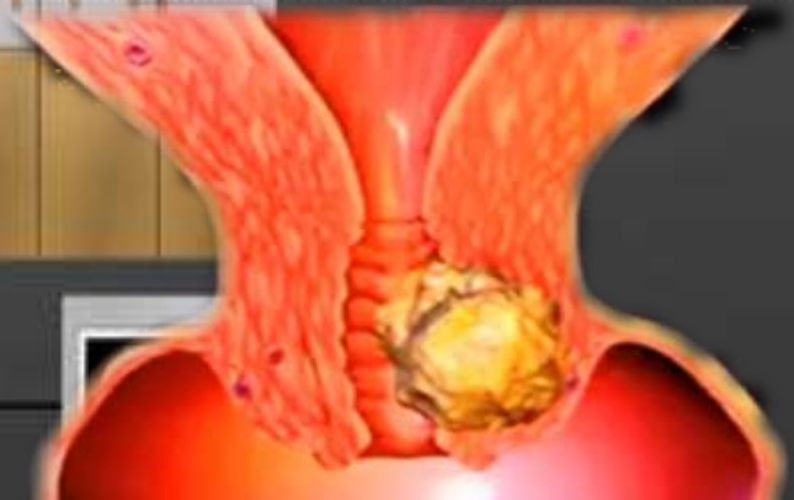
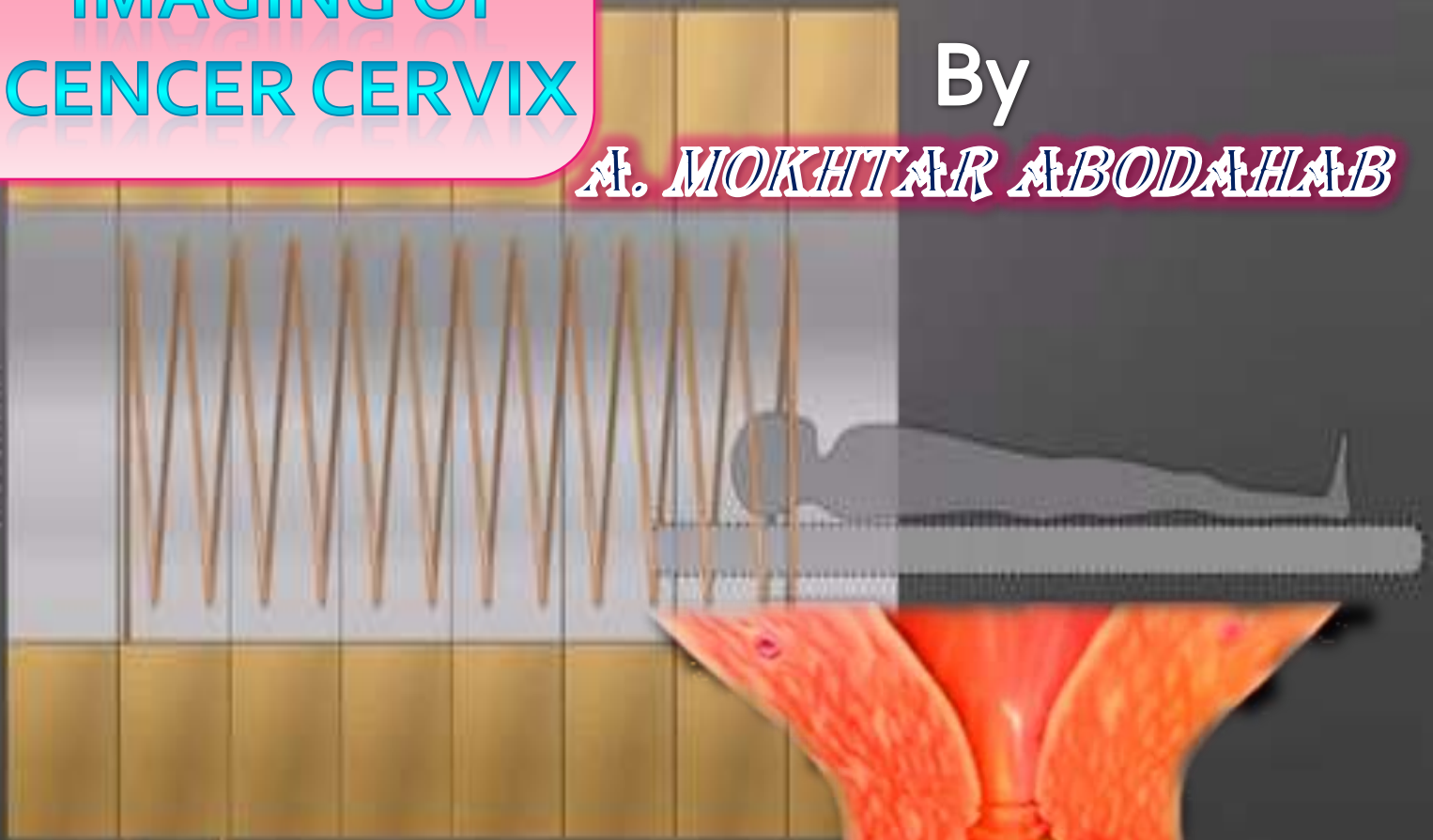


**SPOT
LIGHTS**

**IMAGING OF
CENCER CERVIX**

By

A. MOKHTAR ABODAHAB



Sat, 11 Mar 2017

*** uterine cervix is largely a preventable disease**



*** curable if it is identified before its progression to invasive cancer**

Role of Radiologist

- Detection “Esp. Early “
- Staging
- ttt Follow up



- **Peak** Incidence **55 : 65 y**
- **4 %** of all malignant diseases.

