

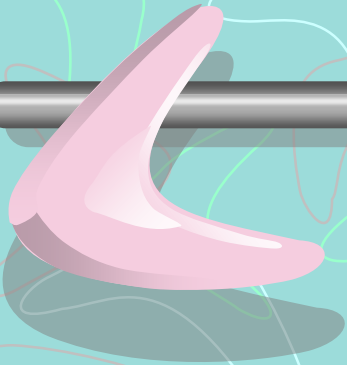
# Imaging in Obstetrics and Gynaecology

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Dr. Vinita Rathi

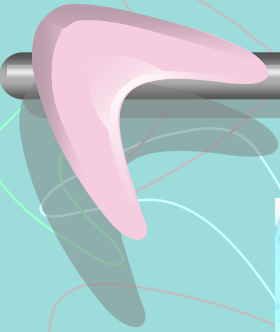
Director Professor

Deptt. of Radio diagnosis





**Figure 1.** Calcified Abdominal Pregnancy - Abdominal X-ray.





# Ultrasound in Obstetrics

- Since the mid 1960s diagnostic ultrasound has had a tremendous impact on obstetric management of many pregnant patients.
- However sonography of pregnant patients is not infallible – rising number of lawsuits involving obstetric ultrasound.
- No adverse bioeffects of Obs USG have been demonstrated but in some lab experiments bioeffects have been demonstrated at high intensities.



# Common Indications of Obstetric Ultrasound

- Confirmation of intrauterine pregnancy and viability.
- Estimation of gestational age
- Evaluation of complicated early pregnancy.
- Diagnosis of ectopic pregnancy
- Detection of fetal anomalies.
- Guidance of amniocentesis, chorionic villous sampling, cordocentesis.
- Detection of placenta praevia , abruption.
- (Optimal time for a single routine ultrasound is between 18-20 weeks)





# Types of Ultrasound examination in Obstetrics

- Transvaginal sonography for early pregnancy
- Transabdominal Ultrasound for mid and late trimester pregnancy.
- Doppler evaluation of placental and fetal circulation.



# Sonography- Intrauterine Gestation





# Applications of Sonography

In early intrauterine pregnancy

TVS can detect

An intrauterine gestational sac: 4-5 weeks

Presence of an embryo : 5 weeks.

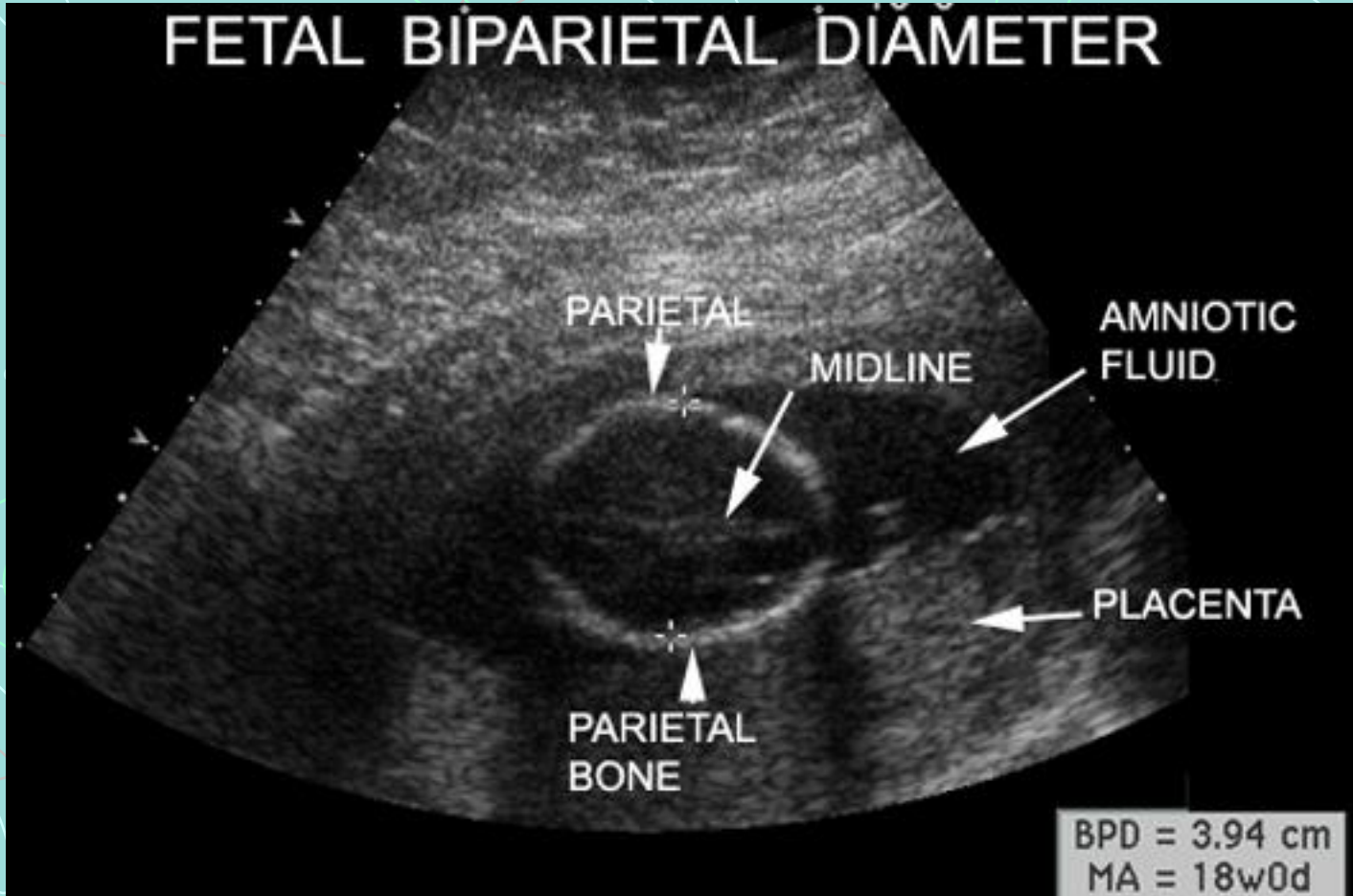
Presence of fetal heart motion : 6 weeks.



