The Role of Ultrasound in the Diagnosis of Endometriosis & Adenomyosis

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Will my scan show if I have endometriosis?

Ultrasound is good at assessing the ovaries for endometriomas.

Endometriosis elsewhere is best visualised by laparoscopy.
Overview

- Definition of endometriosis and adenomyosis
- Ultrasound appearances of endometriosis within the pelvis
- How to assess for pelvic mobility
- What to look for during an ‘endometriosis’ scan
Definition of Endometriosis

- The presence of endometrial – like tissue (glands and stroma) outside the uterus which induces a chronic inflammatory reaction.
- Thought to be caused by retrograde menstruation (peritoneal regurgitation and implantation of viable endometrial cells that are present in menstrual debris) ‘Sampson’s concept’
- Endometriosis typically manifests itself in three ways *endometriomas, adhesions* and *endometriotic nodules (deep or superficial)*
Facts and figures – from Endometriosis UK
www.endometriosis-uk.org

• One in 10 women have endometriosis and it takes an average of seven years for most women to get diagnosed
• Endometriosis can often be confused with or misdiagnosed as IBS
• Endometriosis is the second most common gynaecological condition (after fibroids) in the UK
Endometriosis

- Some women with endometriosis experience painful symptoms and/or subfertility, others have no symptoms at all
- Most common are cyclical pelvic pain, dysmenorrhoea and/or dysparenuia. Intestinal complaints include bloating, diarrhoea +/- constipation. Bowel involved (dyschieza)
- The exact prevalence of endometriosis is unknown but @ 2 to 10% within the general female population and up to 50% in infertile women
**Ovarian endometrioma**

- Endometriomas are common, can mimic other adnexal masses
- Endometriomas result from cyclic haemorrhage
- The walls are thick and fibrotic
- The contents consist of thick, dark degenerate blood product also known as a ‘chocolate cyst’
- If unilateral more likely to occur within the left ovary
- Are bilateral in approximately 50% of cases
- Usually regress substantially after menopause
Ovarian endometriomas – typical appearances

• Well-circumscribed thick-walled unilocular cyst that contains homogeneous low-level internal echoes ‘ground glass’ (measure ‘inner to inner’ in three dimensions)
• Can be multilocular (more likely to be an endometrioma)
Ovarian endometrioma – typical appearances

- Hyperechoic wall foci – specific for endometriomas
- Thought to be cholesterol deposits
- A cyst with low-level echoes, hyperechoic wall foci and no neoplastic features is 32x more likely to be an endometrioma than another adnexal mass

Ovarian endometriomas – typical appearances

- Fluid level, the hyperechoic layer will be the dependent portion of the cyst
- Can have calcified foci within the cyst (acoustic shadowing)
- Typically avascular or low flow (Doppler does not improve sensitivity)
- ‘Acoustic streaming’ can help discriminate from mucinous/serous cystadenomas
Kissing ovaries

- Both ovaries are joined behind the uterus in the pouch of Douglas
- Negative sliding sign (no movement) on applying gentle pressure with the trans-vaginal ultrasound probe
- Strongly associated with the presence of endometriosis and indicates a severe form of the disease (i.e. significant pelvic adhesions)
Kissing Ovaries
Endometrioma Rules

- *Single best* discriminator between endometrioma and other cysts is ground glass echogenicity of cyst fluid – sensitivity 73%, specificity 94%
- Premenopausal status
- One to four locules
- Absence of papillations with detectable blood flow

*Von Holsbeke et al Ultrasound Obstet Gynecol 2010 35: 730 - 740*
Malignant transformation of an endometrioma

- Malignant transformation of endometriomas is rare, but reported to occur in 0.3-0.8% of women
- Typically in women > 45 years

Ovarian endometroid carcinoma stage 2
Cancers arising from endometriosis

Endometroid

Clear cell
Use simple rules to discriminate between benign and malignant cysts

<table>
<thead>
<tr>
<th>Simple</th>
<th>Malignant</th>
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<tbody>
<tr>
<td>Unilocular cyst</td>
<td>Irregular solid cyst</td>
</tr>
<tr>
<td>Presence of solid components, where largest solid component &lt; 7mm</td>
<td>Ascites</td>
</tr>
<tr>
<td>Presence of acoustic shadows</td>
<td>At least 4 papillary structures</td>
</tr>
<tr>
<td>Smooth multilocular tumour with largest diameter &lt; 100mm</td>
<td>Irregular multilocular solid tumour with largest diameter &gt;/=100mm</td>
</tr>
<tr>
<td>No blood flow</td>
<td>Strong blood flow</td>
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Ovarian endometrioma- decidulisation during pregnancy

- Hypertrophy of endometrial stromal cells & development of decidua as a response to progesterone
- Characteristically highly vascular
- Can be mistaken for an ovarian malignancy
- 4-5% of ovarian cysts in early pregnancy are endometriomas
**Ovarian endometrioma only are rarely the sole findings**

Women *with* ovarian endometriomas have more pelvic and intestinal areas invaded by endometriosis, compared to women *without* ovarian endometriomas *(Redwine, 1999)*
IDEA group

Systematic approach to sonographic evaluation of the pelvis in women with suspected endometriosis, including terms, definitions and measurements: a consensus opinion from the International Deep Endometriosis Analysis (IDEA) group

- Evaluation of uterus and adnexae – assessing uterine mobility, sonographic signs of adenomyosis and the presence of endometrioma
- Soft markers site-specific tenderness and fixed ovaries
- Evaluation of the pouch of Douglas using ‘sliding organs sign’
- Assessment for DIE nodules

S Guerriero et al Ultrasound Obstet Gynecol 2016; 48:318-332
**Definition of Adenomyosis**

