Endometriosis: Deeper than you Thought

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Objectives

- Identify ultrasound findings of endometriosis
- Learn the value of ultrasound in diagnosing deep infiltrating endometriosis (DIE)
- Understand the application of ultrasound to staging endometriosis
- Apply this knowledge to preoperative counseling and surgical planning
Endometriosis Incidence

- Reproductive age 5-45% \(^1\)
- Infertile women 21-65% \(^2\)
- Chronic pelvic pain 15-80% \(^3\)


Endometriosis Symptoms

<table>
<thead>
<tr>
<th>Symptoms/Stage</th>
<th>#</th>
<th>I (%)</th>
<th>II (%)</th>
<th>III (%)</th>
<th>IV (%)</th>
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<tr>
<td>Pelvic Pain</td>
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<tr>
<td>Ovarian Mass</td>
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<tr>
<td>Uterine Fibroids</td>
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<td>33.3</td>
<td>25.0</td>
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<td>8.4</td>
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</table>


Asymptomatic Patients with Endometriosis

<table>
<thead>
<tr>
<th>Author</th>
<th>#</th>
<th>I (%)</th>
<th>II (%)</th>
<th>III (%)</th>
<th>IV (%)</th>
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<tbody>
<tr>
<td>Rawson(^1)</td>
<td>85</td>
<td>32.5</td>
<td>9.3</td>
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<tr>
<td>Sangi-Hagheylkar(^2)</td>
<td>115</td>
<td>91.3</td>
<td>4.8</td>
<td>4.0</td>
<td>0.0</td>
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Presurgical Evaluation
Staging with Ultrasound

- Anytime during cycle
  - Prefer early follicular phase
- Do not purposely empty bladder
- Transabdominal and transrectal as needed

Location of Implants

- Ovary 54.9%
- Posterior broad ligament 35.2%
- Anterior cul-de-sac 34.6%
- Posterior cul-de-sac 34.0%
- Uterosacral ligament 28.0%


Presurgical Evaluation
Staging with Ultrasound

Sequence
- Bladder (Sweep with video file) →
- Uterus (Check mobility) →
- Right ovary and adnexa (Sliding organ) →
- Left ovary and adnexa (Sliding organ) →
- Cul-de-sac and US Ligaments (Fluid, peritoneum, mobility of posterior cervix, uterine body, and fundus. Bowel wall) →
- Rectum (3D reconstruction/render)
<table>
<thead>
<tr>
<th>Stage</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
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**Endometriosis**

<table>
<thead>
<tr>
<th>Size</th>
<th>&lt; 1 cm</th>
<th>1-3 cm</th>
<th>&gt; 3 cm</th>
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<tr>
<td>Superficial</td>
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<tr>
<td>Deep</td>
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<td>4</td>
<td>6</td>
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<tr>
<td>1. Superficial</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Deep</td>
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**Posterior Culdeosac Obliteration**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Partial</th>
<th>Complete</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>4</td>
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**Adhesions**

<table>
<thead>
<tr>
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<th>15-23 Endocerv.</th>
<th>&gt; 23 Endocerv.</th>
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</thead>
<tbody>
<tr>
<td>1. Deep</td>
<td>3</td>
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<td>3</td>
</tr>
<tr>
<td>2. Deep</td>
<td>4</td>
<td>4</td>
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</tr>
<tr>
<td>3. Deep</td>
<td>4</td>
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</table>

**Bowel Adhesions**

<table>
<thead>
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<th>Grade</th>
<th>Bowel Adhesions</th>
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<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
<td>C</td>
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</table>

**Uterus**

<table>
<thead>
<tr>
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<th>Grade</th>
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<tbody>
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<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
<td>C</td>
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</tbody>
</table>
Pelvic Pain

- 27 y.o. G0
- Pelvic pain for > 3 years
- Dyspareunia (right > left)
Pelvic Pain

- 27 y.o. G0
- Stage III endometriosis
- Endometrioma – right
- Minimal adhesions

Pelvic Pain - Mass

- 28-year-old G0 presents for evaluation of pelvic pain and pelvic fullness.
- Exam: Right adnexal mass ~ 5 cm
**Endometrioma**

- Homogenous, low-level echoes\(^1\)
  - Sensitivity 90%
  - Specificity 97%
- Septations 29%
- Fluid levels 5%
- Color Doppler