WARNING SIGNS



Loss of bladder control



Pain during intercourse



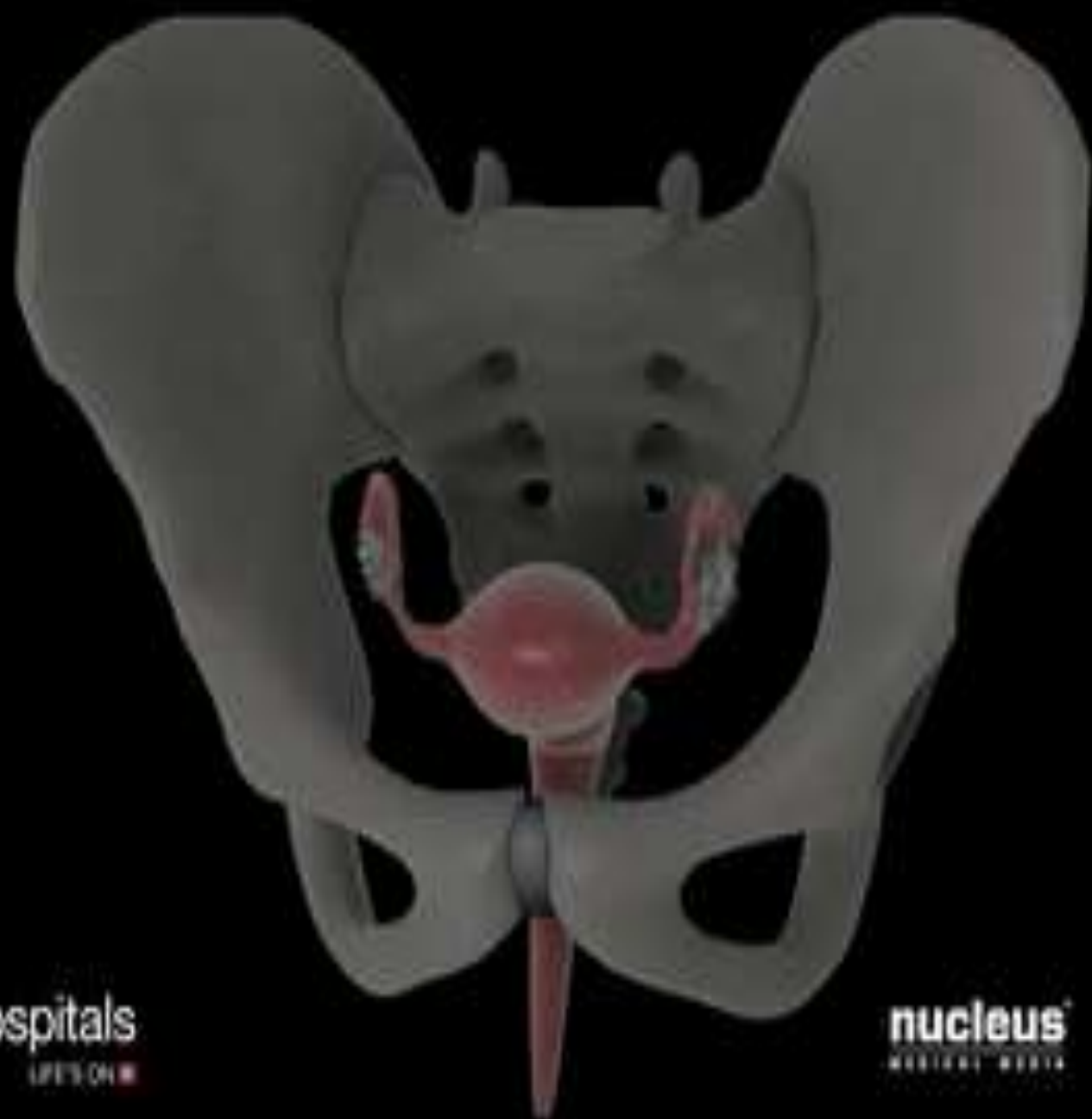
Constant fatigue



Pelvic pain



Unexplained weight loss



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LIFE'S ON

nucleus
MEDICAL MEDIA

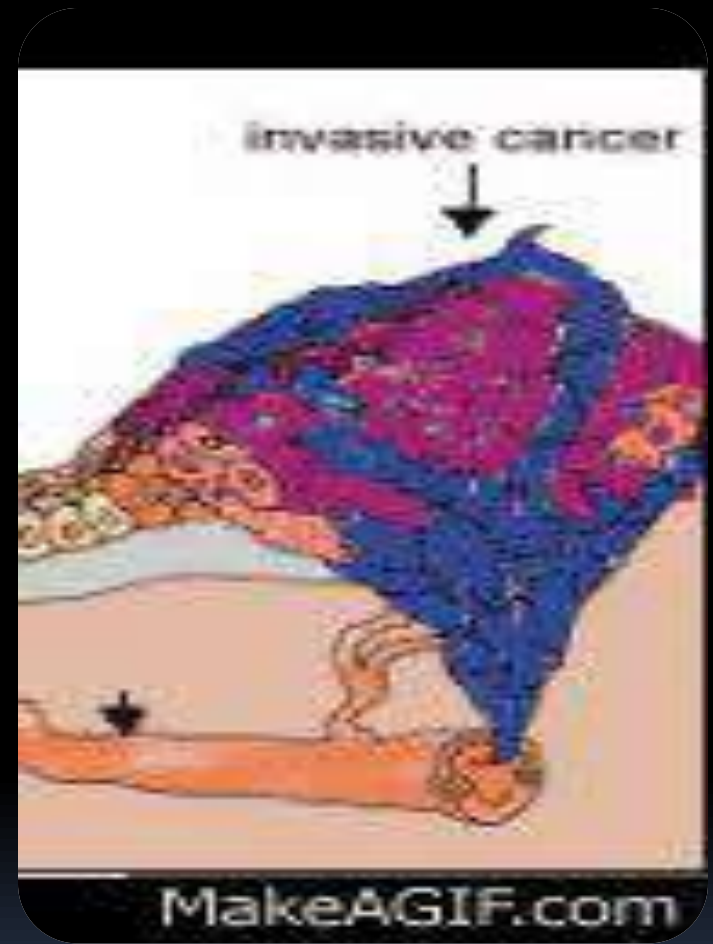
Pathology

- 80%

Squamous Cell carcinoma

- 15%

Adenocarcinoma



MakeAGIF.com

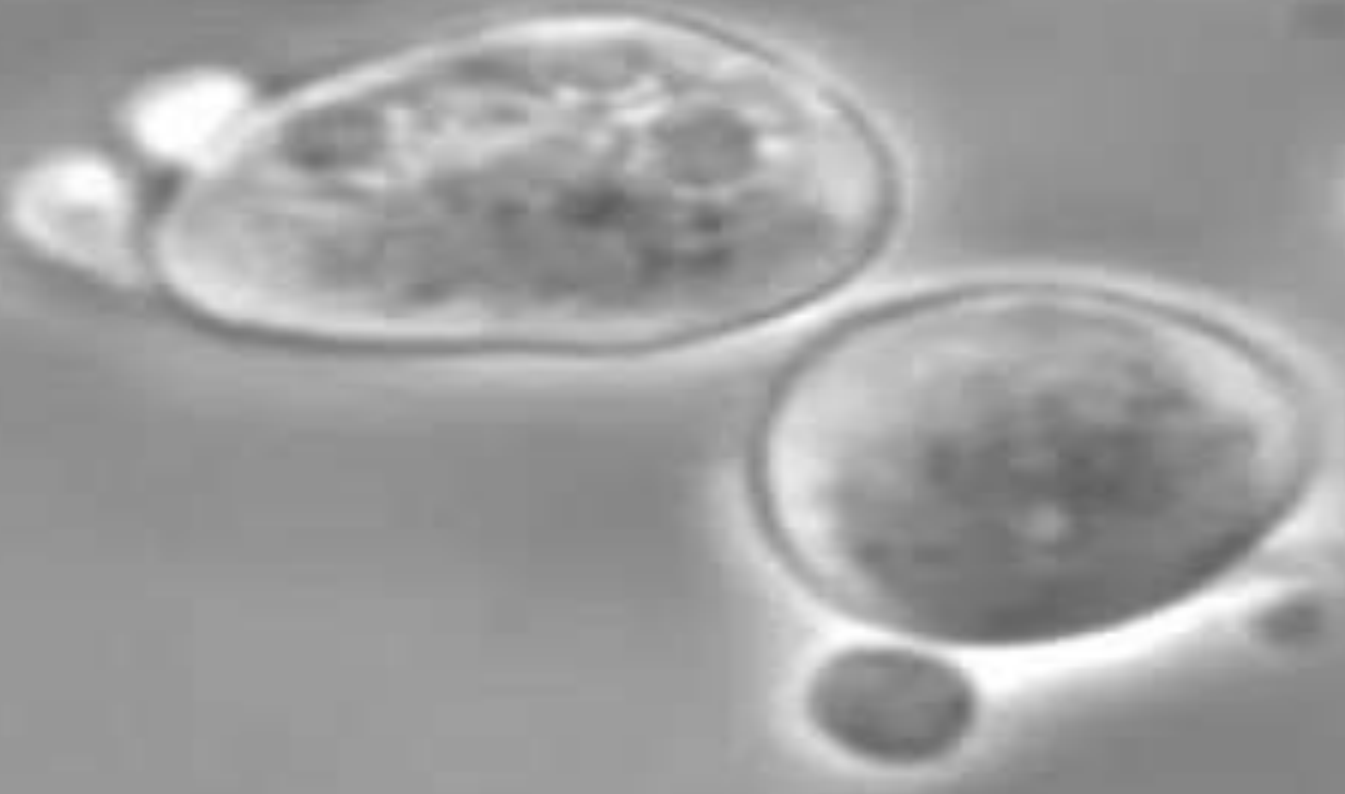
MOD.AIGAKM

invasive cervical cancer remains :

- A disease of significant **morbidity**,
- A major cause of cancer **deaths** in women worldwide,

Human papillomavirus (HPV)

Now is the **most important causative agent** in cervical carcinogenesis at the molecular level,





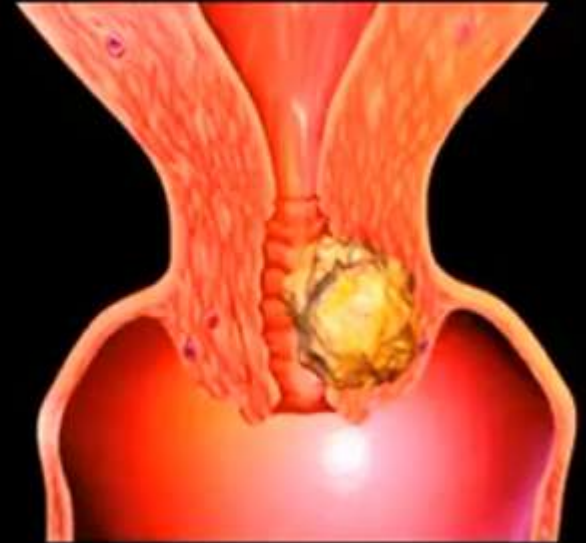
nucleus





Imaging Modalities

- *US "& Doppler"*
- *CT*
- *MRI*

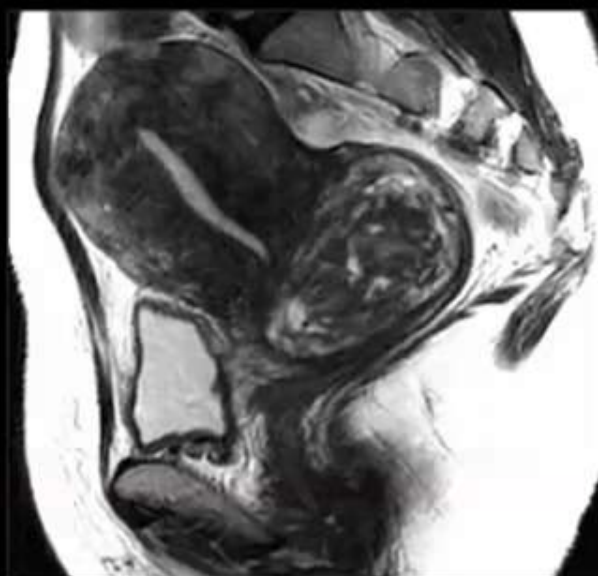


- 
- *Mass in The cervix Considered **CARCINOMA** until proved other wise.*
- 

Cervical leiomyoma

Differential diagnosis

- Prolapsed sub mucosal uterine fibroid
- Cervical carcinoma
- Cervical lymphoma : extremely rare
- Cervical melanoma : rare - usually involves the vagina with invasion of the cervix



- 
- **Early stages** is readily managed with **surgery**.
 - **Radiation** or **chemoradiation** therapies are reserved for high-risk early stages or advanced disease.

Cervical Cancer Progression and Staging

Staging

Stage IA: *confined* to cervix

Stage IB: may extend to uterus

Stage IIA: extension into upper vagina

Stage IIB: parametrial involvement

Stage IIIA: extension into lower vagina

Stage IIIB: pelvic wall (hydronephrosis)

Stage IVA: spread to adjacent organs


Stage IVB: spread to *distant* organs

Stage 0: cancer only in top layer of cells

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nucleus
LIFE IS ON IT

imgflip.com



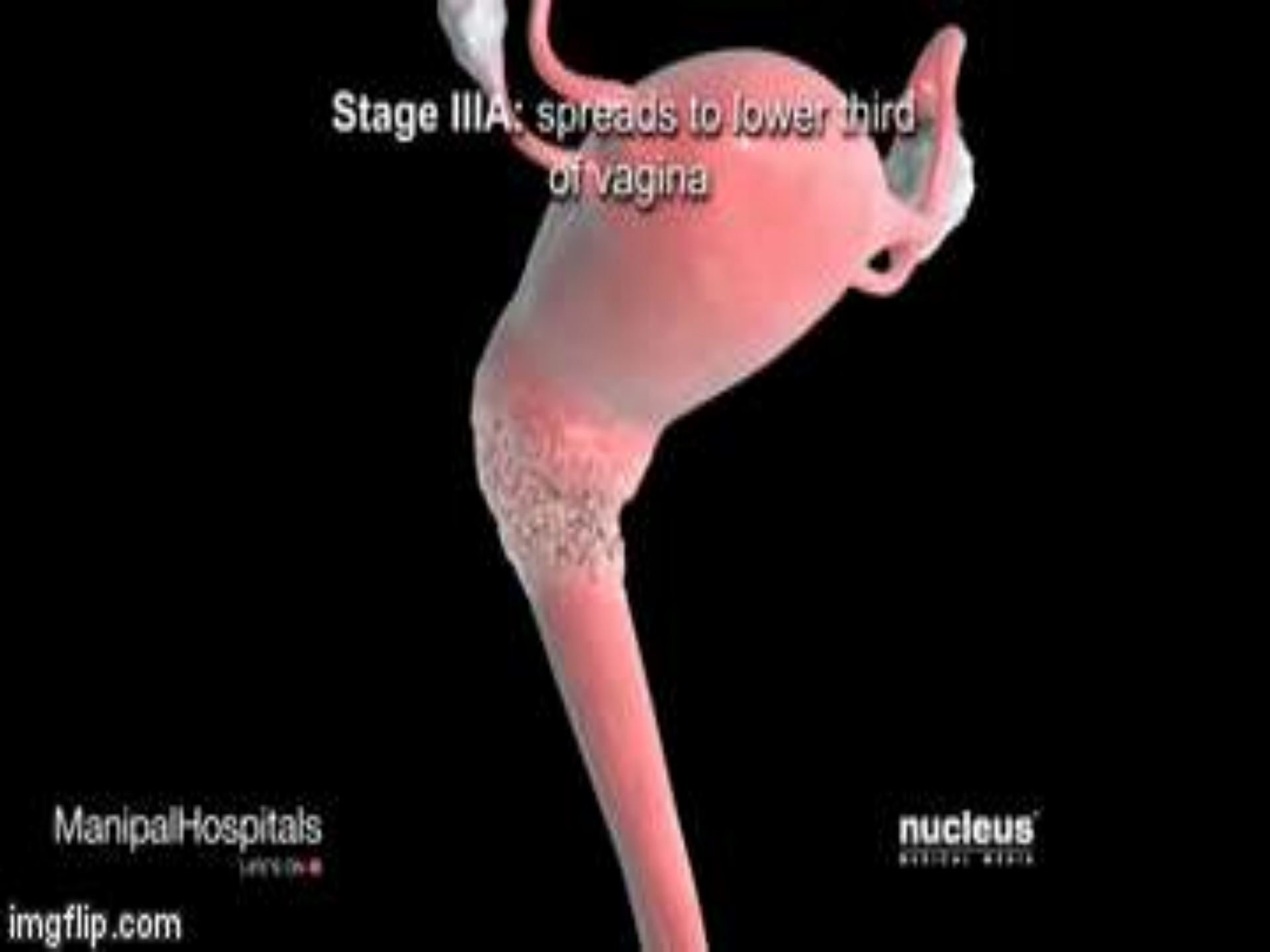
Stage IB: Two subcategories

Stage IIA: spreads to upper 2/3
of vagina



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LIFE IS IN IT

nucleus
KIDNEY CARE



Stage IIIA: spreads to lower third of vagina

This anatomical diagram illustrates the female reproductive system, including the uterus, fallopian tubes, ovaries, and vagina. A pinkish-red shaded area highlights the lower third of the vagina, indicating the extent of Stage IIIA cancer spread. The rest of the reproductive system is shown in a lighter, natural color.

Stage IVA: spreads to bladder
and/or rectum





Imaging Modalities

- ***US & Doppler***
 - ***CT***
 - ***MRI***

Best tissue Delineation	MRI
Easy To Repeat – Non invasive – Cheap	US
Size & staging	MRI > CT
Enlarged L.N.	CT = MRI > US

In general, CT and MRI : ■

- are not warranted in small-volume, early disease (stage Ib ,tumor diameter < 2.0 cm) ← *low probability of parametrial invasion and nodal metastasis.*
- is appropriate > 2.0 cm, when the size of the tumor cannot be adequately evaluated during the clinical examination,
- or when the tumor is endocervical.



LIMITATIONS OF TECHNIQUES

US

- is operator dependent.
- The image quality is degraded by bowel gas and bony structures.
- **The transabdominal** approach is also influenced by :
 - bladder filling
 - presence of surgical incisions, dressings, drains, or skin lesions.
- **Transvaginal** and transrectal US probes have inherent limitations, including :
 - small field of view,
 - a short range of target penetration with high-frequency transducers,
 - occasional patient intolerance of the transvaginal or transrectal approach.

CT


- Uses **ionizing radiation**
- quality is degraded by:
 - metallic prostheses,
 - an extremely large body habitus, and
 - patient or respiratory motion.
- IV iodinated **contrast** for CT is associated with
→ risk of **significant allergic reactions**
(including :
 - fatal anaphylaxis,
 - nephrotoxicity, and
 - complications due to its extravasation into the soft tissues at the injection site.

MRI

- **is contraindicated** in : vital metallic biomedical devices or **metallic objects** “pacemaker ...etc”
- ***More costly***
- ***Less available*** than CT
- Requires ***long image acquisition times***.
- Image quality is degraded **by motion artifacts** related to respiratory and bowel peristalsis, ← occur during the long image acquisition time.
- **Claustrophobia** deters some patients from undergoing MRI.



www.MRImetalDetector.com

A blurry, low-angle photograph of a medical or laboratory setting. In the background, a person's head is visible, possibly wearing a cap or mask. The foreground shows a white surface, likely a table or counter, with some papers or equipment on it. The overall image is out of focus, creating a sense of depth and mystery.