- Crown Rump Length



# FETAL BIPARIETAL DIAMETER



# Gestational Age-Femur length





# Applications.....

## Establishing Gestational age

Fetal crown-rump length-an excellent and accurate means to establish gestational age between 8-10 weeks.

Fetal biparietal skull diameter ( BPD)

Fetal long bones (FL,etc.)

Abdominal parameters :

to establish the appropriateness of head-body proportionality .

used as an approximation of fetal weight.



# Fetal Anomalies

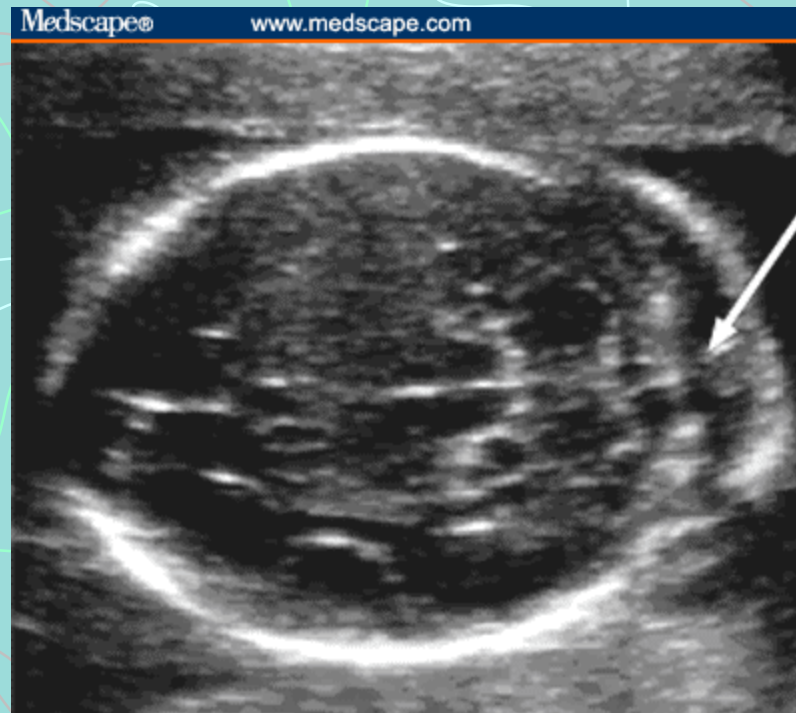
- Head- Anencephaly, Encephalocele, Hydrocephalus, Microcephaly.
- Neck- Cystic hygroma
- Thorax- Cardiac abnormalities, pleural effusion, diaphragmatic hernia, mediastinal tumors.
- Abdomen- Bowel atresia, omphalocele, gastroschisis.
- Retroperitoneum- Hydronephrosis, renal agenesis.
- Spine- Meningocele.
- Extremities- dwarfism, osteogenesis imperfecta.
- Down's Syndrome.





# TAS in fetal anomalies

- Pivotal role in patients with elevated triple screen( b-HCG, E2-estradiol, alpha fetoprotein)





# Doppler Sonography

To identify placental insufficiency in patients with suspected Intra Uterine Growth Retardation(IUGR):

Abnormal systolic-diastolic ratio of uteroplacental vessels / and umbilical arteries may indicate a growth retarded fetus or one that is at risk of developing hypoxia.