\(^1\)Ubaldi F. Hum Reprod 1998;13:330-3

**Depth of Infiltration of Endometriosis**


**TVS detection of deep pelvic endometriosis**

<table>
<thead>
<tr>
<th>Site</th>
<th>Specificity %</th>
<th>Sensitivity %</th>
<th>PPV %</th>
<th>NPV %</th>
<th>Accuracy %</th>
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<td>96.5</td>
<td>81.5</td>
<td>95.7</td>
<td>84.6</td>
<td>93.7</td>
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<tr>
<td>Uterosacral ligaments</td>
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<td>78.0</td>
<td>83.8</td>
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<td>Vagina</td>
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<td>100.0</td>
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<td>Rectovaginal septum</td>
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<td>99.3</td>
<td>96.7</td>
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<td>87.0</td>
<td>90.8</td>
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Endometriosis
Ultrasound and Laparoscopy

“Tenderness-guided” transvaginal ultrasound

- “Stand-off” TVS
- Increased gel in the probe cover
- Sites evaluated
  - Vaginal walls
  - Rectovaginal septum
  - Rectosigmoid involvement
  - Uterosacral ligaments
  - Anterior compartment
  - Bladder


<table>
<thead>
<tr>
<th>Site</th>
<th>Specificity % (n)</th>
<th>Sensitivity % (n)</th>
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</thead>
<tbody>
<tr>
<td>Vaginal involvement</td>
<td>89 (48/54)</td>
<td>91 (31/34)</td>
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<tr>
<td>Rectosigmoid involvement</td>
<td>92 (45/49)</td>
<td>67 (26/39)</td>
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<tr>
<td>Uterosacral ligament</td>
<td>94 (60/64)</td>
<td>50 (12/24)</td>
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<tr>
<td>involvement</td>
<td>88 (37/42)</td>
<td>74 (34/46)</td>
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<tr>
<td>Rectovaginal septum</td>
<td>100 (70/70)</td>
<td>33 (6/18)</td>
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<tr>
<td>involvement</td>
<td>100 (84/84)</td>
<td>100 (44/44)</td>
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Endometriosis Broad Ligament

- Power Doppler
- PRF = 800 Hz
- "Blush"
- Sensitivity 52.4%
- Specificity 47.1%
- PPV 53.2%
- Point tenderness with movement of the transducer
- Many lesions are fibrotic, without vascular activity
- ~34% of lesions penetrate > 5 mm

2 Parsons. Personal communication
Histologic Confirmed Endometriosis

<table>
<thead>
<tr>
<th>Author</th>
<th>Black</th>
<th>White</th>
<th>Red</th>
<th>Gland</th>
<th>Adhes</th>
<th>Yellow</th>
<th>Brown</th>
<th>Pockets</th>
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<tr>
<td>Jansen¹</td>
<td>ns</td>
<td>81%</td>
<td>81%</td>
<td>67%</td>
<td>50%</td>
<td>47%</td>
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<td>Stripling²</td>
<td>97%</td>
<td>91%</td>
<td>91%</td>
<td>75%</td>
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<tr>
<td>Stripling³</td>
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<td>40%</td>
<td>43%</td>
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<td>Martin⁴</td>
<td>94%</td>
<td>80%</td>
<td>75%</td>
<td>66%</td>
<td>3%</td>
<td>22%</td>
<td>30%</td>
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</tbody>
</table>


Red Lesions
75-92%

Clear Lesions
66-67%

Courtesy of Dan Martin, M.D.
Pelvic Pain - Mass

• 36-year-old G2P2002 presents with increasing dysmenorrhea and deep-thrust dyspareunia x 2 years
• Exam:
  • Normal uterus and right adnexa
  • Left ovary: Slightly enlarged and tender
  • Rectal: ? Tender mass

Endometriosis
Ultrasound and Laparoscopy

Pelvic Pain – 36-year-old Woman

• Probable diagnosis
  • Endometriosis: stage III
  • Possible nodule rectovaginal (RV) septum
Endometriosis
Ultrasound and Laparoscopy

26 y.o. G0P0

- Ultrasound
- Anteverted uterus – fixed

Sliding Organ Sign
• Sliding Organ Sign

Sliding Organ Sign

Uterine Sliding Sign
### Uterine sliding sign
Negative (no sliding)