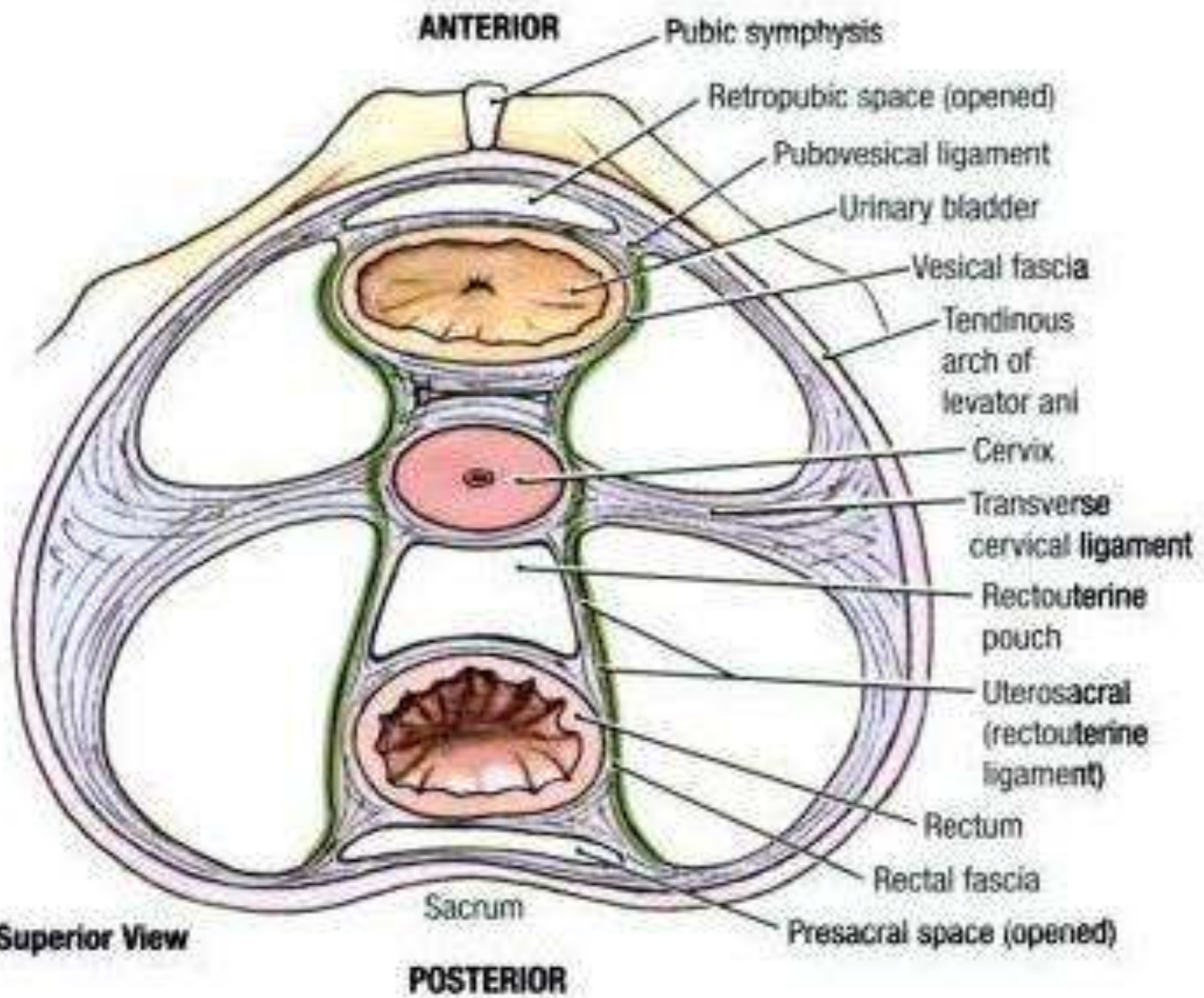
**Imagine
a technician**





FINDING





B. Superior View

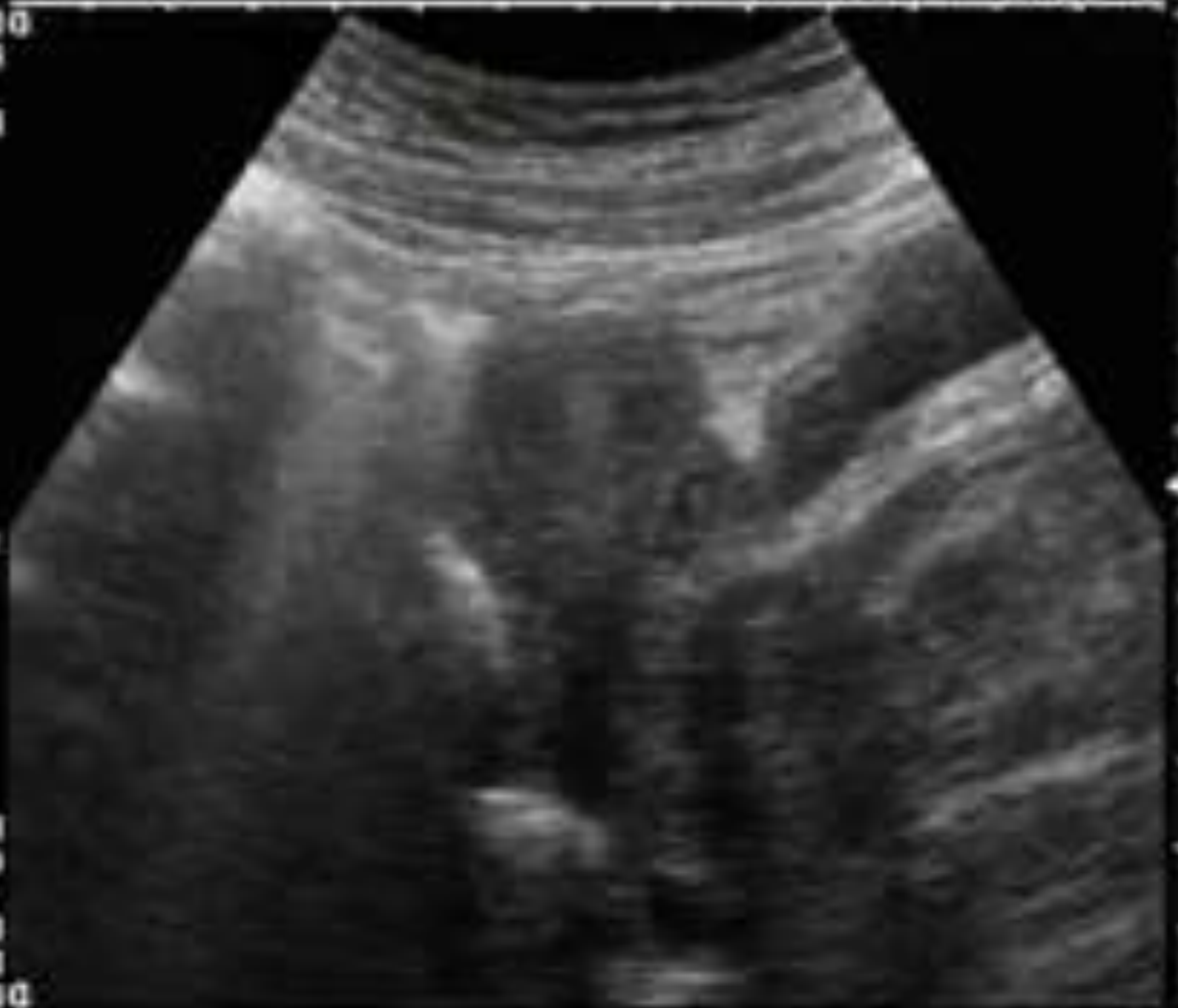


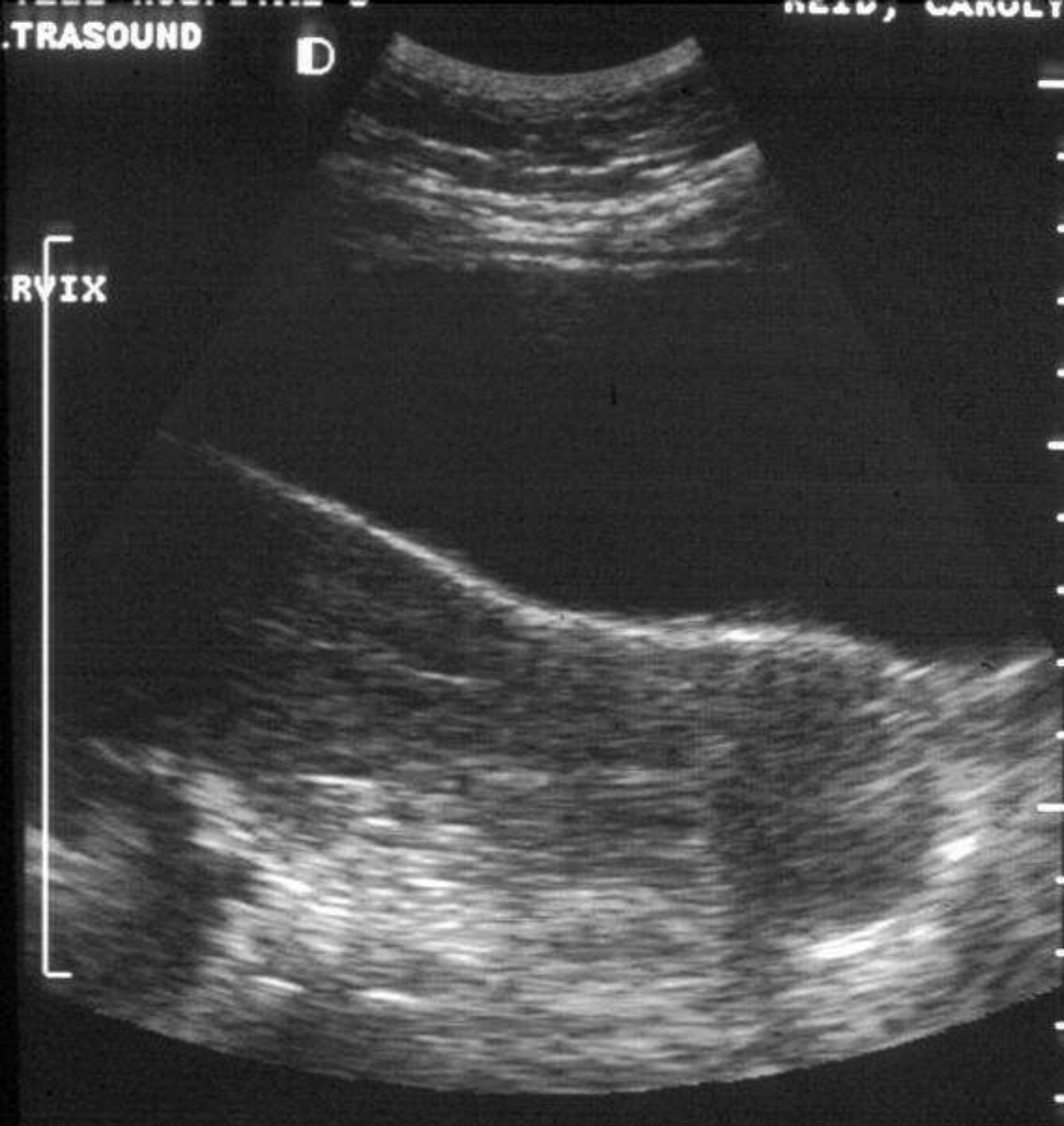
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FR 18

DR. O. MARCEL ORTIZ
CIVIL BEAR

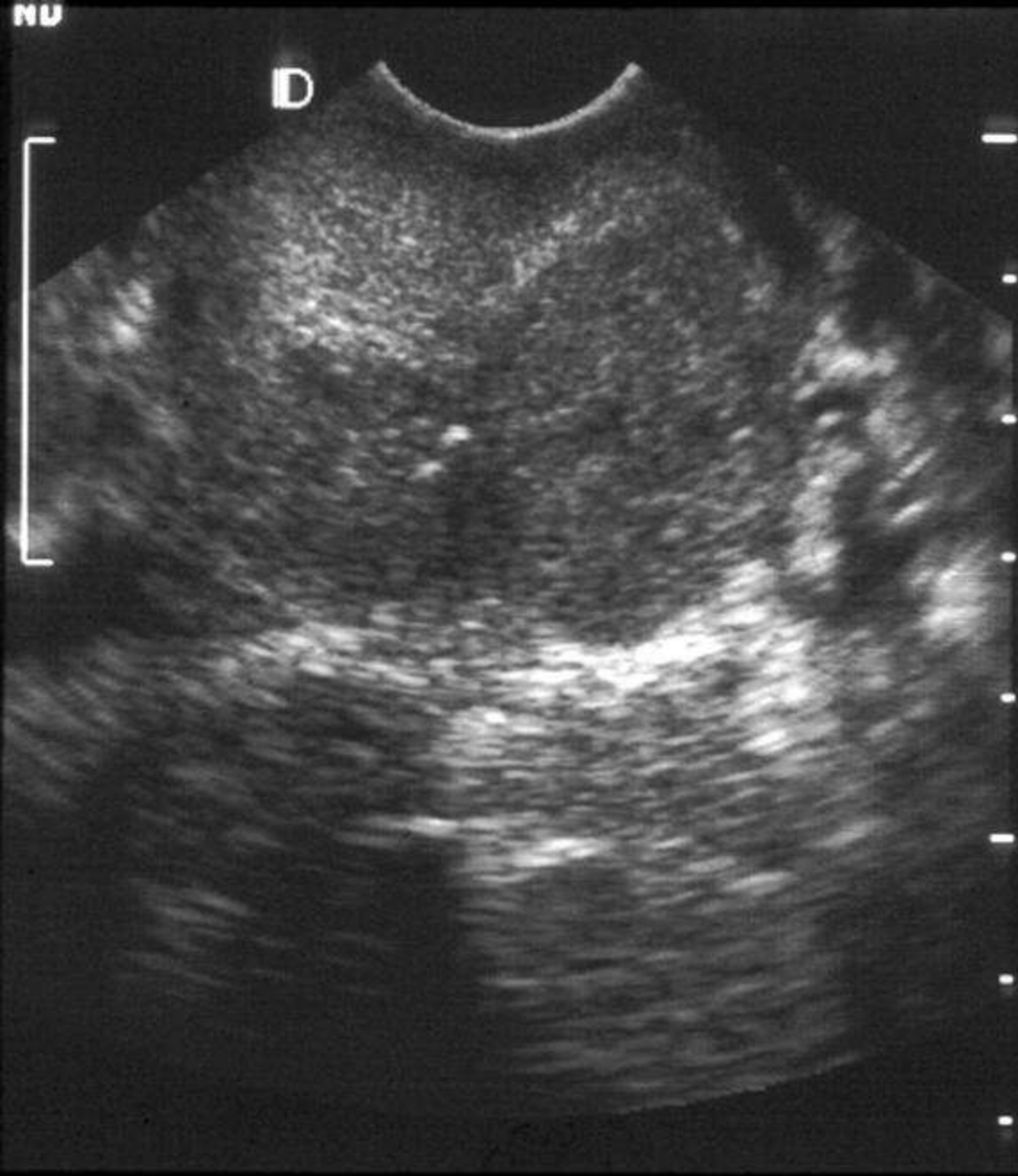
REFLECT

FR 18
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PCB
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DE 18.00H





- circumscribed hypoechoic tumor in the posterior aspect of the cervix.