# US Guidance for Obstetric Intervention

- TAS has a useful role in guiding amniocentesis in an appropriate location, remote from the fetus or the placenta.
- To obtain chorionic villus samples for chromosomal analysis in patients at high risk for genetic disorders.
- Guidance for cordocentesis ( percutaneous umbilical cord sampling in patients with Rh- incompatibility)

# Placenta Praevia





# PC& PNDT (Prohibition of Sex Selection) Act

- PNDT Act (Pre Natal Diagnostic Technique) came into force in 1996 and was amended in 2003.
- An offence under this law can lead to arrest without warrant and is non-bailable.
- Genetic Clinics, portable machines, CT Scan and MRI
- Cannot start work before registration and Validity is for 5 years.



A hand holding a pointer stick is positioned at the top left of the slide, pointing towards the central text box. The background is light blue with abstract, colorful scribbles in white, green, and red.

**PRE-NATAL SEX DETERMINATION  
(BOY OR GIRL BEFORE BIRTH)  
IS NOT DONE HERE.**

**IT IS A PUNISHABLE ACT**

यहाँ पर प्रसव पूर्व लिंग  
(पैदा होने से पहले लड़का या लड़की)  
की पहचान नहीं की जाती।  
यह दण्डनीय अपराध है।

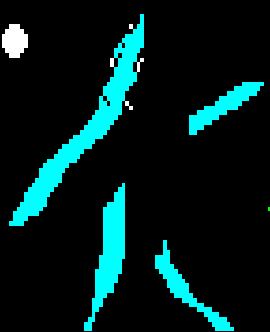
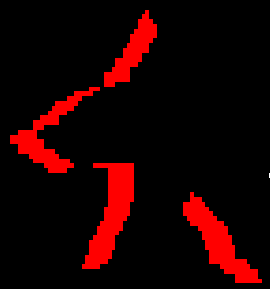


# PC & PNDT Act

## Code of Conduct



- Display board.
- Availability of copy of the act- waiting area/ sonography room.
- Display original certificate- waiting area/ sonography room.
- Use of authorized machine.
- Filling F form completely & signature of concerned sonologist.
- Authorized person performing sonography.
- Submission of report in time.





# Applications of Sonography in Gynaecology

- Evaluation of palpable pelvic masses (Ovarian, uterine, tubal, others)
- Unexplained uterine bleeding (Endometrial hyperplasia, endometrial carcinoma)
- Pelvic pain
- Early detection of ovarian cancer
- IUCD evaluation.
- Follicular monitoring/aspiration
- Ovulation induction, IVF, Embryo transfer-ET, Gamete Intra Fallopian transfer –GIFT )



# Role of imaging in Gynaecology

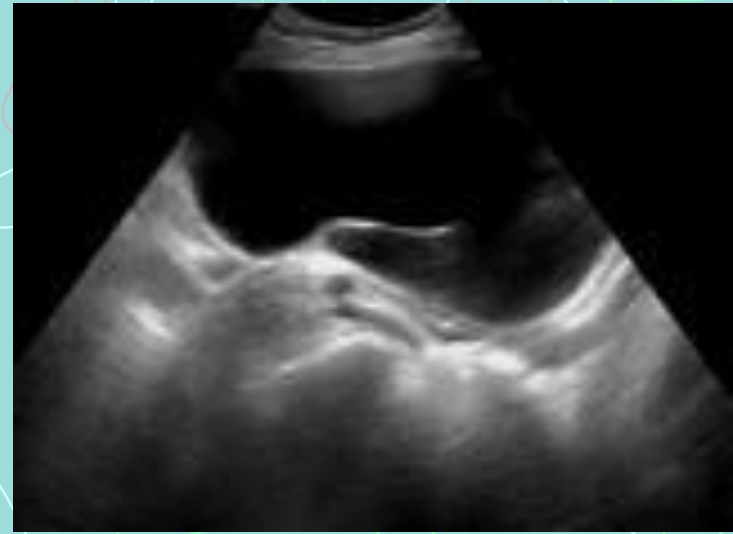
## Sonography

- It is more important in Benign conditions.
- TVS is particularly helpful in Obese patients in whom adequate digital examination is not possible or abdominal USG cannot be definitive.
- TVS gives detailed evaluation of the endometrium.



# Sonographic Pelvic mass Evaluation

- Location
- Consistency
- Benign or malignant
- (TVS allows detailed depiction of pelvic masses of <50mm in diameter. In large masses TAS is needed.)



