



SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Course Name: **19BMB301 Diagnostic & Therapeutic Equipment**

III Year : V Semester

Unit 5- Application of Ultrasonic and Thermography

Topic : Application of Ultrasound in Gynecology



INTRODUCTION

Ultrasound was 1st introduced by Ian Do in 1950 from Glasgow, UK.

Father of ultrasonography - Ian Donald

Ultrasonography is commonly used diagnostic test due to high saf acceptance and low cost



PHYSICS

- ◉ 3.5 MHz frequency is used in abdominal ultrasound where as 5-7.5 MHz is used in vaginal type.
- ◉ Higher is the frequency more will be the resolution of the image but lower will be the depth of tissue penetration.



POTENTIAL USES FOR ULTRASOUND GYNAECOLOGY

- ◉ Assessment of adnexal pelvic masses
- ◉ Diagnosis of polycystic ovaries
- ◉ Investigation of postmenopausal bleeding
 - ◉ Imaging and measure of endometrial thickness
- ◉ Investigation of menorrhagia
 - ◉ Fibroids and adenomyosis
- ◉ Monitoring of follicle number and growth for IVF
- ◉ Egg recovery for IVF and ICSI
- ◉ Evaluation of pelvic pain
 - ◉ A limited role
- ◉ Screening for ovarian cancer
 - ◉ Too many false positives



POTENTIAL USES FOR ULTRASOUND IN GYNAECOLOGY

- ◉ IUCD and Implantation location
- ◉ Treatment of ovarian cysts (aspiration) and ectopic pregnancy (methotrexate)
- ◉ Saline hysteroGRAPHY for delineation of the uterine cavity
- ◉ Tubal patency studies in infertility
- ◉ Evaluation of primary amenorrhoea

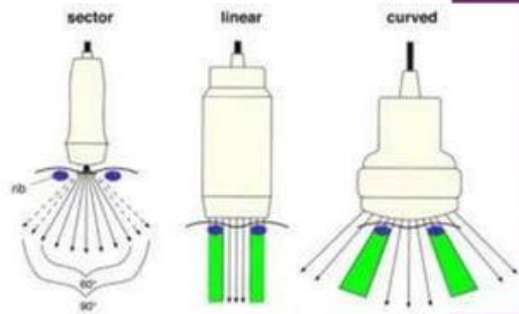


COMPONENTS

- ◉ Transducer Probe
- ◉ Transducer Pulse Controls
- ◉ CPU
- ◉ Display
- ◉ Keyboard/Cursor
- ◉ Disk Storage Device
- ◉ Printer



PROBE TYPES





TRANSABDOMINAL ULTRASOUND





TRANSABOMINAL ULTRASOUND

- ◉ Bladder should be full [Full bladder will push bowel away from the field- **acoustic window**]

Explain

- ◉ Consent [verbal]
- ◉ Female attendant [**chaperone**]
- ◉ Privacy
- ◉ Gentle
- ◉ Brief Gynecological history
- ◉ Examination findings - abdominal and vaginal



TRANSVAGINAL ULTRASOUND

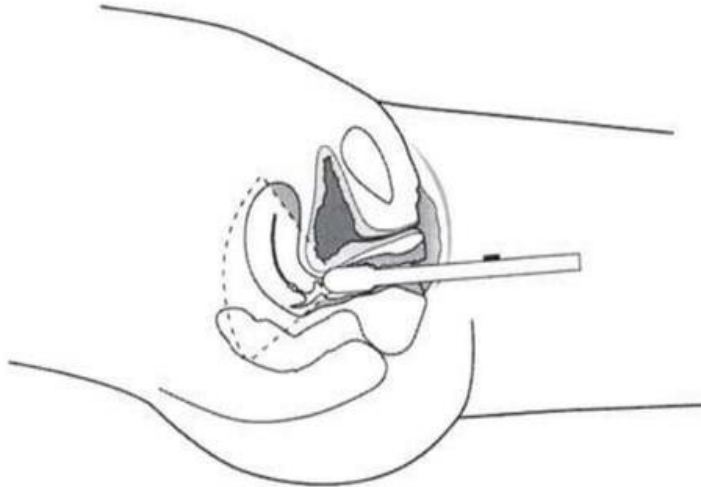
- ◉ Bladder full is not needed
- ◉ It has a range of about 8-10 cm.
- ◉ Wear a pair of Gloves

Trans-vaginal probe movements:

- a) **Penetrating** - introducing into vagina
- b) **Rocking** - antero-posterior movement
- c) **Sliding** - lateral movement
- d) **Roatating** - to 45 to 90 degrees
- ◉ **Drawbacks** -
 1. Virgins
 2. Elderly Postmenopausal women
 3. Post radiation stenosis
 4. Children
 5. Psycho-sexual disorder



TRANSVAGINAL ULTRASOUND IMAGES



Source: Ma OJ, Mateer JR, Blaivas M: *Emergency Ultrasound*, 2nd Edition: <http://www.accessemergencymedicine.com>

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FINDINGS OR OBSERVATIONS



- ◉ Identify bladder
- ◉ Uterus size - 6-8X5X4 cm
- ◉ Uterus position - anteverted or retroverted
- ◉ Myometrium
- ◉ Cervix - for growths like polyps or fibroids
- ◉ Endometrial lining
- ◉ Bilateral ovaries
- ◉ Any other adnexal masses - ovarian or fallopian tubal masses
- ◉ Color Doppler - flow of the blood in a vessel can be identified
- ◉ Fluid in the Pouch of Douglas



GYNECOLOGICAL US

◉ SCANNING TECHNIQUE

■ ORIENTATION

- ◉ FULL BLADDER (MARKER, ACCOUSTIC WINDOW)
- ◉ UTERUS
- ◉ TVS => INTERNAL ILIAC VESSELS, OVARY IN ANTEROMEDIAL



○ SCANNING PLANES

- SAGITTAL (LONGITUDINAL, VERTICAL, ANTERO-POST)
- CORONAL (HORIZONTAL, TRANSVERSE, CS, TRANS-PELVIC)
- LEFT-RIGHT ORIENTATION
- TRANSDUCER
 - TRANS ABD => 3.5-5 MHz
 - TRANSV => 5-8 MHz
- BIG MASS => EMPTYING BLADDER



REPORTING FINDINGS

◉ THE UTERUS & CERVIX

- ANTEVERTED/RETRO
- ENDOMETRIAL THICKNES
- DECIDUAL REACTION
- UTERINE CAVITY ABNORMALITY
- CERVICAL ABNORMALITY



- **THE ADNEXAE (TUBES & OVARIES)**
 - HYDROSALPINX
 - OVARIAN CYST
 - PCO
- **POUCH OF DOUGLAS**
 - FREE FLUID
 - SOLID MASSES
- **OTHER PATHOLOGY**



NORMAL PELVIC ANATOMY

◉ THE UTERUS

- POSITION => NEXT TO BLADDER (ANTEVERTED), LOOPS BOWEL FILLING THE SPACE BETWEEN BLADDER & UTERUS.
- THE SIZE & SHAPE (AGE, PARITY)
 - ◉ PRE PUBERTAL 1.0-3.3 LENGTH, 0.5-1.0 WIDTH
 - ◉ NULLI 7X4X4 CM, MULTI + 1.2 CM
 - ◉ POST-MENOPAUSAL 3.5-6.5 LONG, 1.2-1.8 W



THE MYOMETRIUM

- ◎ TEXTURE OF NORMAL=>
 - HOMOGENOUS
 - LOW-MEDIUM ECHOGENICITY
 - SMALL 1-2 mm BLOOD VESSELS



Figure 2: Normal transverse plane



Figure 3: Normal longitudinal plane

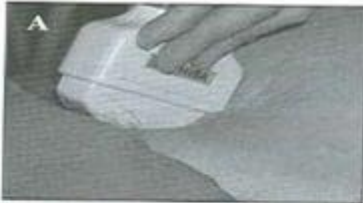


Figure 1:
The trans-abdominal scan; obtaining the longitudinal view *A* with the probe tilted into the pelvis, transverse view *B* and visualising the ovaries (*C & D*).



THE ENDOMETRIUM

- ⦿ THICKNES & TEXTURE AFTER MENARCHE
=> CYCLICAL CHANGES
- ⦿ EARLY MENSTRUAL PHASE => ANECHOIC =>
BLOOD
- ⦿ VERY THIN 1-4 mm (AP width)
- ⦿ PROLIFERATIVE; 4-8 mm, isoechoic or
slightly hyperechoic relative to the outer
- ⦿ LATE PROLIFERATIVE (PERIOVULATORY)=>
A MULTILAYERED ENDOMETRIUM



- THE SECRETORY PHASE=> ECHOGENIC, 8-16 mm
- Outline endomet cavity=> regular, except polyp, submucous fibroid.
- Oligomenorrhoea, amenorrhoea => >16 mm, prolonged unopposed estrogen effect
- Normal postmenopausal=> atropic, thin, < 4mm