- transverse transvaginal sonogram shows a circumscribed hypoechoic tumor in the left posterior aspect of the cervix.

CERVICAL CARCINOMA

ULTRASOUND

- Bulky cervix
- Both exophytic and endophytic show early stromal invasion
- Increased vascularity





CT

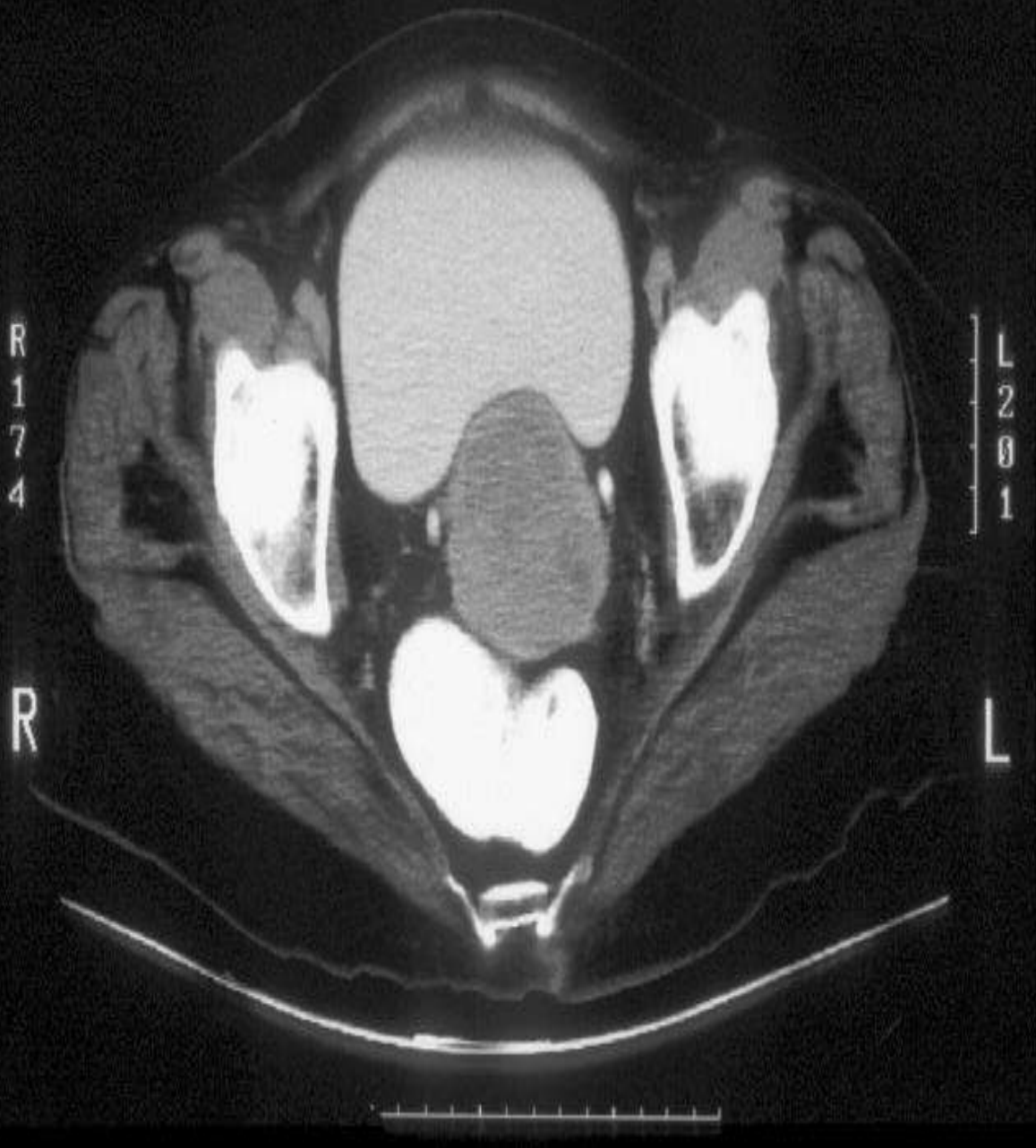
CT Technique

- Adequate opacification of the bowel loops
- Gastrographin enema, vaginal tampons
- Intravenous contrast injection **80- 120 ml**
- **5 mm** sections from iliac crest to the pubic symphysis
- Small field of view that includes the whole pelvis
- **2D** sagittal and coronal reformatted images



CT NORMAL Cervix

- The normal uterine cervix is :
- Ovoid or round structure
- generally < 3 cm in diameter.
- Homogeneous soft-tissue density.
- shows peripheral enhancement on the earliest images.
- The contrast enhancement rapidly becomes diffuse and uniform throughout the cervix, but it may not be as intense as the myometrial enhancement because of the preponderance of fibrous tissues in the cervical stroma.



- CT
- clinically visible carcinoma confined to the cervix (stage IB).
- a **mass**:
slightly heterogeneous, expands the cervix, is surrounded by a thin rim of relatively preserved stroma.
- **The cervical margins** → smooth, well defined, and intact.
- **the periureteral fat planes** are preserved.

DFOV 34.5cm
STND/P



- CT of parametrial and rectal invasion by cervical carcinoma.

CT cancer Cervix

- *without IV contrast :*

Cervical cancer and normal cervical stroma usually have similar attenuations.

- → the tumor and cervical parenchyma cannot be reliably distinguished on nonenhanced CT scans, & the cervix may have a normal CT appearance.
- the only detectable finding may be an enlarged cervix with homogeneous attenuation
+ Regular or Irregular contours.

- **POST CONTRAST** , the manifestations of cervical cancer include the following:
 - A cervix with a normal CT appearance
 - An enlarged cervix with normal contrast enhancement
 - An enlarged cervix with inhomogeneous areas of hypoattenuation but without a discrete mass that is clearly delineated or definitely evident
 - An enlarged cervix with a circumscribed solid mass that has an enhancement which is less than that of the normal cervical stroma and shows a homogeneous or heterogeneous hypoattenuation



