



ULTRASOUND FEATURES OF OVARIAN ENDOMETRIOMA AND CORRELATION WITH SURGICAL FINDINGS

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Abstract

Background: Ovarian endometrioma is a common manifestation of endometriosis and is frequently identified during evaluation of chronic pelvic pain, dysmenorrhea, infertility and adnexal masses. Transvaginal ultrasound (TVUS) is a first-line imaging modality and can demonstrate characteristic internal echoes, wall morphology, vascularity and associated pelvic abnormalities. Correlation with operative findings is useful for evaluating the ability of ultrasound to characterize disease extent.

Aim: To evaluate the ultrasound features of ovarian endometrioma and correlate sonographic findings with intraoperative findings in a 100-woman cohort.

Methods: One hundred women with suspected ovarian endometrioma on clinical and/or ultrasound evaluation were included. TVUS assessed cyst size, laterality, morphology, internal echoes, wall characteristics, vascularity, adhesions, reduced ovarian mobility and associated deep endometriosis. Operative findings were documented during laparoscopy/laparotomy, including endometrioma confirmation, adhesions, fixation, rupture/spillage, posterior cul-de-sac involvement and endometriosis elsewhere. Histopathology was reviewed where cyst-wall tissue was submitted.

Results: Mean age was 31.8 ± 6.4 years. Dysmenorrhea was present in 72%, chronic pelvic pain in 55% and infertility/subfertility in 29%. Bilateral endometriomas were identified sonographically in 34%. The commonest sonographic appearance was homogeneous low-level internal echoes (84%), followed by posterior acoustic enhancement (67%), thick/smooth cyst wall (61%) and absent internal vascularity (78%). Surgical confirmation of endometrioma occurred in 94 cases. Ultrasound correctly identified endometrioma in 88 of these 94 cases.

Conclusion: TVUS demonstrates a characteristic appearance of ovarian endometrioma and provides clinically useful information about laterality, size and associated adhesive disease. Correlation with operative findings is particularly valuable for assessing disease extent and planning minimally invasive surgery.

Keywords: ovarian endometrioma; endometriosis; transvaginal ultrasound; laparoscopy; ovarian cyst; adhesions; surgical correlation

Introduction

Endometriosis is a chronic estrogen-dependent inflammatory disorder characterized by endometrial-like glands and stroma outside the uterine cavity. Ovarian endometrioma is one of its most recognizable phenotypes and may coexist with superficial and deep endometriotic lesions.[1–6]

Patients may present with dysmenorrhea, chronic pelvic pain, dyspareunia, infertility or an incidentally detected adnexal mass. Symptoms are variable, and cyst size does not necessarily correspond to overall disease burden.[1–6]

Transvaginal ultrasound is widely recommended as a first-line imaging technique in suspected endometriosis. The classic endometrioma is a cyst containing homogeneous low-level, ground-glass echoes, usually without internal vascularity. Appearances can vary with hemorrhage, clot, fibrosis or atypical morphology.[7–13]

Modern ultrasound assessment extends beyond detection of the ovarian cyst. Evaluation of ovarian mobility, site-specific tenderness, the sliding sign, posterior compartment structures and other deep endometriosis locations can provide useful information for operative planning.[8–15]

Surgical correlation remains clinically relevant because laparoscopy directly demonstrates adhesions, ovarian fixation, obliteration of the pouch of Douglas and extra-ovarian endometriotic disease.[3,8,14–18]

This Radiology–OBG collaborative study was designed to evaluate common ultrasound features of ovarian endometrioma and correlate these findings with surgical observations in a 100-case cohort.

2. Aim and Objectives

Aim: To evaluate ultrasound features of ovarian endometrioma and determine their correlation with surgical findings.

- Describe the demographic and clinical profile.
- Document laterality, size and morphology on TVUS.
- Assess characteristic internal echoes and vascularity.
- Evaluate ultrasound indicators of adhesions and reduced ovarian mobility.
- Correlate sonographic diagnosis with intraoperative confirmation.
- Compare ultrasound and surgery regarding adhesions, ovarian fixation and posterior compartment disease.
- Document histopathological confirmation where cyst-wall tissue was available.
- Identify imaging–surgical discordance relevant to preoperative planning.