Benign Ovarian Cyst



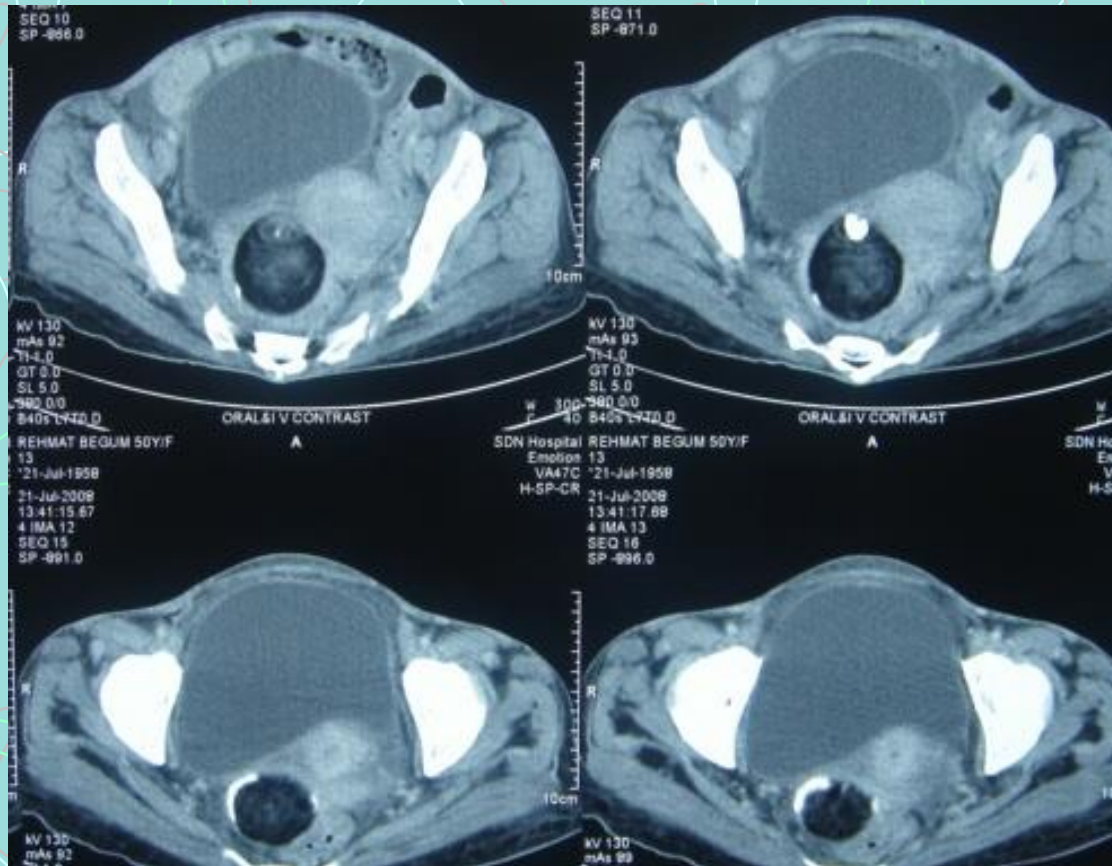
# Computed Tomography

- CT is the most commonly used primary imaging modality for evaluating the extent of gynaecologic malignancy.
- CT has a limited role in characterising early stages of pelvic malignancy.  
CT & MRI are more important than USG in *Staging* gynaecological neoplasms.
- CT guided biopsy can be used to confirm metastatic spread of disease.

# Dermoid Cysts- Sonography



# CT Scan- Dermoid Cyst







# Magnetic Resonance Imaging

- Useful in evaluating Mullerian duct anomalies.
- Superior to CT in work-up of uterine and cervical cancers.
- May aid in the differentiation of radiation fibrosis from recurrent tumor.



# Hysterosalpingography



- Radio-opaque contrast is instilled into the uterus and fallopian tubes.
- Performed ideally within 10 days of the first day of the menstrual cycle when the isthmus is most distensible.
- Catheters with balloon gently inflated in cervical canal or metal cannula ( e.g. Leech Wilkinson) used.
- Contrast warmed to body temp; instilled slowly, steadily.



## HSG....



- Air bubbles can occlude fallopian tubes and cause diagnostic difficulty.
- Cornual spasm can be differentiated from organic obstruction by smooth muscle relaxation induced by i.v. glucagon.
- Delayed radiographs may show persistence of opacification of tubes in case of hydrosalpinx.



# HSG Contraindications

- **Pregnancy**
- **Recent untreated pelvic infection**
- **Bleeding**



## Indications for HSG

- Infertility- primary or secondary
- Recurrent abortions
- Congenital abnormalities
- Post uterine surgery e.g. adhesiolysis
- Post tubal surgery e.g. assessment of patency after sterilisation, reversal of sterilisation, reconstructive tubal surgery.



