

Ultrasound Features to Distinguish Endometrioma from Other Pelvic Masses

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ABSTRACT

Purpose: To evaluate diagnostic accuracy of ultrasound findings in the diagnosis and discrimination of endometriomas from other adnexal masses.

Materials and methods: Ultrasound examination of 120 adnexal masses in 98 women was done and findings were recorded on a check list. Philips HDI 5000 and I21 ultrasound machines were used. Diagnostic features which can discriminate endometriomas from other pelvic masses were reviewed.

Results: There were 30 endometriomas. Diffuse low-level internal echoes were present in 29 (97%) of endometriomas and in 5 (17%) nonendometriomas. The presence of multilocularity or hyperechoic wall foci further increased the positive likelihood ratio to 35, allowing the identification of 15 endometriomas (50%).

Conclusion: ultrasound features of diffuse low level echoes, echogenic wall and multilocularity has a high positive predict value in the diagnosis of endometrioma and helping it in discrimination from other pelvic masses. Endometriomas exhibits wide range of ultrasound features, ranging from anechoic to echogenic cysts to masses containing multiple septations and solid tissue.

Key words: Endometrioma, ultrasound, pelvic masses

INTRODUCTION

Endometriosis is defined as the presence of endometrial glandular tissue outside of the uterus. Two main theories exist for the pathogenesis of endometriosis. One theory is that endometrial tissue is spread by retrograde menstruation or by vascular and/or lymphatic spread. The second theory holds that the serosal epithelium of the peritoneum undergoes metaplastic differentiation into endometrium-like tissue.

The theory that retrograde menstruation causes endometriosis is supported by the analysis of peritoneal fluid in women. As many as 90% of women have blood in the peritoneal fluid during the perimenstrual period. In addition, endometrial cells have been found in the peritoneal fluid. The pattern of endometriosis is consistent with retrograde menstruation and is most common in the ovary, followed by the other dependent areas of the pelvis. Vascular and/or lymphatic spread is supported by noting the occasional distal (extraperitoneal) sites of endometriosis, including the lungs and central nervous system (CNS). In addition, teenage girls with obstructive uterine or vaginal anomalies show retrograde menstrual bleeding, and endometriosis is common in these patients.

This study is designed to evaluate the accuracy of conventional grey scale ultrasound examination as a first line diagnostic modality and to evaluate its predictability for the need of any further diagnostic modality.

MATERIALS AND METHODS

The study consisted of a retrospective review of the sonograms from 98 women with 120 adnexal masses. Two groups of patients were selected. First group of patients was reviewed in National Guard hospital, Dammam (52 patients) and second group of patient (46 patients) examined in Astoon Hospital Dammam. Study period was one year and seven months (February 2007 to September 2008). Philips HDI 5000 and I21 ultrasound machines were used. Trans-abdominal and endovaginal probes were used to assess these patients.

Inclusion criteria: All female patient of reproductive age with clinically suspicion of pelvic mass.

Exclusion criteria: Women who were suspected of having an ectopic pregnancy or pelvic inflammatory disease.

Two ultrasound examiners blinded to the clinical history of the patient, the information about follow-up examinations, and the final diagnosis independently reviewed each sonogram. For each mass, both sonologists recorded US features by using a standardized checklist:

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Ultrasound Findings	Check List
Focal Acoustic Impedance	
Regional Bright Echoes	
Hyperechoic Lines And Dots	
Fluid-Fluid Levels(gravity-dependent linear interface between two materials of differing echogenicity)	
Fibrinous strands	
Retracting Clot (marginal clumped echoes with concave margins)	
Diffuse Low-Level Internal Echoes	
Hyperechoic Wall Foci (punctate peripheral echogenic foci)	
Internal Septal Thickness	

Masses were categorized as cystic or solid. The sensitivity, specificity, positive predictive value, negative predictive value, negative likelihood ratio, and positive likelihood ratio were analyzed for the diagnosis of endometrioma according to each US finding and selected combinations of findings.