<table>
<thead>
<tr>
<th>Author</th>
<th>#</th>
<th>Sensitivity %</th>
<th>Specificity %</th>
<th>PPV %</th>
<th>NPV %</th>
<th>Accuracy %</th>
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<tr>
<td>Hudelist et al.</td>
<td>117</td>
<td>85</td>
<td>96</td>
<td>91</td>
<td>94</td>
<td>93.1</td>
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<tr>
<td>Reid et al.</td>
<td>100</td>
<td>83.3</td>
<td>97.1</td>
<td>92.6</td>
<td>93.2</td>
<td>93.0</td>
</tr>
</tbody>
</table>

Infertility and Pelvic Pain

- 24 y.o. G0
- Primary infertility x 5 years
- Dyschezia
- Dyspareunia
Infertility and Pelvic Pain

Findings
- Stage IV endometriosis
- Bilateral endometriomas
- Obliterated cul-de-sac
- Perirectal endometriosis

Pelvic Pain
- 31-year-old G0 presents with pelvic pain x 18 months
- Incapacitating dysmenorrhea
- Unrelieved with NSAIDs and narcotics
- LMP = 3 weeks prior
- Menses regular
- Birth control: Condoms
- UCG = negative

-NSAIDs = non-steroidal anti-inflammatory drugs; UCG = urine chorionic gonadotropin

Right Ovary
Pelvic Pain – 31-year-old G0

- Probable diagnosis
  - Endometriosis: stage IV
  - Non-mobile ovaries
  - Obliterated cul-de-sac
- Planned procedure
  - Hysterectomy
  - Left salpingo-oophorectomy (LSO)
  - Right ovarian cystectomy
- Preoperative counseling

- Right Ovary

- Left Ovary
Pelvic Pain – 31 year-old G0

- Laparoscopy vs. Robotics vs. Laparotomy
- Surgeon-dependent
- Bowel preparation
- Surgeon availability
  - Colon-rectal surgeon
  - General surgeon
  - Gynecologic oncologist
- Location
  - Outpatient center vs. hospital

Surgical Findings

34 y.o. G0

- Pelvic pain
- Dysmenorrhea
- Hematuria
34 y.o. G0

- Stage IV endometriosis
- Bilateral endometriomas
- Obliterated cul-de-sac
- 4 cm endometrioma-bladder
27 y. o G0P0

- Heavy menses
- Infertility
- Left ovarian cystectomy 2015
  - Endometrioma
TVS – Soft Markers
Predicting Endometriosis

TVS Predicting Endometriosis


Ultrasound Predicting Endometriosis

http://www.biomedicalcentral.com/1472-6874/13/43
Surgical findings

• 1. Right Adnexa & Ovarian Fossa small endometrial superficial implants, not thought to be clinically significant. There was a significant nodule on the right USL.
• 2. Left Adnexa & Ovarian Fossa 5 cm endometrioma with the left ovary adherent to the left pelvic sidewall.
• 3. Posterior Cul de Sac obliteration of the cul-de-sac with rectovaginal nodule as noted on TVUS and exam.

Pathologic findings

• 1. ENDOMETRIAL POLYP, BIOPSY: Minute fragments of endometrium suggestive of endometrial polyp.
• 2. LEFT OVARY, CYST, CYSTECTOMY: Cystadenoma with adjacent endometriosis.

42 y.o G0

• Pelvic pain and pressure
• Dyspareunia
• Dysmenorrhea
• Constipation requiring laxatives
Examination

- Uterus is tender to palpation, small, deviated anteriorly, limited mobility
- Mass posterior to uterus filling posterior cul-de-sac, ~8-10cm in size, tender to palpation
- Adnexa are difficult to palpate, mildly tender to palpation bilaterally
- Rectovaginal examination confirms the above examination. No intrinsic disease of rectum/colon appreciated. Colon moves freely.
Impression

- Uterus: Visualized, Retroverted - Retroflexed. The uterus measures 9.47 x 7.99 x 7.52 cm. Deviated to the patient’s left. It seems to be fixed in the pelvis. Heterogeneous myometrium consistent with adenomyosis.
- Endometrium: Visualized. It measures 8.15 mm thick.
Right ovary: Visualized Unilocular, heterogeneous cyst. Thick fluid in appearance. Internal Echoes and debris. No “streaming” identified. However, one can demonstrate slight movement of the heterogeneous fluid within the cyst. The ovary is fixed in the right adnexal region. This is most consistent with an endometrioma. The differential includes a dermoid or cystadenoma.