# Complications of HSG

- Pain
- Vasovagal episode
- Bleeding
- Intravasation
- Infection
- Pregnancy irradiation
- Failure

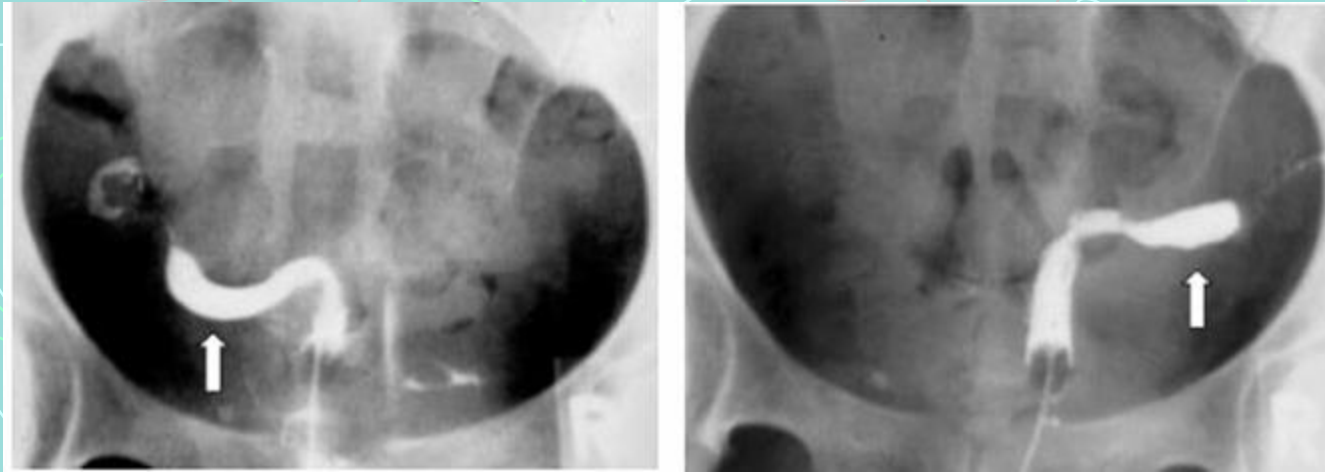


# Unicornuate uterus



- May be associated with failure of development of renal tract on opposite side

# Uterus Didelphys – Complete duplication of vagina, cervix and uterus.



## Other Congenital Uterine Abnormalities

- Uterus bicornis bicollis- a single vagina, two separate uterine horns each with its own cervix.
- Bicornuate uterus- uterus bicornis unicollis. MRI shows a dividing septum composed of myometrium.
- Septate uterus- higher complications as collagenous septum cannot support a pregnancy as well as myometrial septum of bicornuate ut.
- Arcuate uterus- (differential diagnosis: fundal fibroid.)






# HSG- Uterus Bicornis Unicollis



# MRI- Bicornuate Uterus







# Asherman's Syndrome

- Synaechiae or intrauterine adhesions were described by Asherman in 1950.
- HSG appearances are diagnostic.
- An irregular filling defect is present, cannot be obscured by contrast medium.
- Scarring may cause gross uterine distortion.

# Asherman's Syndrome:HSG

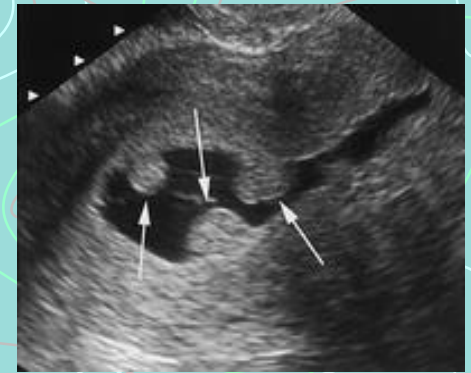




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# Sonohysterosalpingography

- Instillation of fluid under US guidance into the endometrial lumen improve outlining of endometrial polyps or submucosal fibroids.
- Negative contrast (sterile saline) or positive contrast (Echovist) used.
- Outpatient procedure
- No exposure to radiation.
- Not equal in accuracy to conventional HSG or laproscopy.



## Others...

- Intravenous Urography- locate position of ureters, demonstrate obstruction. CT/ MR provide similar & additional information.
- Barium enema- signs are not specific for bowel involvement by gynaecologic cancer. Can be useful if added to CT/MR.
- Pelvic Arteriography-Transcatheter embolisation of internal iliac artery as treatment of hemorrhage from advanced CA cervix.