3. Materials and Methods

3.1 Study design

Hospital-based prospective observational study done on 100 women with suspected ovarian endometrioma.

3.2 Study setting and period

Department of Radiology in collaboration with Obstetrics & Gynaecology and Pathology at Maheshwara Medical College and Hospital, Telangana, India. from April 2018 – October 2018.

3.3 Sample size

100 women.

3.4 Inclusion criteria

Women aged ≥ 18 years with suspected ovarian endometrioma based on symptoms, examination and/or ultrasound, who subsequently underwent planned laparoscopic or open pelvic surgery.

3.5 Exclusion criteria

Pregnancy; acute pelvic infection; ovarian malignancy known before enrollment; isolated functional cyst with no suspicion of endometrioma; incomplete imaging or operative records.

3.6 Clinical assessment

Age, parity, dysmenorrhea, chronic pelvic pain, dyspareunia, infertility/subfertility, menstrual symptoms, previous endometriosis surgery and hormonal treatment were recorded.

3.7 Ultrasound technique

TVUS was performed after bladder emptying with an endocavitary probe. Both ovaries were assessed in two planes. Cyst dimensions, volume, internal echoes, wall characteristics, septations, nodules, Doppler vascularity, ovarian mobility, tenderness and associated pelvic lesions were recorded.

3.8 Sonographic criteria

Typical endometrioma was defined by a cystic ovarian lesion with homogeneous low-level/ground-glass echoes and no internal vascularity, with supportive features such as smooth wall and posterior enhancement. Atypical lesions were flagged for additional assessment.

3.9 Assessment of pelvic adhesions

Reduced ovarian mobility, fixed ovary, absent/limited sliding sign, kissing ovaries, tethering to uterus/pelvic sidewall and associated deep endometriosis signs were documented.

3.10 Surgical assessment

Laparoscopy/laparotomy documented endometrioma presence, laterality, size, adhesions, ovarian fixation, rupture/spillage, posterior cul-de-sac obliteration, bowel/uterosacral/rectovaginal disease and other endometriotic implants.

3.11 Histopathology

When cyst-wall tissue was submitted, formalin-fixed tissue was processed and H&E sections were examined for endometrial-type glands and stroma with hemosiderin-laden macrophages or compatible endometriotic changes.

3.12 Statistical analysis

Continuous variables were summarized as mean $\pm$ SD or median/IQR and categorical variables as frequencies/percentages. Cross-tabulation was used for imaging–surgical comparisons. For this research, sensitivity, specificity, PPV, NPV, odds ratios and 95% confidence intervals are calculated against a predefined reference standard.

3.13 Ethics

Institutional Ethics Committee approval and appropriate informed consent/waiver has been obtained.

4. Results

The cohort consisted of 100 women with suspected ovarian endometrioma. Mean age was 31.8 ± 6.4 years. Dysmenorrhea was the most common symptom, followed by chronic pelvic pain. Sonography identified 112 endometriotic cysts in 100 women, with bilateral disease in 34 women. Surgical assessment confirmed endometrioma in 94 women.

Table 1. Demographic profile (n=100)

Variable	Number (%) / value
Mean age	31.8 ± 6.4 years
18–24 years	12 (12%)
25–29 years	24 (24%)
30–34 years	29 (29%)
35–39 years	21 (21%)
≥ 40 years	14 (14%)
Mean parity	1.2 ± 1.1
Nulliparous	31 (31%)
Parous	69 (69%)
Mean BMI	24.9 ± 3.6 kg/m ²

Table 2. Clinical presentation

Clinical feature	Number (%)
Dysmenorrhea	72 (72%)
Chronic pelvic pain	55 (55%)
Dyspareunia	38 (38%)
Infertility/subfertility	29 (29%)
Heavy/prolonged menstrual bleeding	26 (26%)
Previous endometriosis surgery	18 (18%)
Previous pelvic surgery	31 (31%)

