Ultrasonography of the Uterus

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Objectives
- Know the standard orientation for transabdominal and transvaginal images of the uterus.
- Be able to recognize the normal uterus and cervix on ultrasound images.
- Be able to recognize common uterine and cervical abnormalities as seen on gynecologic ultrasound.
- Understand the indications and procedure for saline infused sonohysterography.
- Understand the 3 planes used in generating a 3D ultrasound image and applications were 3D ultrasound may be helpful.

Ultrasonography of the Uterus
- Standard Orientation
- Normal Ultrasound Findings
- Abnormal Ultrasound Findings
- Saline Infused Sonohysterography
- 3D Applications

Standard Orientation
Transabdominal Imaging (TA)
- Sagittal view
  - Uterine fundus on the right side of image, Cx on left side of image.
  - Bladder upper left side of image.
- Transverse view
  - Maternal right is on the right side of the image (feet point towards you)

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- Standard Orientation
- Transabdominal Imaging
- Transvaginal Imaging
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TA Saggital Orientation
Uterine fundus
TA Trans Orientation

Bowel

Bladder

Transvaginal Orientation

TV Standard Orientation

- Sagittal View – Patient orientation
  - Bladder upper right hand corner of image
  - Uterine fundus points to the right side of image
  - Rectum lower left corner of image

TV Standard Orientation

- Sagittal View - Image Viewing Orientation
  - Image is rotated 90 degrees counter-clockwise
  - Uterine fundus points to the right side of image (your left)
  - Vaginal probe nearly vertical
TV Standard Orientation

- Sagittal View - Image Viewing Orientation
  - Image is rotated 90 degrees counterclockwise
  - Uterine fundus points to the right side of image (your left)
  - Vaginal probe nearly vertical

TV Sag Orientation

- Bladder

TV Sag Orientation

- Uterine Fundus
TV Sag Orientation
Endometrial Stripe

TV Sag Orientation
Cervix

TV Sag Orientation
Bowel

TV Standard Orientation
Transverse View
- Objects too large to all fit on one image
- Representative caudal to cephalad slices through cervix and uterus
- Adnexae treated separately and measured in 3 separate planes.

Ultrasonography of the Uterus
- Standard Orientation
- Normal Ultrasound Findings
  - Size
  - General appearance
  - Cervix
  - Cul de sac fluid
  - IUD’s
  - Endometrium

Normal Uterine Size
- Length: upper limit of normal in ovulating women is 9 to 10 cm.
- Width: 5 to 6 cm
- AP Diameter: 4 to 5 cm
- Corresponds to a 80 - 100 gm uterus.
  - \( L \times W \times AP \text{ (in cm)} \times 0.53 = \text{approx wt in grams} \)
General Appearance

Normal uterus
Sagittal view

Normal uterus
Transverse View

Normal antverted uterus
Sagittal view

Normal antverted uterus
Sagittal View

Normal retroverted uterus
Sagittal view
Normal retroverted uterus
Sagittal View

Normal cervix
Sagittal view

Nabothian Cysts
Sagittal view

Normal Cervix
Cul de sac Fluid

Intrauterine Devices

TA images supporting proper intracavitary placement of the IUD

TV Image consistent with intracavitary placement

TV Image consistent with intracavitary placement

TV Image consistent with intracavitary placement

36 yo 2 weeks post IUD insertion with bleeding and missing strings. U/S confirmed intrauterine placement but appears within lower uterine segment.
33 yo c/o heavy bleeding 3 weeks after insertion of Mirena IUD
IUD strings not visualized on exam

No clear intracavitary echoes suggesting IUD

Flat plate of the abdomen

bingo

Successful laparoscopic removal
Posterior wall penetration clue

Successful laparoscopic removal

Endometrium

Endometrial Measurement
- Measure at thickest site - near fundus
- Measure both walls minus any intracavitary fluid
- Measuring from the basalis to the basalis layer

Endometrium:
Menstrual date specific
Early proliferative - CD 5
Echogenic basalis layer
Thin hypoechoic functionalis layer

Postmenopausal. No HRT

CD 10 - “3 layers”
Echogenic basalis layer
Hypoechoic functionalis layer
Echogenic lumen

CD 21
Completely echogenic endometrium
Obscure lumen

Postmenopausal. On HRT
Endometrial Echogenicity Pattern I
- Echogenic basalis
- Thin hypoechoic functionalis
- Echogenic lumen
- Early Proliferative

Endometrial Echogenicity Pattern II
- Basalis layer becomes more echogenic
- Thin hypoechoic functionalis suggests lack of ovulation

Endometrial Echogenicity Pattern III
- Thick, echogenic endometrial layer
- Consistent with ovulation
- Hypoechoic functionalis layer becomes echogenic
- Tortuous glands of secretory phase contribute to echogenicity

Unreliable Endometrial Stripe
- Presence of adenomyosis
- Distorted by myomas
- Intrauterine adhesions
- Angle of insonation less than 45 degrees from longitudinal uterine axis

Ultrasonography of the Uterus
- Standard Orientation
- Normal Ultrasound Findings
- Abnormal Ultrasound Findings
  - Endometrial/Endocervical Polyps
  - Myomas
  - Uterine Anomalies
  - Adenomyosis
  - Endometrial carcinoma