# Leiomyoma

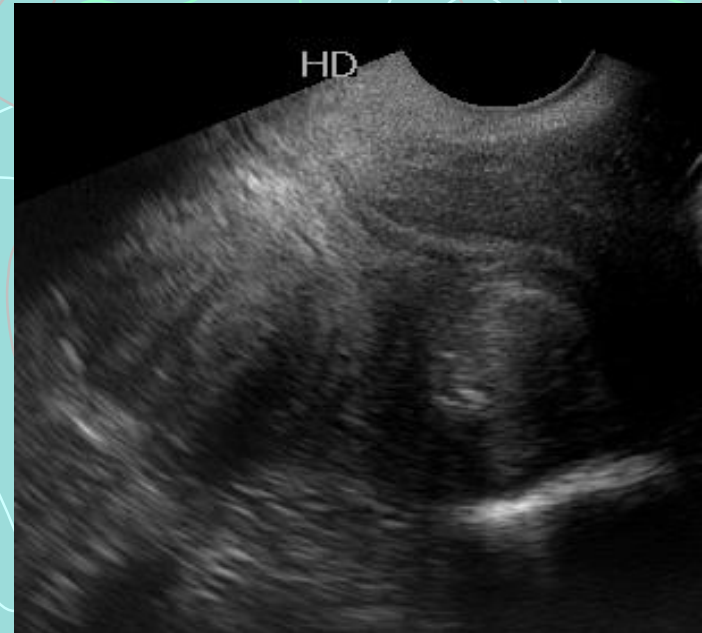
- Most common uterine tumor; benign
- Found in 40% women in their reproductive years.
- May be subserosal, intramural or submucosal.
- Treatment-  
myomectomy; hysterectomy; transcatheter uterine  
arterial embolisation (UAE).

# Leiomyoma-Ultrasound

- Uterus enlarged.
- Outline irregular or lobular.
- Well-marginated ,hypoechoic, round/oval mass within uterine body.
- Sometimes heterogeneous due to degeneration.
- Calcification causes acoustic shadowing.



# Leiomyoma- HSG, USG



# Leiomyoma -HSG



- Globular enlargement of uterine cavity
- Cornual obstruction





- Large leiomyomas-crescentic or spindle-shaped elongation of the uterine cavity.



# Leiomyoma-CT

- Soft tissue density similar to myometrium
- Degeneration may result in low attenuation.
- Contour deformity is the commonest sign,
- Calcification is the most specific finding of leiomyoma.



# Leiomyoma-MRI

- Is indicated when US examination is indeterminate or limited.
- Useful in patients considered for myomectomy, allowing precise determination of the size, location and number of leiomyomas.
- Facilitates differentiation of a pedunculated leiomyoma from an adnexal mass.



# Adenomyosis

- Is the presence of endometrial tissue within the myometrium and secondary smooth muscle hypertrophy-hyperplasia.
- Most frequent symptoms are dysmenorrhoea and dysfunctional uterine bleeding.
- US shows enlarged uterus with diffuse changes in echotexture.
- MRI shows a widened low intensity junctional zone > 12mm.



# Endometrial Hyperplasia

The main objective of investigation is

1. exclude coexisting endometrial carcinoma
2. exclude coexisting Ovarian cancer.
3. the risk of progression to endometrial carcinoma.





# Cervical Incompetence

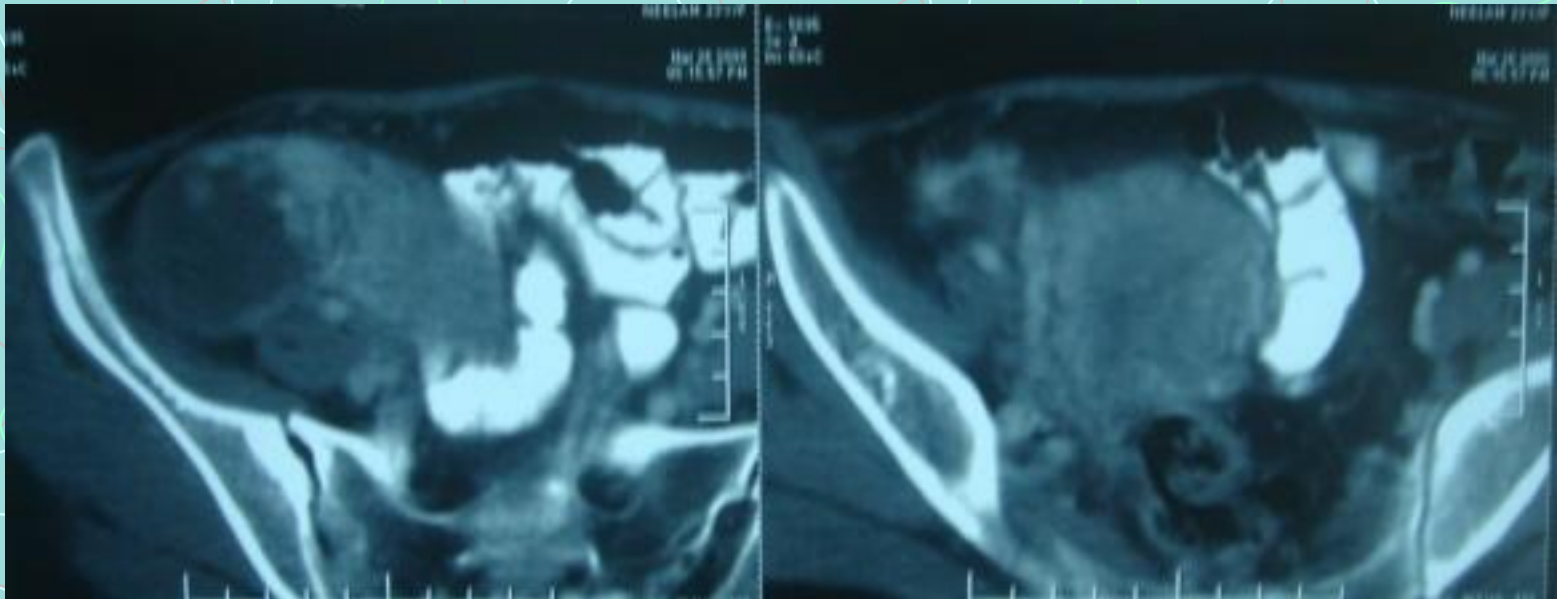
- Responsible for approx. 15% second and third trimester abortions.
- US is investigation of choice for diagnosis.
- Cervical length < 3 cms.
- Cervical width > 2 cms.
- Bulging of membranes into the cervical canal.
- Widening of the internal os > 4.0 mm.