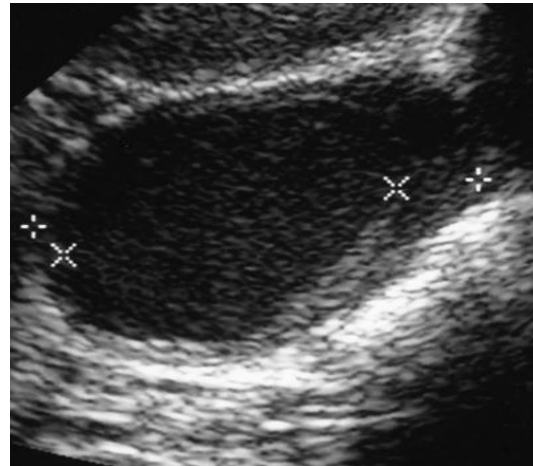
Our study design does not allow for determination of the true sensitivity of disease detection because patients without ultrasonographically identified adnexal masses were not surgically evaluated. The negative likelihood ratio is defined as $(1 - \text{sensitivity}) / \text{specificity}$, and the positive likelihood ratio is defined as $\text{sensitivity} / (1 - \text{specificity})$. Likelihood ratios are useful because they do not change with the pretest probability of disease, unlike sensitivity and specificity.

RESULTS

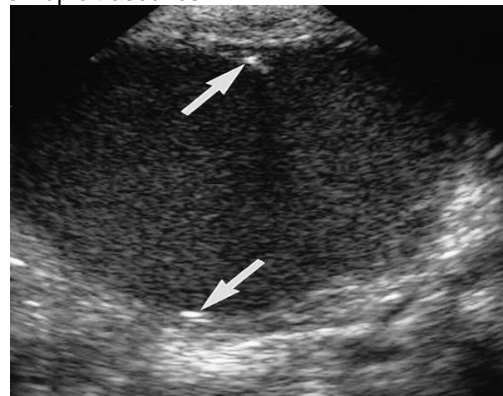
Among the 120 masses, there were 30 endometriomas (25% prevalence). Of the 90 nonendometriomas, there were 11 cystic teratomas, 17 benign neoplasms, 5 malignant neoplasms, 29 hemorrhagic cysts, 26 other nonneoplastic cysts (16 histopathologically proved nonneoplastic ovarian cysts, 7 self-resolving anechoic ovarian cysts, 2 cases of hydrosalpinx, and 1 paratubal cysts), 1 case of ovarian torsion, and 1 broad ligament myoma.



Two adnexal cystic masses showing diffuse internal low level echoes.



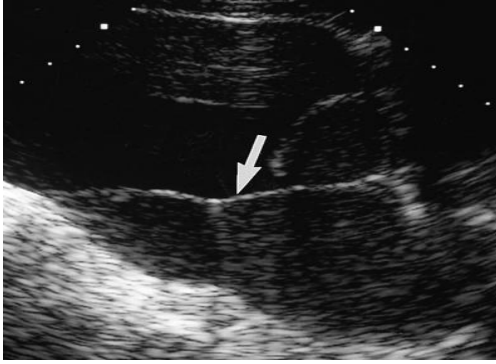
Hemorrhagic cyst of the right ovary in a 33-year-old woman, showing diffuse low level internal echoes, difficult to differentiate on ultrasound features but usually resolves on follow up ultrasounds.



Endometrioma in a 25-year-old woman, exhibits diffuse low-level internal echoes and punctate peripheral echogenic foci



An endometrioma in a 30-year-old woman. Hyperechoic wall foci (arrow) and low-level echoes



Multiloculated endometrioma showing low level internal echoes and thin septations in a 32 years old woman.

DISCUSSION

Ectopic endometrial glandular tissue is influenced by ovarian hormones and undergoes cyclic bleeding. Over time, the repeated hemorrhaging can produce extensive fibrosis surrounding the endometrial tissue, which can result in adhesions to adnexal structures or to bowel and can obliterate the pelvic cul-de-sac.