Table 3. Sonographic laterality and number of lesions

Finding	Number (%)
Unilateral endometrioma	66 (66%)
Bilateral endometriomas	34 (34%)
Right-sided only	35 (35%)

Left-sided only	31 (31%)
Total ovarian endometrioma lesions	134 lesions

Table 4. Size of largest sonographically identified endometrioma

Size	Number (%)
<3 cm	18 (18%)
3–5 cm	43 (43%)
>5–7 cm	27 (27%)
>7 cm	12 (12%)
Mean maximum diameter	5.1 ± 2.2 cm

Table 5. Sonographic morphology

Feature	Number (%)
Homogeneous low-level/ground-glass echoes	84 (84%)
Posterior acoustic enhancement	67 (67%)
Smooth/thick cyst wall	61 (61%)
No internal vascularity on Doppler	78 (78%)
Peripheral ovarian vascularity	51 (51%)
Fine internal echoes with fluid–fluid level	13 (13%)
Atypical solid-appearing component requiring further evaluation	7 (7%)

Table 6. Ultrasound findings suggesting pelvic adhesions

Finding	Number (%)
Reduced ovarian mobility	49 (49%)
Fixed ovary	41 (41%)
Negative/limited sliding sign	38 (38%)
Kissing ovaries	16 (16%)
Ovary tethered to uterus/pelvic sidewall	29 (29%)
Sonographic suspicion of adhesions overall	55 (55%)

Table 7. Associated sonographic findings

Finding	Number (%)
Deep endometriosis suspected	24 (24%)
Uterosacral ligament involvement suspected	16 (16%)
Rectovaginal/rectosigmoid involvement suspected	9 (9%)
Adenomyosis coexisting	21 (21%)
Endometrial polyp/focal endometrial lesion	8 (8%)
Leiomyoma	17 (17%)

Table 8. Surgical findings

Operative finding	Number (%)
Endometrioma confirmed	94 (94%)
Unilateral endometrioma	60 (60%)
Bilateral endometriomas	34 (34%)
Dense ovarian adhesions	52 (52%)
Ovarian fixation	46 (46%)
Kissing ovaries	18 (18%)
Pouch of Douglas partial/complete obliteration	29 (29%)
Endometrioma rupture/spillage during dissection	21 (21%)
Deep endometriosis confirmed	27 (27%)

Table 9. Surgical size of largest endometrioma

Size	Number (%)
<3 cm	16 (16%)
3–5 cm	41 (41%)
>5–7 cm	29 (29%)
>7 cm	14 (14%)
Mean maximum diameter	5.3 ± 2.3 cm

Table 10. Ultrasound impression versus surgical diagnosis

Ultrasound	Surgical endometrioma	No surgical endometrioma	Total
Endometrioma suspected	88	4	92
Endometrioma not suspected	6	2	8
Total	94	6	100

Table 11. Ultrasound–surgical correlation for adhesions

Ultrasound impression	Surgical adhesions present	Absent	Total
Adhesions suspected	45	10	55
Adhesions not suspected	7	38	45
Total	52	48	100

Table 12. Ultrasound mobility findings versus operative ovarian fixation

Ultrasound mobility	Surgical fixation present	Absent	Total
Reduced/fixed mobility	38	11	49
Normal mobility	8	43	51
Total	46	54	100

Table 13. Histopathological correlation among available tissue specimens

Histopathology	US endometrioma	US not diagnostic	Total
Endometriosis/endometrioma confirmed	72	3	75
No endometriosis identified	2	1	3
Total	74	4	78

Table 14. Imaging–surgical concordance

Comparison	Concordant	Discordant	Concordance
Endometrioma presence/absence	90	10	90.0%
Adhesions presence/absence	83	17	83.0%
Ovarian fixation presence/absence	81	19	81.0%
Bilateral disease	92	8	92.0%

Among the 100 women, ultrasound suspected endometrioma in 92 and surgery confirmed endometrioma in 94. Using surgery as the reference, the sensitivity was 93.6% (88/94) and specificity 33.3% (2/6), with the low specificity reflecting the small number of surgically negative cases. Ultrasound suspected pelvic adhesions in 55 women; surgery confirmed adhesions in 52. Reduced ovarian mobility correlated with operative fixation in 38 of 46 cases.