# Gestational Trophoblastic Disease

- Includes hydatidiform mole, invasive mole and choriocarcinoma.
- USG shows soft tissue mass with multiple small cystic spaces; Ovarian enlargement with bilateral multilocular theca lutein cysts.
- Role of imaging is to document metastatic disease at initial diagnosis or evaluate persistent disease.
- No specific imaging finding to differentiate complete mole from invasive mole or choriocarcinoma.

# Choriocarcinoma



# Metastases





# Endometrial Carcinoma

TVS is superior to transabdominal USG for imaging endometrium.

- Seen as prominent thickened endometrium
- (>5mm in post menopausal females).
- Typically diagnosed at biopsy or D&C.
- Role of imaging is to evaluate the extent.
- Dynamic contrast-enhanced MRI offers a one-stop pretreatment evaluation.





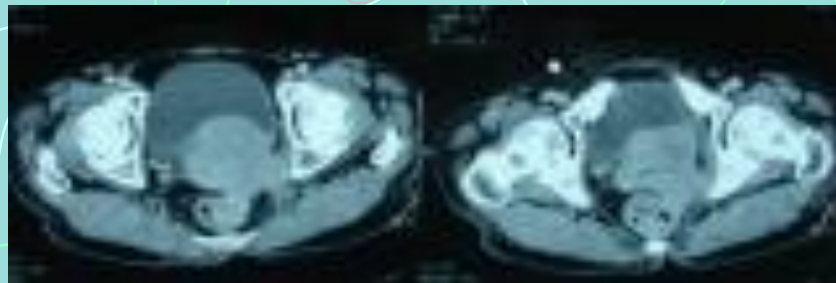
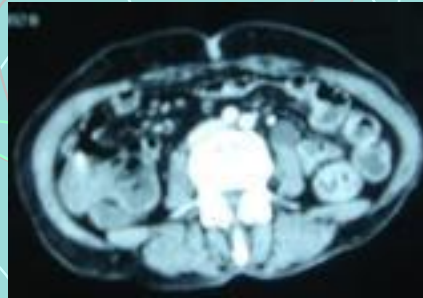
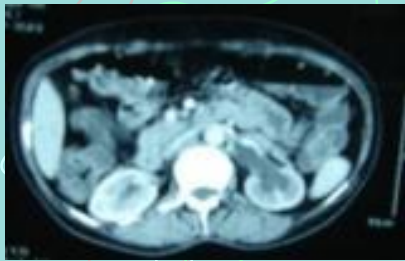
# Carcinoma of the Cervix

- Early CA Cx is difficult to detect with Transabdominal or transvaginal USG.
- More advanced cancer can be visualised with TVS.
- MRI is the best single imaging investigation.
- Superior to US and CT for delineation of primary tumor site, tumor dimensions and extent (parametrial invasion , nodal metastases).
- Contrast used in suspected advanced disease i.e. bladder or rectum involvement.