When the ovaries are involved, they can become enlarged with cystic, blood-filled spaces that, on gross examination, are termed chocolate cysts, or endometriomas. Endometriomas can become large and multilocular. The endometrial-cell lining can become obliterated over time, making the pathologic distinction between an endometrioma and a hemorrhagic cyst difficult in some cases.

There is a wide spectrum of ultrasound features that can mimic endometrioma which lead to this false impression that with ultrasound impossible to achieve a high positive predictive value in the diagnosis of endometrioma. Several investigators have sought to identify the diagnostic performance of US in distinguishing endometriomas from other adnexal masses, with each group using features different than those used by the others.

Clearly, there is a range in what experts have defined as a “classic” endometrioma. These studies have not addressed which of the criteria used are most important in discriminating between an endometrioma and other adnexal lesions. While the presence of low-level echoes is a uniform diagnostic criterion for all studies, diagnostic requirements for the thickness and contour of the wall and shape and location of the lesion differ among the investigations. Understanding the degree to which any particular feature or set of features increases or decreases the likelihood ratio for the diagnosis of endometrioma is important, because one can then use this knowledge to direct the evaluation toward identifying those features that have the greatest relevance and avoid effort and confusion in characterizing those features that have no relevance.

Our study systematically addressed these issues, and our findings confirm that the presence of diffuse low-level internal echoes is the important feature that helps to discriminate an endometrioma from other lesions; 97% of endometriomas exhibit diffuse low-level internal echoes. While the absence of this finding does not exclude endometrioma, it significantly decreases the likelihood of that diagnosis (negative likelihood ratio, 0.1).

Certain US features (focal acoustic impedance, regional bright echoes, and hyperechoic lines and dots) are predictive of cystic teratomas. Because most endometriomas do not demonstrate these features, excluding masses with these features improves diagnostic performance.

Our data suggest that there is no diagnostic value to the assessment of wall thickness. On the other hand, we demonstrate considerable benefit from the assessment of wall nodularity, a feature that is associated with neoplasia. Excluding masses with wall nodularity from the diagnosis of endometrioma helped to exclude neoplasm, especially malignancy, as a false-positive diagnosis.

Hemorrhagic ovarian cysts can also demonstrate diffuse low-level internal echoes and typically do not demonstrate those features discussed above that are associated with dermoids or other neoplasms. Using only these criteria to predict that a mass is an endometrioma yields majority of false-positive diagnoses representing hemorrhagic cysts. Hemorrhagic cysts are almost exclusively nonneoplastic. Thus, they resolve spontaneously and are surgically removed only when patients have compelling acute symptoms. This has justifiably led to the practice of follow-up US as a diagnostic strategy to use when a mass is thought most likely to represent an endometrioma but that alternatively may represent an acutely hemorrhagic cyst, a strategy that virtually eliminates the possibility that a patient will undergo an unnecessary operation. Our data document the usefulness of this strategy. Hemorrhagic cysts are

Demonstration of hyperechoic wall foci in a mass with low-level echoes and absence of neoplastic features is strongly predictive of an endometrioma. We separately evaluated “wall nodularity” from “hyperechoic wall foci.” Thirty-five percent of endometriomas in our series demonstrated these foci, while only 6% of nonendometriomas did so. Thus, our data indicate that a mass with low-level internal echoes, hyperechoic wall foci, and no neoplastic features is 30 times more likely to be an endometrioma than another adnexal mass and that US follow-up in such lesions is a low-yield course of action.

Another feature of diagnostic usefulness is the presence of septations without nodularity, also known as multilocularity. However, when used as a feature in addition to low-level echoes and absence of neoplastic features, multilocularity increased the likelihood that a mass was an endometrioma. As a result, a mass with low-level echoes, without neoplastic features, and with multilocularity is 58 times more likely to represent an endometrioma than another adnexal mass.

This study analyzed adnexal masses that were not related to pelvic inflammatory disease or ectopic pregnancy. While these entities may manifest US features similar to those discussed here, the clinical presentations in patients with pelvic inflammatory disease and ectopic pregnancy differ.