- Migration of ectopic endometrial glands from the basal layer of the endometrium to within the myometrium
- Usually present in older reproductive age group
- Rarely in nulliparous/ postmenopausal women
- Symptoms include uterine tenderness, dysmenorrhea and menorrhagia
- Often incorrectly diagnosed as fibroids
- 27% of women with pelvic endometriosis had adenomyosis on pre-op MRI

Adenomyosis

**Ultrasound features**

<table>
<thead>
<tr>
<th>Feature</th>
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<tbody>
<tr>
<td>Asymmetrical myometrial thickening</td>
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<tr>
<td>Globular shape</td>
</tr>
<tr>
<td>Ill defined endometrial/ myometrial interface</td>
</tr>
<tr>
<td>Linear striations</td>
</tr>
<tr>
<td>Myometrial cysts</td>
</tr>
<tr>
<td>Hyperechoic nodules</td>
</tr>
<tr>
<td>Increased junctional zone thickness on 3D &gt;= 8mm</td>
</tr>
</tbody>
</table>
Myometrial layers

Inner (Junctional zone)
Middle
Outer
Adenomyosis

Globular shape

Ill-defined endometrial/myometrial interface

Linear striations

Myometrial asymmetry
Adenomyosis

Cystic spaces

Hyperechoic nodules
**Nodules or implants**

- Nodules vary in size from a few mm to a few cm and are superficial or deep.
- Nodules may change appearance during the menstrual cycle – becoming more swollen and congested during menses and develop internal haemorrhage.
- Only laparoscopy can detect superficial peritoneal implants.
Superficial implants

Uterovesical fold

Pouch of Douglas
**Deep infiltrating endometriosis (DIE)**

- Definition is the infiltration of endometriotic nodules $\geq 5\text{mm}$
- Locations includes
  - rectosigmoid
  - utero-sacral ligaments
  - recto-vaginal septum
  - vagina
  - bladder
DIE

Vesicouterine pouch

Bladder

Rectouterine pouch

Uterus

Rectum
DIE

Posterior

Uterosacral ligament

Cardinal ligament (under broad ligament)

The round ligament

Round ligament of uterus

Anterior
Bowel wall layers

- Serosa
- Muscularis propria
- Submucosa
- Mucosa

Lumen
**Bowel nodules**

- Histologically definition is the presence of endometrial glands and stroma in the bowel reaching at least the muscularis propria
- Involves anterior rectum, rectosigmoid junction and/or sigmoid colon
- Typically hypoechoic or isoechoic solid masses with irregular outer margins
- Tender on palpation
Bowel nodules
**Bladder lesions**

- Hypo- or isoechoic nodule within the bladder base (close to the ureteral ostia) or in the bladder dome
- ‘Nodular’ or a ‘comma’ shape
- Small internal anechoic cystic areas are seen in approximately 30% of the nodules
Examining the Ureters

- Find urethra in the sagittal plane
- Move the probe laterally to find the intra-vesical portion of the ureter
- Follow the ureter and rotate the probe to get a view of the distal ureter
- Follow until it reaches the internal iliac vessels

Ureter  Bladder
Why is it important to diagnose bladder endometriosis?

- Bladder endometriosis mimics recurrent cystitis with dysuria, urgency, frequency, suprapubic pain and incontinence
- Macroscopic haematuria relatively rare
- Occurs in 1 – 4% of women with laparoscopic diagnosis of endometriosis
- Diagnosis is often delayed or not considered at all
Ovarian mobility

- Apply pressure with trans-vaginal probe to assess whether ovary is fixed to the uterus medially or the pelvic side wall laterally.
- Note any indication of site specific pain.
Assessment of POD mobility

- Use a slight pressure with the probe
- Uterus should slide anterior rectum
- Then use free hand over abdominal wall to assess movement of the uterine fundus
- If no movement in either location POD is recorded as obliterated
Adhesions

• Filmy adhesions have fluid entrapped within them. Known as the ‘flapping sail sign’

• Question mark sign
  - Fundus of uterus is ‘pulled’ by adhesions
  - Uterus is ‘fixed’
How to assess pelvis
Ovarian mobility
Staging - American Society for Reproductive Medicine (ASRM)

- Disease staging commonly performed according to the ASRM revised classification of endometriosis (1996, 1997)
- The classification assigns points to the different locations of the disease resulting in four stages: minimal, mild, moderate and severe
- The stages do not account for the severity of endometriosis associated with pain and infertility
- The classification system is of limited value in scoring deep endometriosis.
ASRM

Stage I (Minimal)
Findings restricted to only superficial lesions and possibly a few filmy adhesions

Stage II (Mild)
In addition, some deep lesions are present in the cul-de-sac

Stage III (Moderate)
As above, plus presence of endometriomas on the ovary and more adhesions.

Stage IV (Severe)
As above, plus large endometriomas, extensive adhesions
Definition of what should seen by a specialist

- Kissing ovaries – likely severe deeply infiltrating endometriosis (DIE) present
- Bladder involvement – urologist needed
- Rectovaginal / bowel involvement - colorectal support
Take home messages

• TV U/S accurate at assessing endometriomas
• Severity of symptoms does not correlate with extent of disease
• Identifying an endometrioma – likely that there is further sites of pelvic endometriosis
• ‘Kissing ovaries’ associated with extensive pelvic adhesions
• Adenomyosis is usually under reported
• Assessment of pelvic mobility can indicate adhesions
Conclusions

• TVS is accurate at assessing severe endometriosis (DIE) when performed by experienced operators
• More appropriate referral to a tertiary referral endometriosis centre will ensure safer management
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