PAIN R/O MASC

5



5

PAIN R/O MASS

DFOV 34.5cm
3TND/P

loss of definition of the cervical contours

R
1
7
2

L
1
7
2

R

L



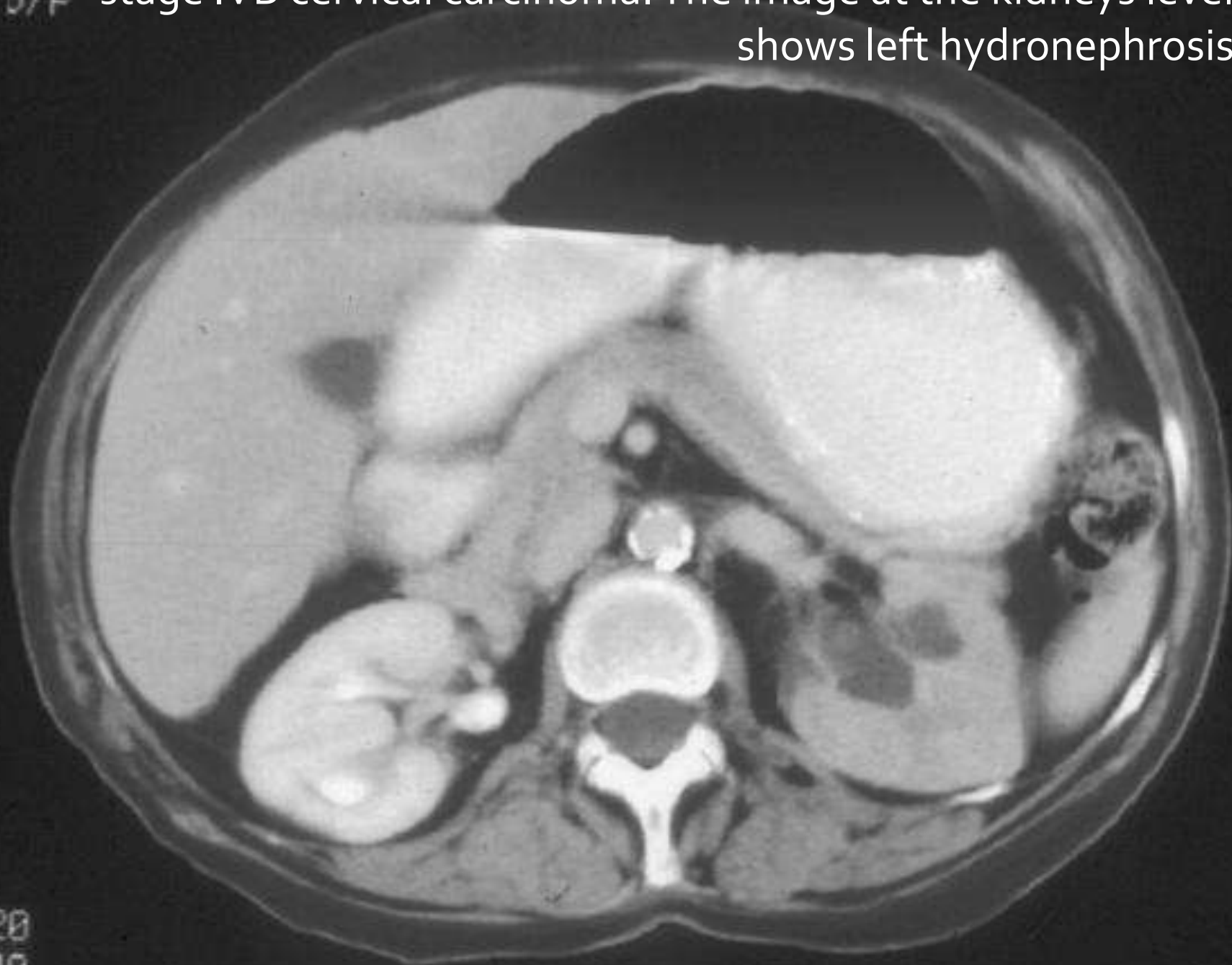
rectal invasion

kV 120
mA 140
Medium



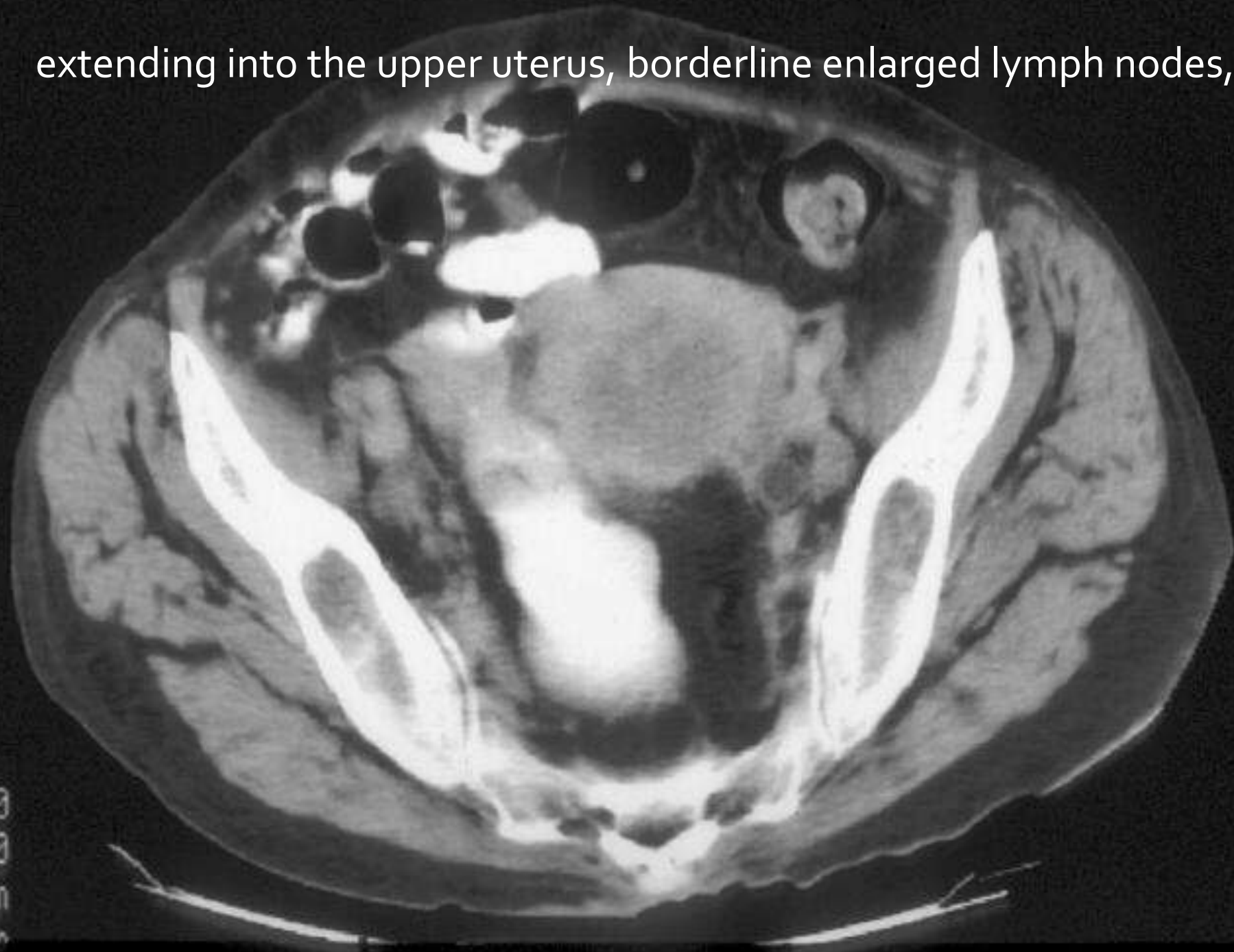
extending into the posterior wall of the bladder and into the left pelvic sidewall. IIIb

34.5cm
D/P stage IVB cervical carcinoma. The image at the kidneys level shows left hydronephrosis



20
40

extending into the upper uterus, borderline enlarged lymph nodes,



MRI


Magnetic resonance imaging





MRI

has **excellent soft-tissue contrast** resolution, > CT scanning and ultrasonography (US).



MRI

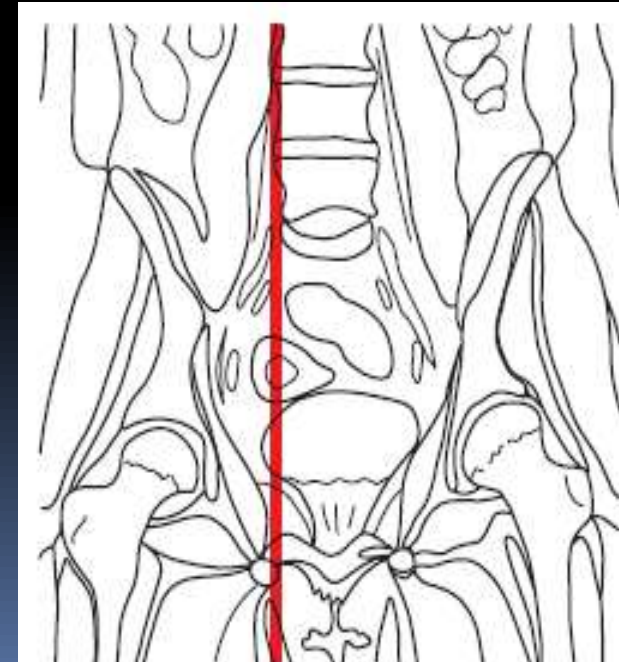
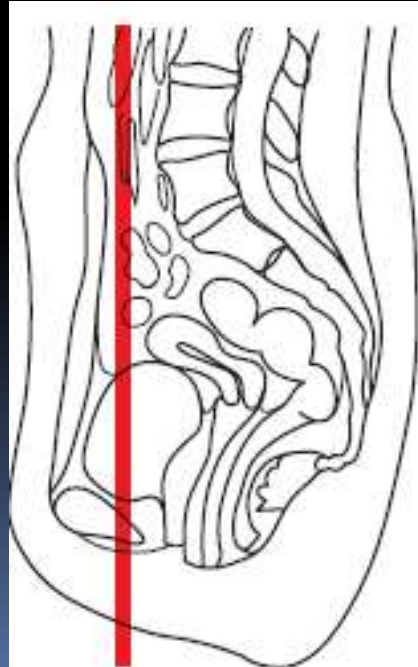
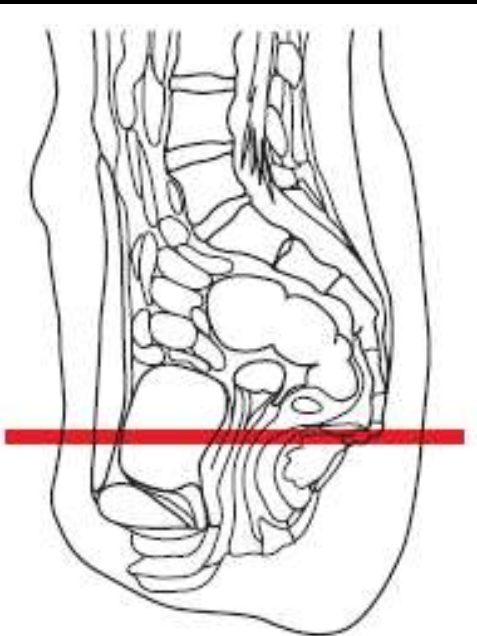
...*Multi Sequences* ...*Multi Planner*

Multi sequences..... ■

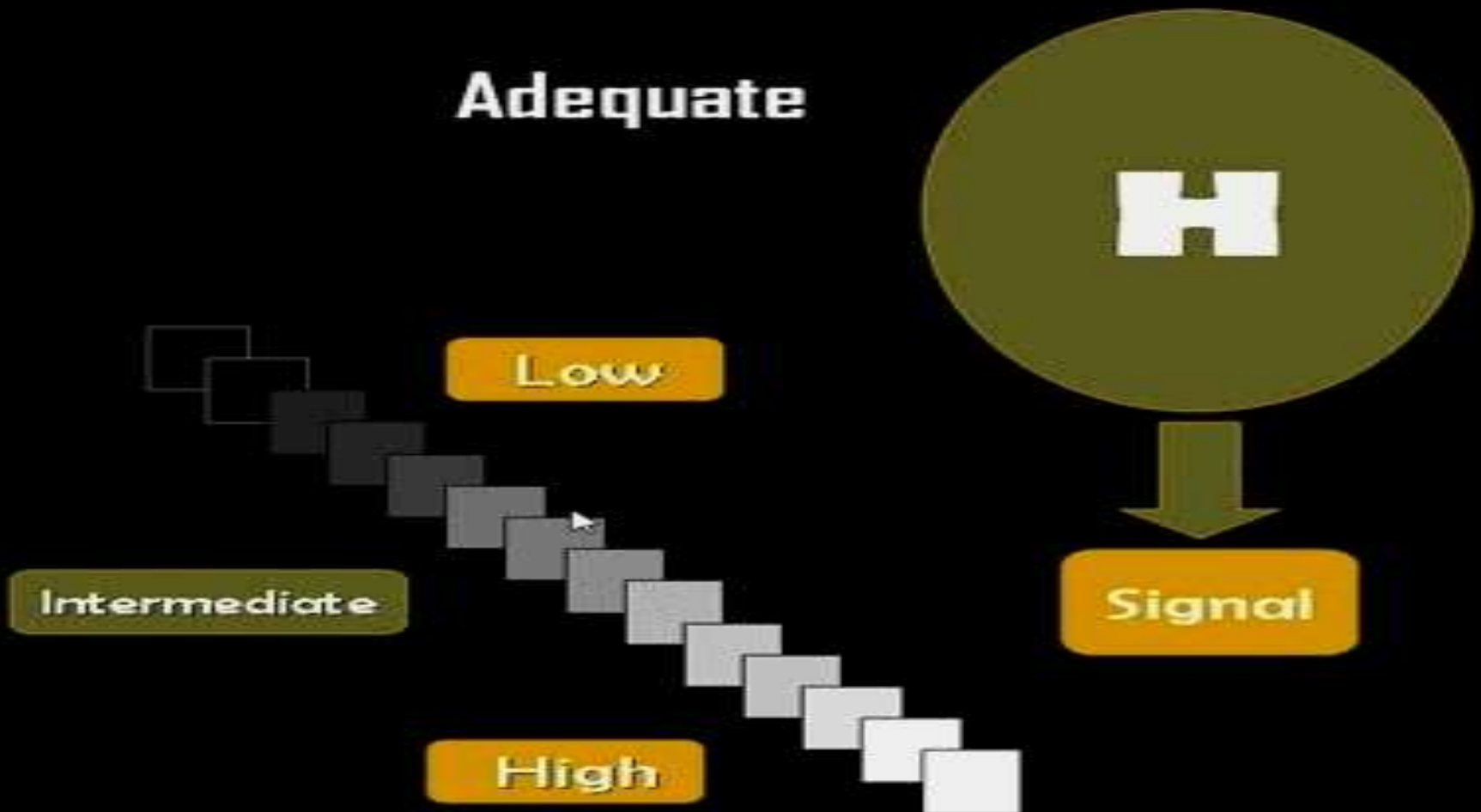
T₁, T₂, FLIR,etc.

Multi Planner

..... Axial, Coronal, sagittal.

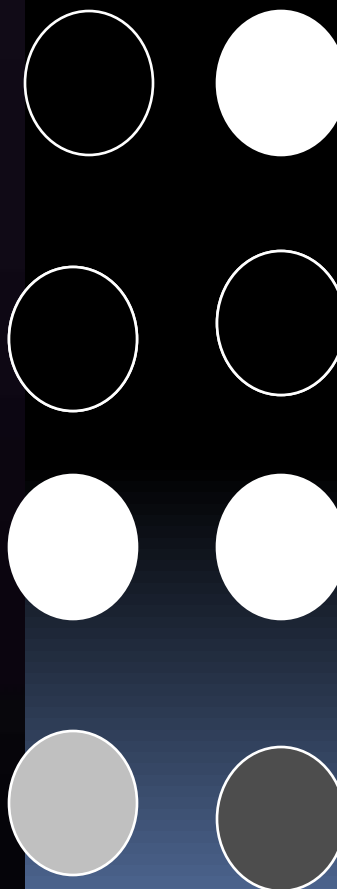


The Key word is...Signal



MR SIGNAL CHARACTERISTICS

T1	T2	Diagnosis	Example
Low	High	Fluid	Urine in the bladder
Low	Low	Calcium fibrous tissue	Leiomyoma
High	High	Blood	Hemorrhagic cyst endometriosis,...
High	Low	Fat	Normal pelvic fat Dermoid cyst