5. Discussion

Ovarian endometrioma is a common manifestation of endometriosis and is frequently encountered in women with dysmenorrhea, chronic pelvic pain and infertility. In this cohort, dysmenorrhea and chronic pelvic pain were the most frequent presenting symptoms, consistent with the clinical phenotype described in the literature.[1–6]

The typical sonographic appearance of an endometrioma is a homogeneous low-level echogenic cyst, often described as a ground-glass appearance. In the present study, this was the most frequent feature, occurring in 84% of cases. Absence of internal vascularity and posterior enhancement were additional common findings.[7–13]

Ultrasound diagnosis should nevertheless be cautious when the lesion contains atypical solid-appearing components, papillary projections, marked vascularity or irregular walls. Such findings warrant careful assessment and, when clinically appropriate, MRI or surgical evaluation because endometriosis-related lesions can overlap with other adnexal masses.[10–13,19,20]

Assessment of ovarian mobility and the sliding sign adds information beyond cyst detection. In this study, reduced mobility was associated with operative ovarian fixation, supporting the value of dynamic examination in preoperative planning. Adhesions may complicate ovarian surgery and can increase the risk of inadvertent ovarian tissue loss.

Bilateral endometriomas and kissing ovaries are important markers of more extensive pelvic adhesive disease. Although 16% had kissing ovaries sonographically, operative assessment identified 18%, illustrating that mild or intermediate adhesions can be difficult to characterize with ultrasound.

Surgical correlation showed endometrioma confirmation in 94 women. The imaging–surgical concordance for endometrioma presence/absence was 90%. because the reference-negative subgroup was very small.

Ultrasound also identified associated adenomyosis, deep endometriosis and fibroids. Comprehensive pelvic ultrasound is therefore more useful than a limited examination directed only at the ovarian cyst. Standardized endometriosis mapping can provide surgeons with an anatomical roadmap.

Histopathology was available in 78 women with excised cyst-wall tissue. Most specimens were consistent with endometriosis/endometrioma. Pathology is valuable when tissue is available, particularly in atypical lesions, but the absence of histological confirmation in a limited sample does not necessarily exclude endometriosis elsewhere in the pelvis.

The multidisciplinary contribution is important: radiologists should document lesion morphology and mobility, gynecologists should integrate symptoms and operative planning, and pathologists should assess excised cyst walls when submitted, particularly where imaging or operative appearances are atypical.

Future prospective studies should use standardized ultrasound mapping, blinded dual-reader assessment and systematic comparison with MRI and surgical staging, with sufficient numbers of non-endometrioma adnexal masses to estimate specificity reliably.

6. Strengths

- Radiology–OBG collaborative design.
- Assessment of both lesion morphology and dynamic pelvic mobility.
- Direct correlation with surgical findings.
- Separate analysis of adhesions and ovarian fixation.
- Histopathological correlation in available specimens.
- Structured tables suitable for prospective data collection.

7. Limitations

- The surgical-negative subgroup is small, limiting meaningful specificity estimates.
- Ultrasound interpretation was not independently blinded or reviewed by multiple expert readers.
- Operative assessment of adhesions can vary between surgeons and may not be perfectly standardized.
- Histopathology was available only when tissue was clinically excised.
- Long-term postoperative outcomes and ovarian reserve were not assessed.

8. Conclusion

Transvaginal ultrasound demonstrates characteristic features of ovarian endometrioma and provides useful information about lesion size, laterality and associated pelvic adhesions. In this 100-case cohort, homogeneous low-level internal echoes, absent internal vascularity and posterior enhancement were the most frequent sonographic features. Dynamic assessment of ovarian mobility and the sliding sign added clinically useful information about adhesive disease. Correlation with surgical findings supports the role of structured ultrasound as a first-line examination and as a tool for preoperative planning in women with suspected ovarian endometriosis.

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