# Carcinoma cervix- CT Scan



# CT- Carcinoma Cervix with Hydroureteronephrosis



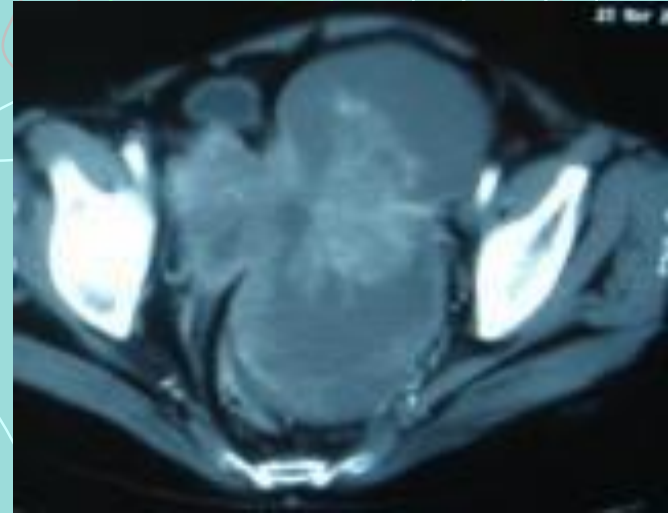
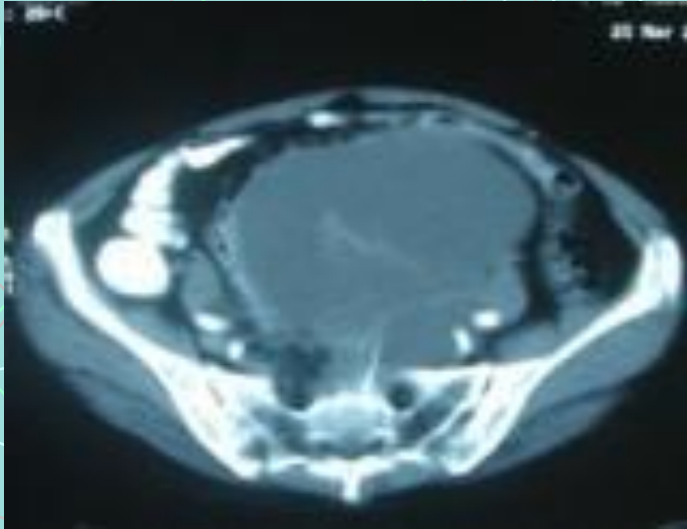


# Ovarian carcinoma

- Disease of post-menopausal women and pre-pubescent girls.
- Adnexal mass > 9 cm, irregular walls, solid components, papillary projections, thick septations are suspicious of malignancy.
- Doppler shows neovascularity.
- Appearance of ovarian metastases (from stomach/colon CA) is indistinguishable from a primary ovarian neoplasm.



# CT scan- Ovarian Malignancy







# Intrauterine Contraceptive Device

- On USG-Produce a dense linear shadow in the sagittal plane of the uterine cavity
- TVS will be more accurate in identifying malposition of an IUCD and perforation of the myometrium.





# Copper-T



- In case of missing threads of an IUCD:
- A plain radiograph will establish whether it has been expelled or lies in the pelvis.



# Gynaecological Infertility

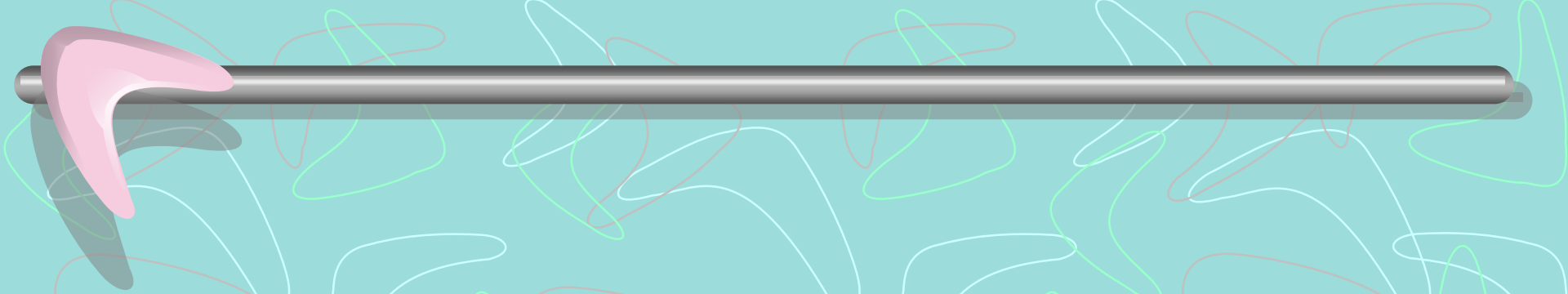
- TVS has an important role in the management of infertility related to gynaecological disorders.
- The success of in vitro fertilisation (IVF) has been partly due to the correct timing of ovulation and subsequent oocyte retrieval that US can provide:
  - 1. Follicular Monitoring-depicting follicular development in patients who receive medication to induce ovulation.
  - 2. Guided follicular aspiration-for oocyte retrieval , it is preferred over laproscopic technique.



# Infertility....

- 3.TAS guided Embryo Transfer and transcervical cannulation of fallopian tube for Gamete Intra Fallopian tube Transfer (GIFT) procedure
- (MRI is valuable-it can diagnose leiomyomas, adenomyosis/and endometriosis with confidence- and should be part of the investigation in patients with persistent unexplained infertility awaiting costly procedures e.g GIFT and IVF.)





THANK YOU