Left ovary: Visualized Normal size and appearance. The ovary is fixed to the fundal region of the uterus, suggesting significant adhesions.

Adnexa: Right adnexal mass visualized (see right ovary).

Cul-de-sac: No fluid was visualized. The bowel is fixed along the posterior cervix, posterior uterine wall and over the fundus. This is consistent with an obliterated cul-de-sac. 3D Multiplanar reconstruction and rendering reveals no rectal/perirectal abnormalities.

Bladder: The bladder has no visualized mucosal abnormalities. I was unable to demonstrate ureteral jets from either ureter.

Right kidney: Marked hydronephrosis. The kidney measures 11.95 x 6.81 x 6.12 cm. The primary collecting system is dilated measuring 5.30 x 4.35 x 3.90 cm. The is preserved stroma surrounding the hydronephrosis.

Left kidney: Normal appearance, measuring 7.89 x 5.34 x 4.73 cm.

Right ureter: Dilated from the renal collecting system down to the level of the right pelvic mass. It measures 8.3 mm in internal diameter and 12.7 mm in external diameter. This is consistent with an obstructed ureter. I was unable to demonstrate ureteral jets from either ureter.

The constellation of findings are consistent with Stage 4 endometriosis.
Cystoscopy

- Cystoscopy with stent placement
Diagnostic Findings

- Stage IV endometriosis
- Large right endometrioma
- Obliterated cul-de-sac
- Right hydronephrosis and hydroureter, with partial obstruction

Surgical Treatment

- TLH and BSO
- Diffuse pelvic adhesions
- Obliterated cul-de-sac
- Ureterolysis. Led to resolution of hydroureter

32 y.o. G0P0

- Family history of cancer
  - Ovary: 2 maternal cousins (30's)
  - Breast: Maternal aunt (40's)
  - Colon: MGF
- Weight loss = 20# x 1 year
- Surgery: none
- Contraception: None
Surgical findings

- Stage IV endometriosis
- Bilateral endometriomas
- 3 cm endometrioma – bladder
- Obliterated cul-de-sac
- TAH + BSO
- Partial bladder resection
32 y.o. G0

- Stage IV endometriosis
- Bilateral endometriomas
- Obliterated cul-de-sac
- 3 cm endometrioma-bladder

Ultrasound Mapping of Endometriosis

http://www.biomedicalcentral.com/1472-6874/13/43

21 y.o. G0P0

- Pelvic pain
- Dysmenorrhea
- Menorrhagia
- Dyspareunia
Diagnostic Findings

- Stage IV endometriosis
- 4 cm endometrioma: Posterior bladder
- External compression: right ureter
- Hepatic lesion (superficial)

Surgical Procedure

- Cystoscopy with retrograde pyelogram with stent placement
- Transurethral resection of bladder tumor
- Pathology: Endometriosis (bladder)

Treatment

- Depo-Leuprolide Acetate
- 6-month follow-up
<table>
<thead>
<tr>
<th>DIE location</th>
<th>Prevalence (%)</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Accuracy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uterus</td>
<td>7.7</td>
<td>100</td>
<td>96.8</td>
<td>97.1</td>
</tr>
<tr>
<td>US ligaments (R/L)</td>
<td>54.0/61.5</td>
<td>82.7/82.8</td>
<td>87.2/85.0</td>
<td>83.7/83.7</td>
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<td>Right parametrium</td>
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<td>67.9</td>
<td>93.4</td>
<td>96.5</td>
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<td>31.7</td>
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<td>94.3</td>
<td>94.4</td>
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<td>RV septum/Obliteration</td>
<td>44.2/67.3</td>
<td>73.9/98.6</td>
<td>86.2/94.1</td>
<td>80.8/97.1</td>
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<tr>
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<td>58.6</td>
<td>82.7</td>
<td>75.9</td>
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<tr>
<td>Rectum (cranial/caudal)</td>
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<td>89.7/94.4</td>
<td>86.2/94.9</td>
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<td>97.1</td>
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<td>61.5/68.7</td>
<td>97.9/95.5</td>
<td>93.3/91.3</td>
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</table>

Conclusion

• Ultrasound is an effective method of evaluating patients with suspected endometriosis
• Preoperative staging can be performed using US findings
• Assists in counseling for procedures and medical therapy

Thank You