ENDOMETRIAL THICKNESS

- Proliferative phase - 2-4 mm
- Secretory phase - 5 - 14 mm
- In post-menopausal women - more than 4 mm warrants or is an indication for biopsy



NORMAL, NON-PREGNANT UTERUS ON T/V U/S



Ma OJ, Mateer JR, Blaivas M: *Emergency Ultrasound*, 2nd Edition;
www.accessemergencymedicine.com

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19BMB301/DTE/Unit-5/Mrs.Jareena/AP/BME



THE OVARIES

- ◉ Not easily seen during trans-abd US
- ◉ Ovoid structures antero-medial to the internal iliac vessels => TVS
- ◉ Size varies => hormonal status
- ◉ Adolescence=> 4.2 cm³
- ◉ Premeno adult=> 9.8 cm³
- ◉ Postmeno => 5.8 cm³



- Small, rounded,
- anechoic spaces=> follicles or corpus luteum in reproductive age
- 60% postmenopausal ovaries can be identified.
- Simple functional cysts are solitary and measure 4-7 cm in diameter.



Figure 4: Proliferative endometrium ('triple stripe')

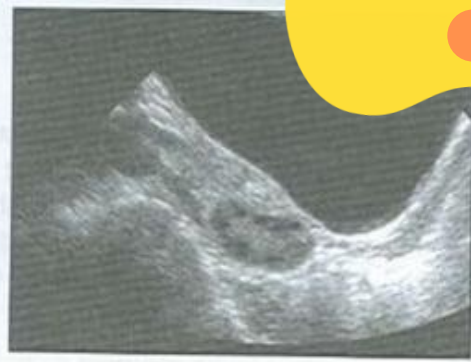


Figure 5: Normal ovary

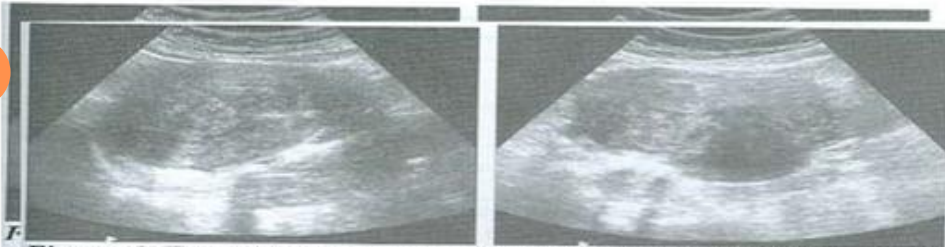
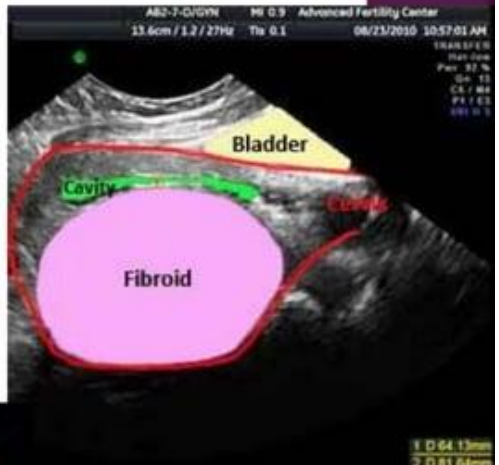


Figure 6: Fundal fibroid (left) and posterior uterine wall fibroid (right)