Zona1 Anatomy / Sagittal T2wi

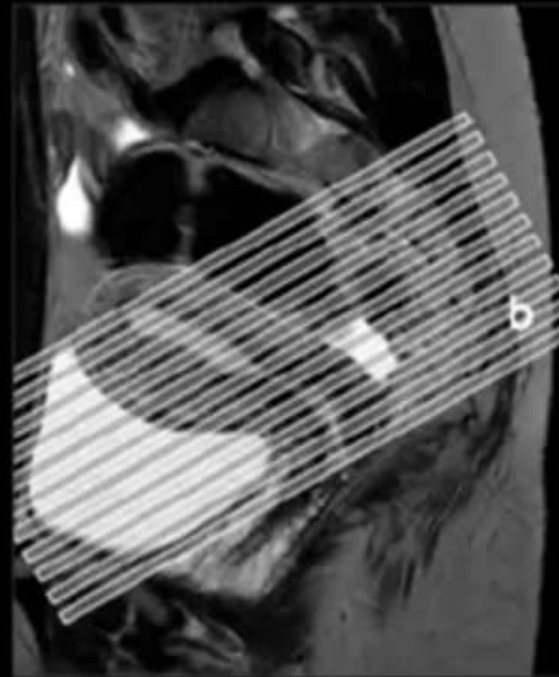


MR Imaging Technique

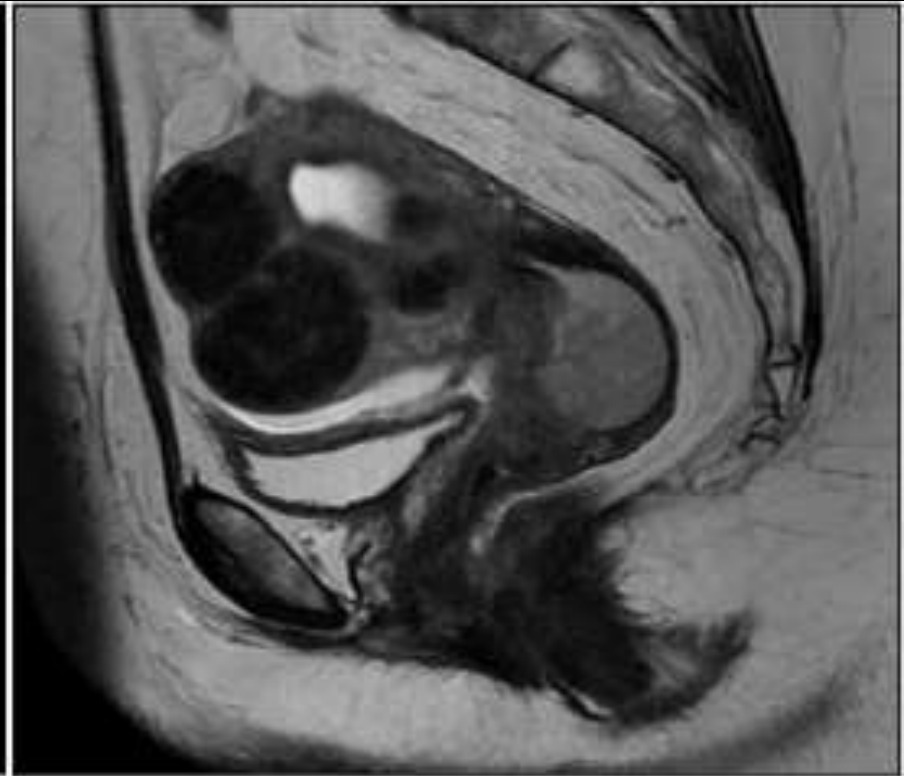
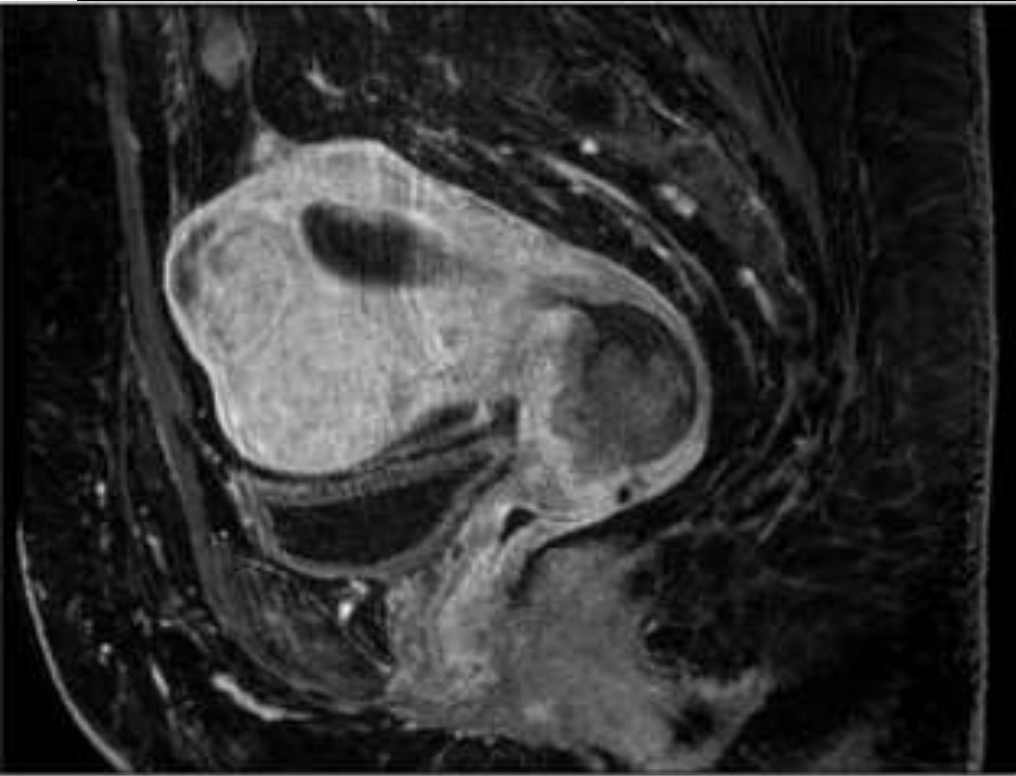
- High-field 1.5-T scanner
- Pelvic or torso phased-array coil.
- No special patient preparation is needed
- A spasmolytic agent to reduce bowel peristaltic artifacts
- Patients is instructed to void prior to the examination
- The standard position is the comfortable supine position
 - Axial, sagittal and coronal
 - T1, T2 , Gradient weighted images (vessels)
 - Small field of view 24- 32cm (patient size)
 - Slice thickness 5 mm with 1-3 interslice gap
 - Contrast enhancement



MR Imaging Technique

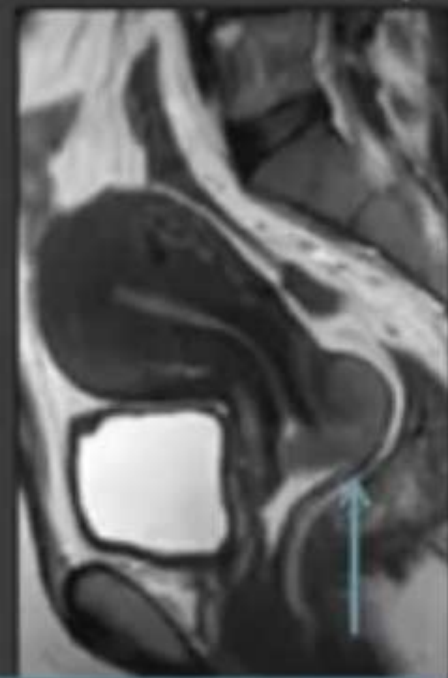


- Axial T1-weighted and axial STIR sequences are standard techniques
- [Sagittal T2-weighted](#) images are most important for the assessment of the uterus.
- [Axial oblique](#) parallel to the endometrial cavity , long axis view for fundal contour.
- Fast sequence of the [upper abdomen](#) to assess possible renal pathology.

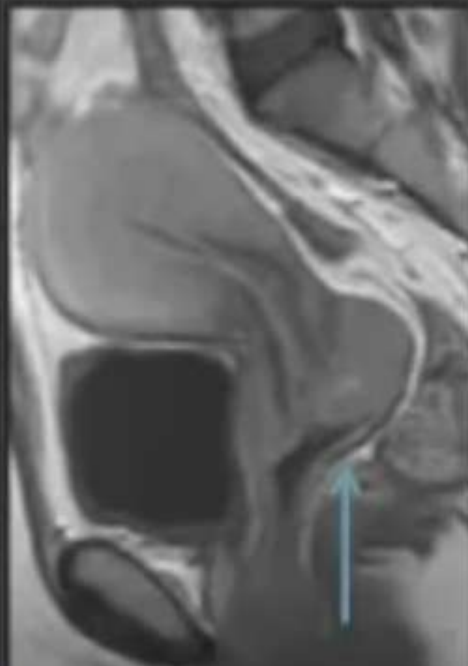


MRI OF CERVICAL CARCINOMA

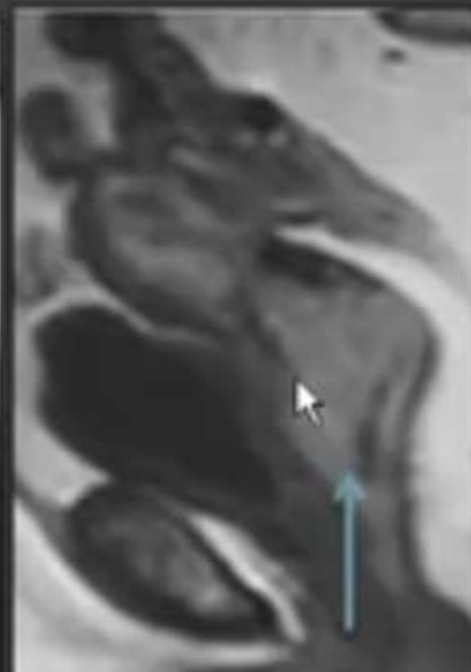
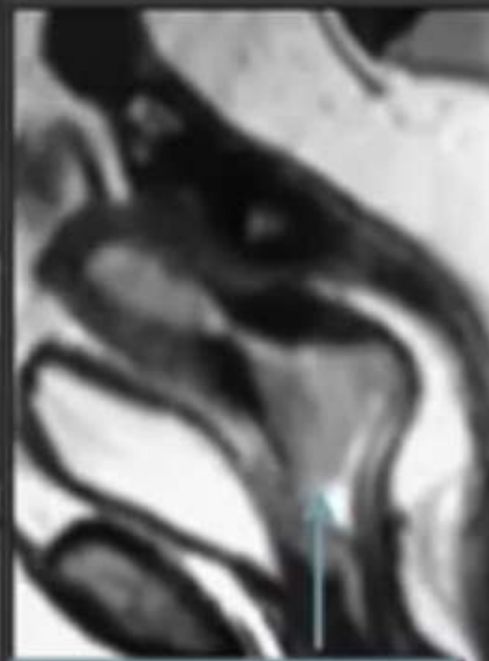
- Both the exophytic and the endophytic variants show a bulky uterus.
- The mass has a typically bright T2 signal
- Contrast uptake



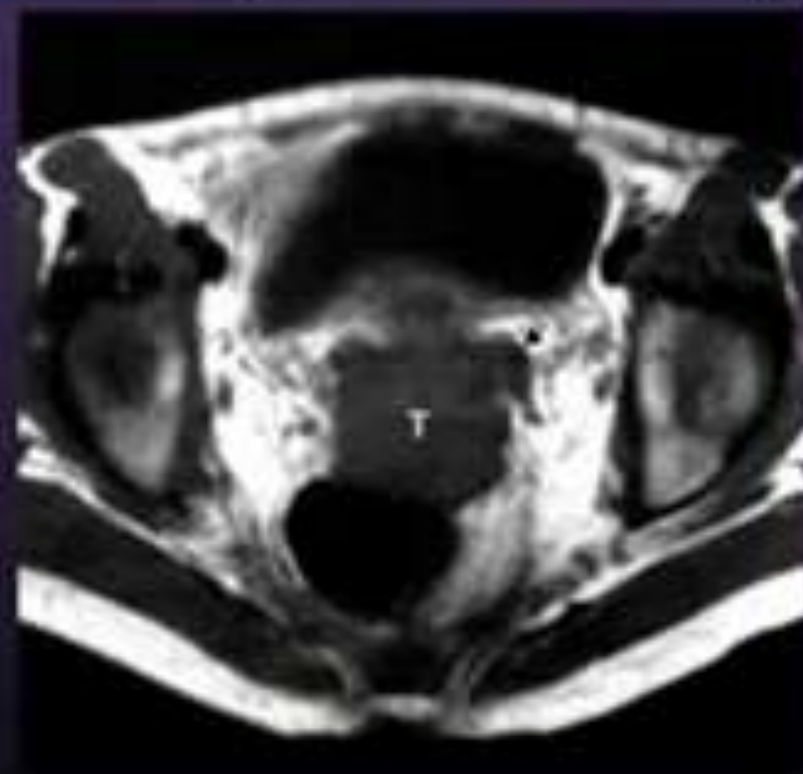
EXOPHYTIC



ENDOPHYTIC



MR	T1	T2	Contrast
Cervical Carcinoma	Low signal Extra uterine invasion Lymph nodes	high signal Uterine and vaginal invasion	Enhancement is of little diagnostic value



Cancer cervix with parametrial extension



* **Sagittal T2WI**

- circumscribed, hyperintense mass in the posterior lip of the cervix
- Associated with:
 - intact peripheral cervical margins and
 - intact parametrium.
- features of cancer that is confined to the cervix (stage IB)