Endometrial and Endocervical Polyps
**Polyps**
- Common cause AUB
- PMB—30% due to polyps
- Most benign—Ca risk 0.5% to 1.5%
- Homogeneous & echogenic
- Often missed without SIS
- Distinguish from late secretory endometrial folds
- Bleeding?
  - Could be a blood clot

BL a 47 yo with AUB

SIS reveals polypoid mass

Hysteroscopic resection
Sessile, thin stalked benign polyp

Endometrial Polyp

Hysteroscopic resection
Sessile, thin stalked benign polyp
Leiomyomas
- Subserosal, intramural and submucosal
- Usually hypoechoic with poor sound transmission
- Well defined, smooth or lobulated border
- Submucosal myomas can be difficult to distinguish from endometrial polyps

37 yo with DUB. SIS suggests fundal mass encroaching Endometrial cavity
37 yo with DUB. SIS suggests fundal mass encroaching Endometrial cavity

SIS suggests fundal mass encroaching Endometrial cavity

Myomas

Uterine Anomalies

RW a 27 yo with AUB

Trans view suggests 2 endometrial cavities
SIS confirms 2 cavities

Bicornuate uterus
Gestational Sac Left Horn

**bicornuate uterus**
- difficult in differentiating between bicornuate and septate uterus
- key features of bicornuate
  - fundus is indented
  - uterine horns are wider apart

**bicornuate vs. septate uterus**

KP a 44 yo with AUB
Irregular mass within endometrial cavity
Irregular surface endometrium
Intrauterine adhesions
Endometrial polyp

15 yo with primary amenorrhea

Mayer-Rokitansky-Kuster-Hauser Syndrome
- Mullerian Agenesis
- Vaginal Agenesis or hypoplasia
- Normal 46 XX
- Ovarian function is normal as are growth and development
- Small uterus and cervix; may be functional
  - May have cyclic abdominal pain as result

Adenomyosis
- Usually “normal” report.
- Findings may be subtle
- Involves the inner 2/3 of the myometrium
- Obscuring of the endometrial stripe - makes it difficult to measure
- Multiple 2-4mm subendometrial or myometrial cysts
Adenomyosis

- Poorly distinct endometrial border
- Multiple small subendometrial echolucencies
- Arcuate vessels

MRI adenomyosis

Endometrial Cancer
Endometrial Cancer

- Unable to reliably diagnose with U/S
- Most commonly appears as diffuse, echogenic thickening of an inhomogeneous endometrium
- SIS - thickened endometrium with a poorly distensible cavity
- 3D may help with depth of invasion and cervical involvement
Endometrial Ca

Ultrasonography of the Uterus

- Standard Orientation
- Normal Ultrasound Findings
- Abnormal Ultrasound Findings
- Saline Infused Sonohysterography

Saline Infused Sonohysterography (SIS)

- Simple procedure
- Easy to learn
- Minimal expense
- Well tolerated
- Low complications
- Can be done in combination with an endometrial biopsy

SIS-Indications

- Abnormal uterine bleeding
- Postmenopausal bleeding
- Recurrent pregnancy loss/Infertility
- Thickened endometrial stripe
- Alternative to HSG?

SIS-Complications

- Vasovagal reactions
- Pain
- Perforation (if used dilators)
- PID
  - Hydrosalpinges can be expanded and become painful.
SIS Equipment

- Minimal equipment:
  - Open-side speculum
  - Ring forceps
  - 20ml syringe
  - 40ml Sterile normal saline
  - IUI type catheter (5.3 fr Soules)
  - Betadine swabs
  - Gloves
  - Ultrasound

- Additional Equipment:
  - Long-billed open side speculum
  - 2% lidocaine (injection or instillation)
  - Cervical probes/dilators
  - 3-ring syringe for paracervical blocks
  - HSG catheter with balloon tip for patulous cx or large uterine cavity
  - Endometrial sampling device

SIS Preparation

- Pre-procedure:
  - Test performed first half of cycle (day 5-12)
  - Adequate contraception for irregular cycles
  - PID risk – no evidence

SIS Procedure

- Technique
  - Complete GYN study prior to procedure.
  - Open-sided speculum
  - Sterile prep
  - Insert catheter and remove speculum
  - Insert TV probe
  - Create the 3D image in your head

SIS Demos

Normal SIS
Normal SIS

Intrauterine Adhesion

SIS - Submucosal Myoma

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3D Applications
- Improved preoperative positioning of pathology
- Müllerian Defects
- Possibly eliminate need for MR backup
- IUD position
- Endoanal ultrasound

3D Ultrasound
TV Standard Orientation

TV Standard Image Viewing Orientation

TV Sag Orientation - Bladder

TV Sag Orientation - Fundus

TV Sag Orientation - Endostripe
5 cm intramural
Fundal fibroid

Myoma distorted fundal
Endometrial cavity

50 yo with AUB

SIS

Hysteroscopic resection
Benign polyp

SIS
MP a 41 yo with AUB

Polyp resected with hysteroscopic resectoscope

PB a 46 yo with AUB
Intramural myoma with calcifications

PB a 46 yo with AUB
Intramural myoma with calcifications