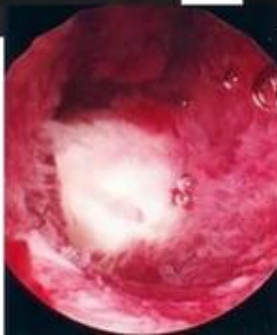


INVESTIGATING A SUBMUCOUS FIBROID





INVESTIGATING A SUBMUCOUS FIBROID

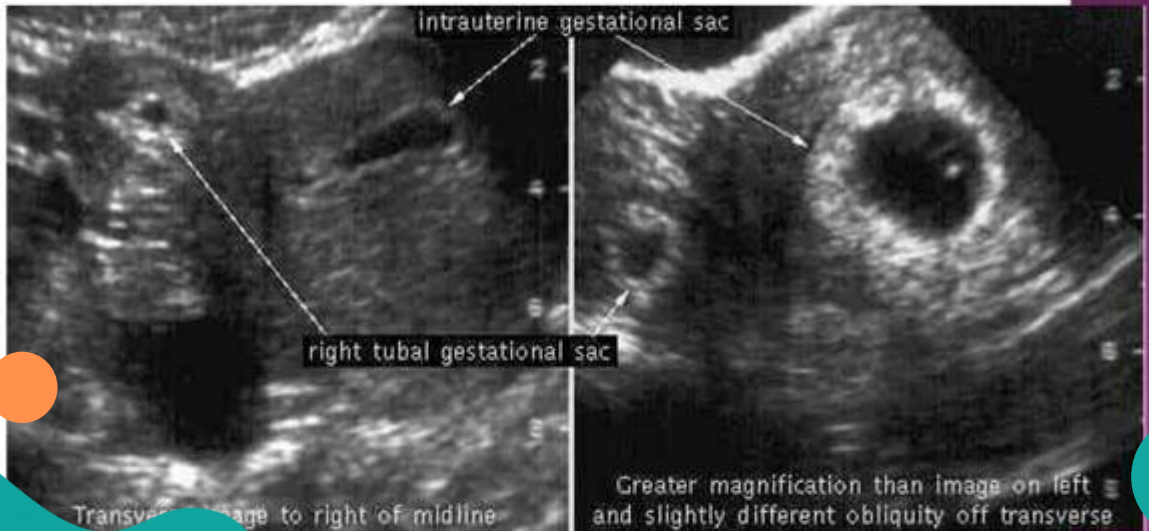




FIBROID UTERUS



A HETEROTOPIC PREGNANCY (COMPARE NORMAL VS. ABNORMAL)





ECTOPIC PREGNANCY



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POLYCYSTIC OVARIAN DISEASE



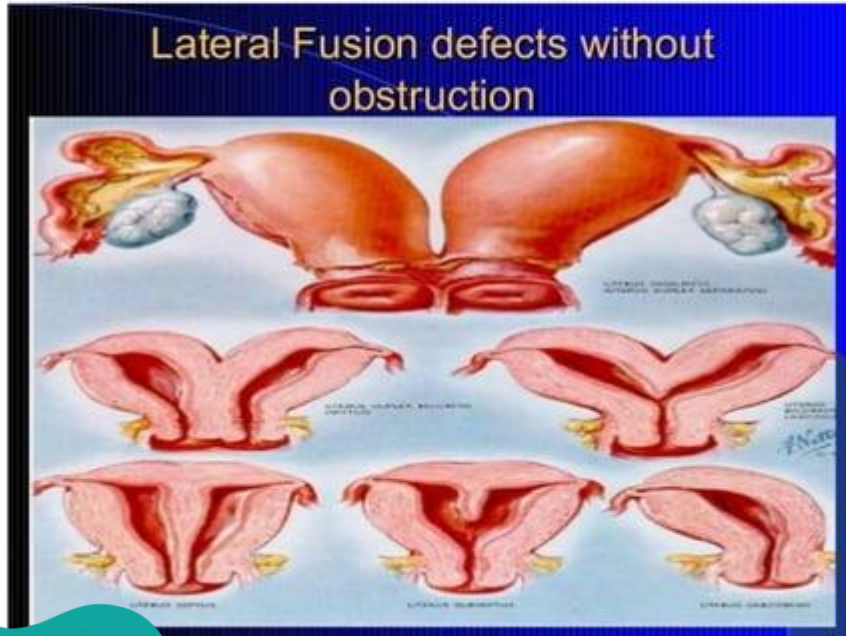


MOLAR PREGNANCY





ANOMALIES OF UTERUS





BI-CORNUATE UTERUS



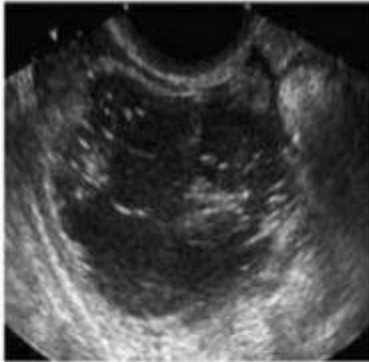


UTERUS DIDELPHYS





DERMOID CYST



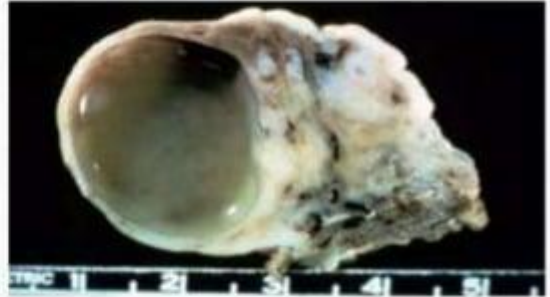
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Follicular cysts





Thank You All