Same Patient Axial T2WI



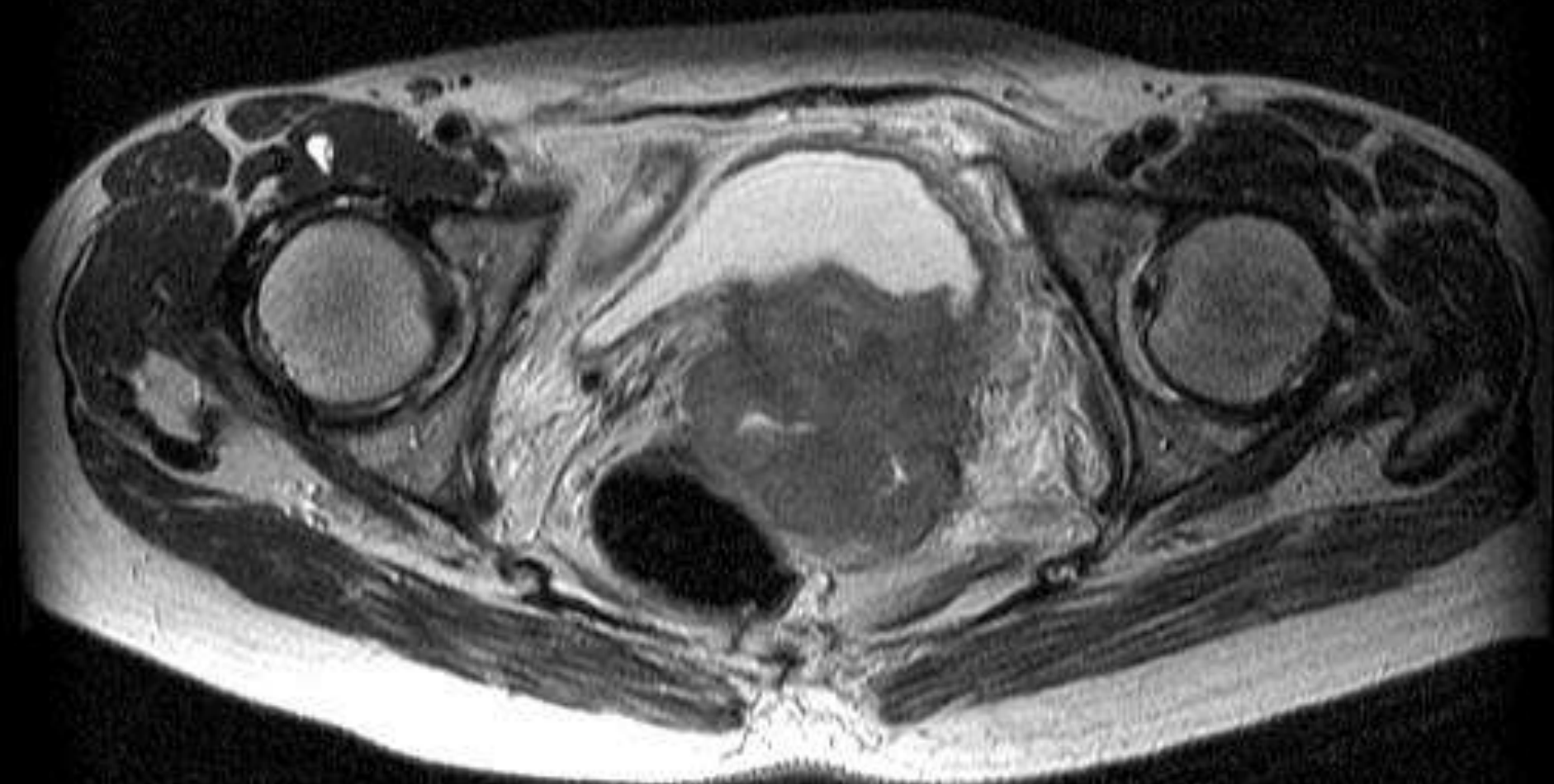


Notice uterine Fluid

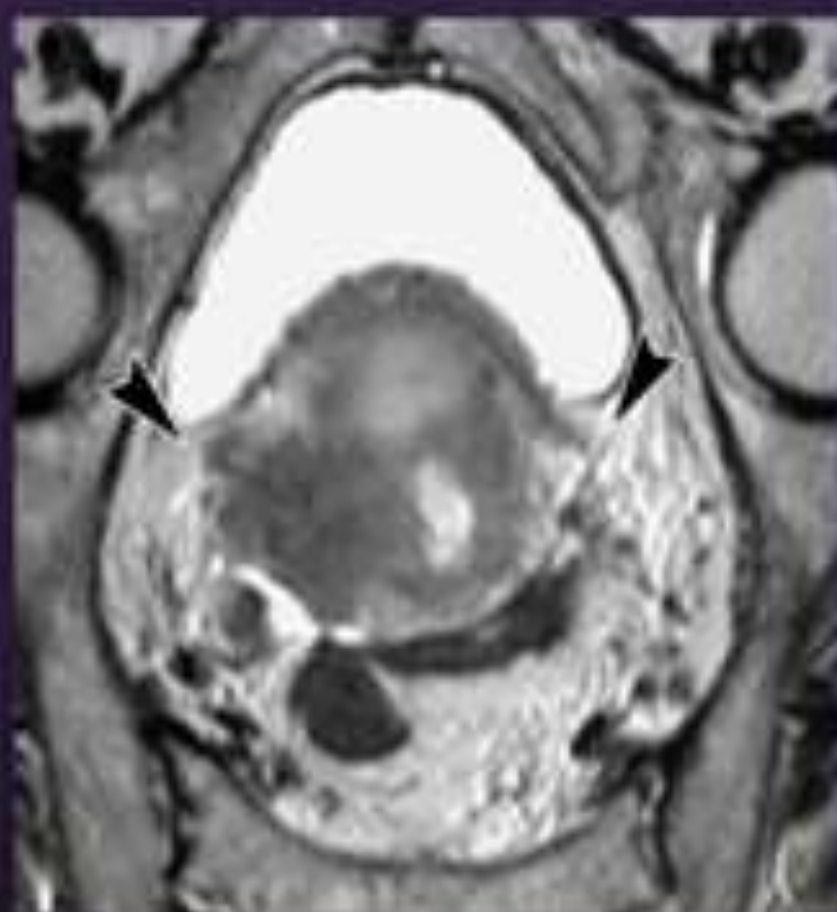
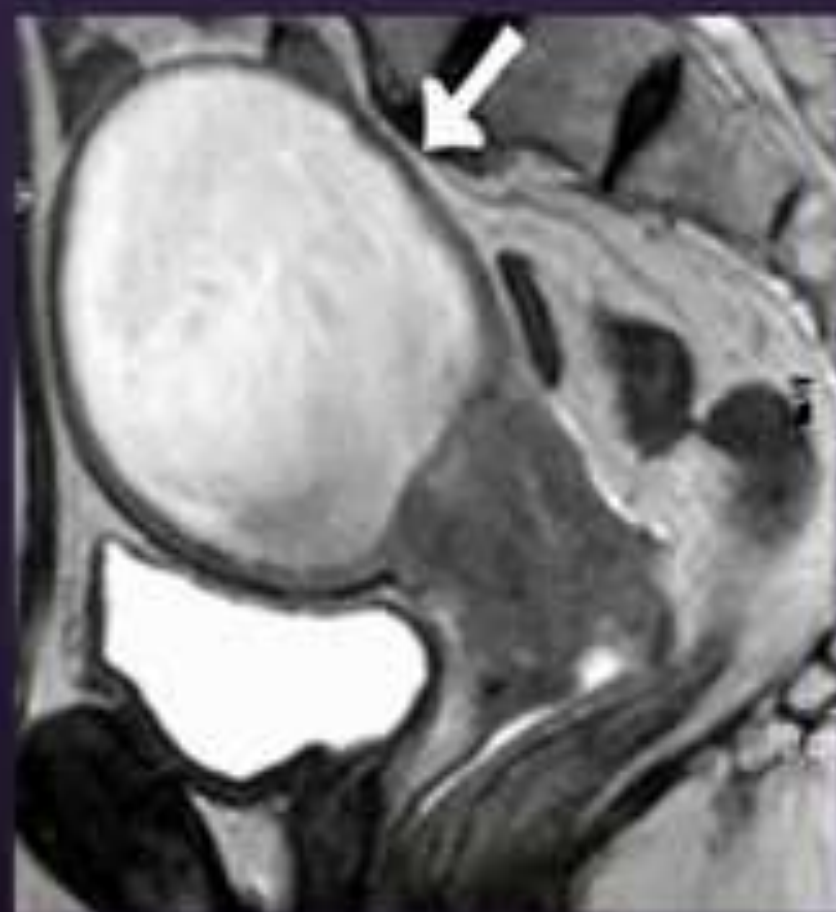
- stage IIB
- parametrial and anterior vaginal fornix invasion.
- slightly hyperintense cervical tumor disrupting the hypointense stromal stripe, extending anteriorly through the disrupted vaginal fornix, and involving the parametrium.



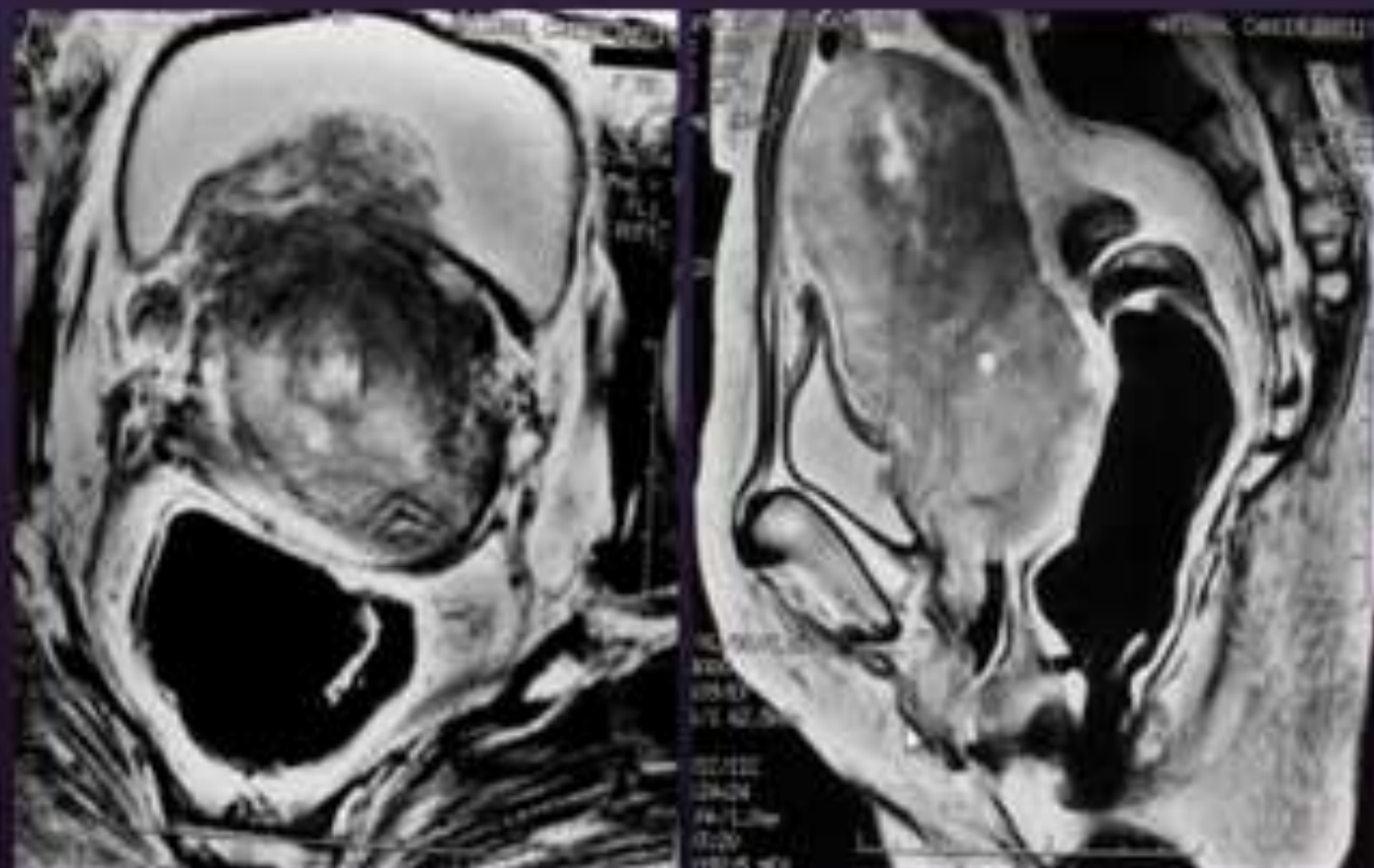
Cervical carcinoma in a 59-year-old woman. Sagittal T2-weighted MR image shows a slightly hyperintense mass that replaces the cervix (white arrows). The lesion is located almost within the cervical canal. The patient also has a mature cystic teratoma of the right ovary, which is seen as a cystic mass (black arrow) behind the uterus.



- large cervical tumor with full-thickness stromal invasion → complete loss of the hypointense stromal stripe or ring.
- invasion of the parametrium and the posterior bladder wall



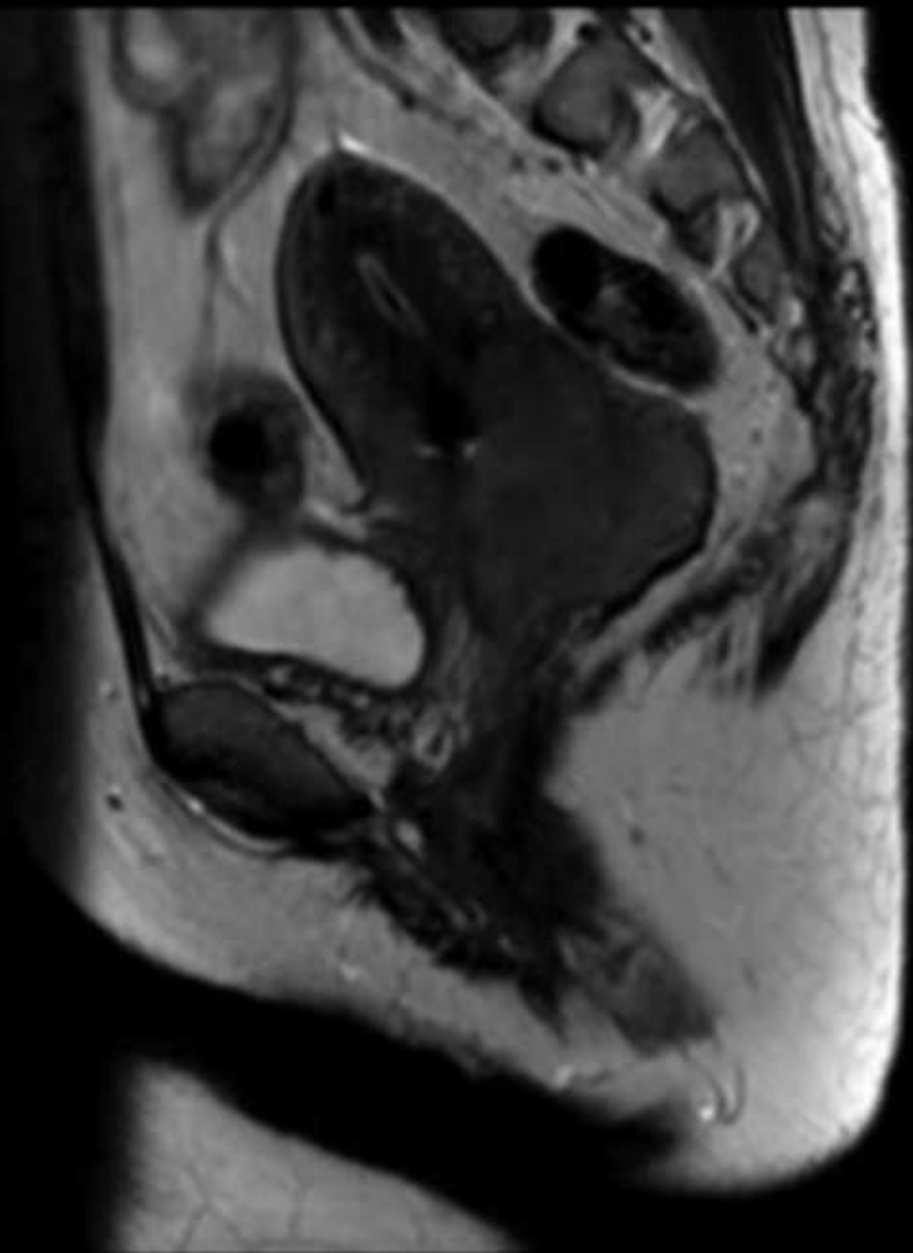
Cervical carcinoma. Sagittal and axial T2-weighted MR images show that the cervix is almost entirely replaced by a slightly hyperintense mass. The tumor protrudes into the parametrium bilaterally, however, it does not reach the pelvic wall. Hydrometra, which is caused by the obstructed internal cervical os, is also noted.



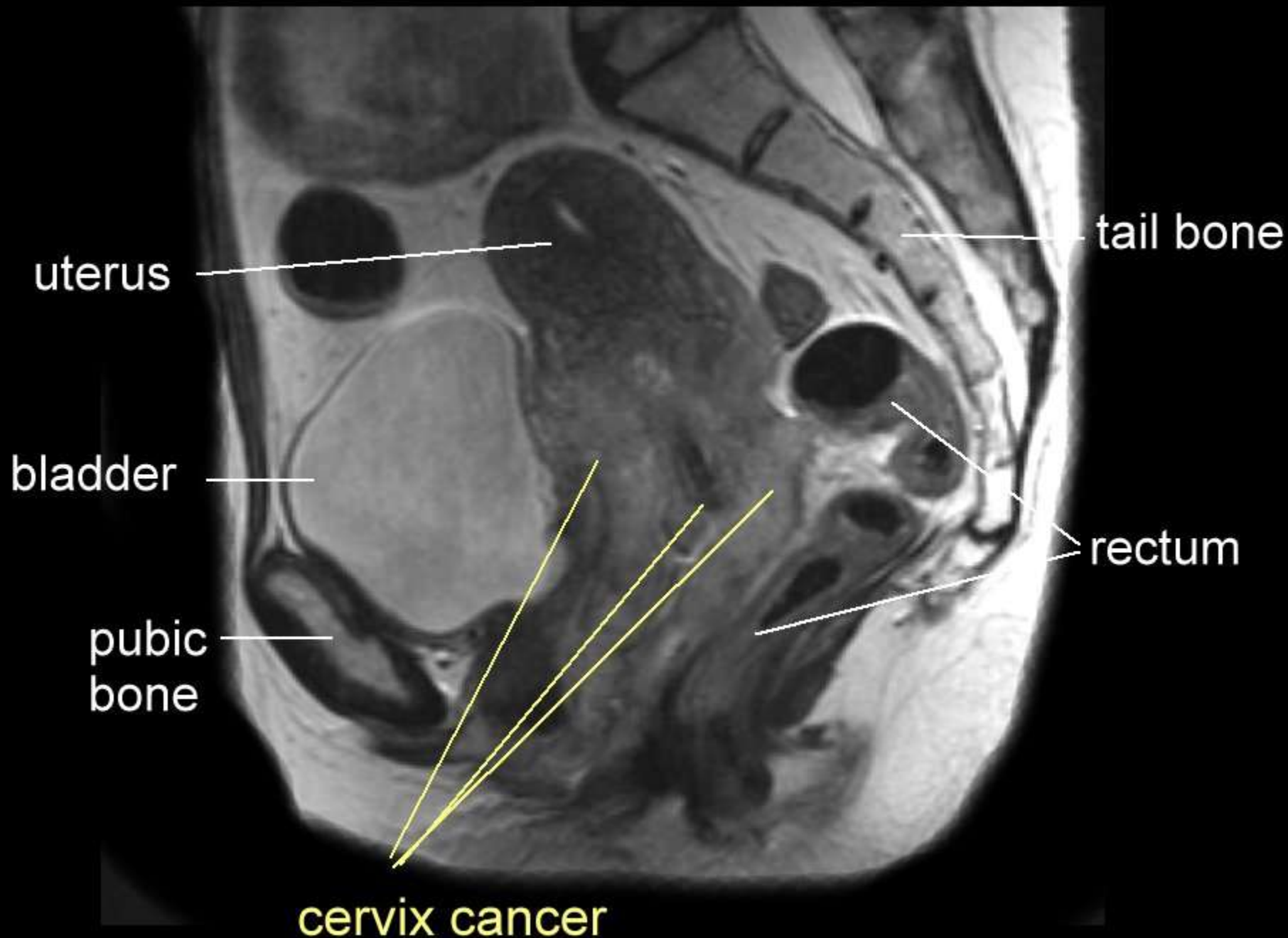
Cancer cervix invading the bladder



Cervical cancer



MRI - advanced cervix cancer invading the bladder



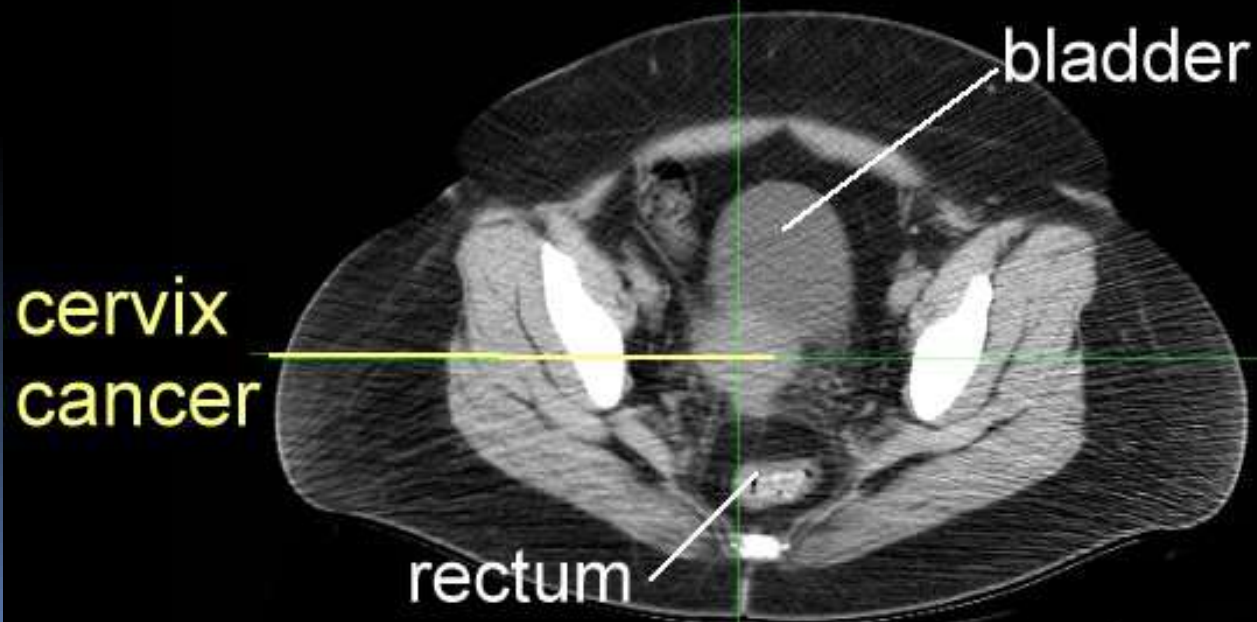
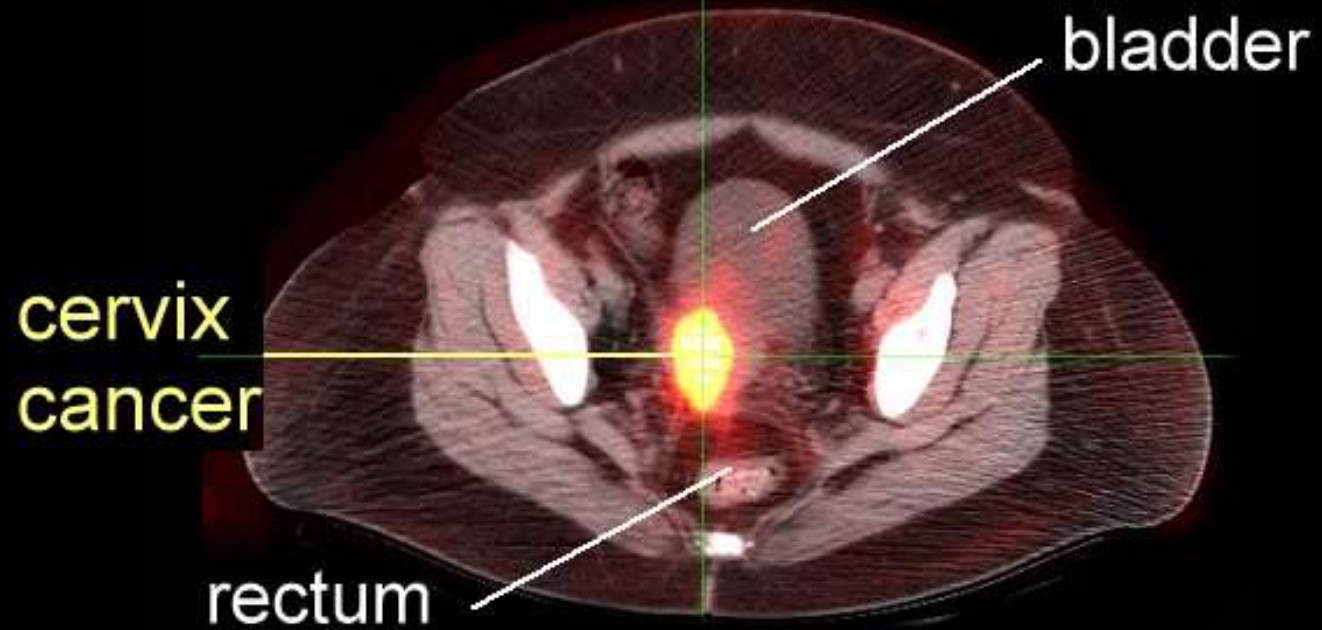


Yet there is more & More
!!!

PET CT

- PET scanning was most valuable in :
 - *staging extra-pelvic metastases* and
 - Detecting recurrence,
- whereas MRI was most valuable in evaluating the loco regional status of the disease

CT/PET Scan - IB2 Cervix Cancer



VACCINATION ... & PREVENTION



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MEDICAL MEDIA

Sources

- **Female pelvic imaging I** - Dec 2014 – PROF. Dr Mamdouh Mahfouz
<https://www.youtube.com/watch?v=PhEJN4havGc&list=PLF8XZxHGFioG88vr2m6HqLToO8kuhoNK9>
- **Imaging of Uterine & Cervical Cancer** (Nov 2013) - Dr Rasha kamal <https://www.youtube.com/watch?v=8uIJWTjlGoo>
- **Medscape / Cervical Cancer Imaging**
<http://emedicine.medscape.com/article/402329-overview>
- **Cervical Cancer Progression And Staging** - Manipal Hospital
https://www.youtube.com/watch?v=1W_2qjLFF_A
- **HPV Human Pailloma Virus, Cervical cancer and vaccine**
<https://www.youtube.com/watch?v=D4OlAY5pliw>
- **Gurney Let Loose in MR Scan Room**
<https://www.youtube.com/watch?v=byRIwDk21sw>

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WITH My Best Wishes

Ahmad Mokhtar Abodahab

9 Mar 2017





نَسْأَلُكُمْ الدُّعَاءَ



صَدَقَةٌ جَارِيَةٌ

لِلرَّوْحِ أَخِي الْمُهَنْدِسِ / حَاتِمِ أَبُو دَهَبِ