CONCLUSION

Gray-scale US can achieve a high degree of accuracy in the diagnosis of endometrioma. An adnexal mass with diffuse low-level internal echoes and absence of particular neoplastic features is highly likely to be an endometrioma if there are no features of acute hemorrhage and especially if multilocularity or hyperechoic wall foci are present.

In addition, a diagnosis of endometrioma is highly unlikely when no component of an adnexal mass contains low-level internal echoes. For those masses with low-level internal echoes, follow-up US appears most useful when the mass has no wall nodularity, is unilocular, and does not possess hyperechoic wall foci.

MR imaging may be useful in discriminating between endometriomas and neoplasms when wall nodularity is present.

REFERENCES

1. Endometriosis: Radiologic-Pathologic Correlation Radiographics January 2001 21:193-216
2. Fried AM, Rhodes RA, Morehouse IR. Endometrioma: analysis and sonographic classification of 51 documented cases. South Med J 1993; 86: 297-301.
3. Pelvic Pain: Overlooked and Underdiagnosed Gynecologic Conditions Radiographics January 2005 25:3-20; doi:10.1148/rg.251045511
4. Moran RE, Older RA, De Angelis GA, Baghdady BH, Chrisman HB, Ciambotti JM. Genitourinary case of the day: endometrioma. AJR 1996; 167: 246, 248-249.
5. Mais V, Guerriero S, Ajossa S, Angiolucci M, Paoletti AM, Melis GB. The efficiency of transvaginal ultrasonography in the diagnosis of endometrioma. Fertil Steril 1993; 60: 776-780.
6. Guerriero S, Mais V, Ajossa S, Paoletti AM, Angiolucci M, Melis GB. Transvaginal ultrasonography combined with CA-125 plasma levels in the diagnosis of endometrioma. Fertil Steril 1996; 65: 293-298.
7. Guerriero S, Ajossa S, Paoletti AM, Mais V, Angiolucci M, Melis GB. Tumor markers and transvaginal ultrasonography in the diagnosis of endometrioma. Obstet Gynecol 1996; 88: 403-407.
8. Jain KA. Prospective evaluation of adnexal masses with endovaginal gray-scale and duplex and color Doppler US: correlation with pathologic findings. Radiology 1994; 191: 63-67.
9. Volpi E, De Grandis T, Zuccaro G, La Vista A, Sismondi P. Role of transvaginal sonography in the detection of endometriomata. J Clin Ultrasound 1995; 23: 163-167.
10. Alcazar JL, Laparte C, Jurado M, Lopez-Garcia G. The role of transvaginal ultrasonography combined with color velocity imaging and pulsed Doppler in the diagnosis of endometrioma. Fertil Steril 1997; 67: 487-491.
11. Outwater E, Schiebler ML, Owen RS, Schnall MD. Characterization of hemorrhagic adnexal lesions with MR imaging: blinded reader study. Radiology 1993; 186: 489-494.
12. Takahashi K, Okada S, Okada M, Kitao M, Kaji Y, Sugimura K. Magnetic resonance imaging and serum CA-125 in evaluating patients with endometriomas prior to medical therapy. Fertil Steril 1996; 65: 288-292.
13. Radack KL, Rouan G, Hedges J. The likelihood ratio: an improved measure for reporting and evaluating diagnostic test results. Arch Pathol Lab Med 1986; 110: 689-693.
14. Atri M, Nazarnia S, Bret PM, Aldis AE, Kintzen G, Reinhold C. Endovaginal sonographic appearance of benign ovarian masses. RadioGraphics 1994; 14: 747-760.
15. Fried AM, Kenney CM, III, Stigers KB, Kacki MH, Buckley SL. Benign pelvic masses: sonographic spectrum. RadioGraphics 1996; 16: 321-334.
16. Patel MD, Feldstein VA, Lipson SD, Chen DC, Filly RA. Cystic teratomas of the ovary: diagnostic value of sonography. AJR 1998; 171: 1061-1065.
17. Sassone AM, Timor-Tritsch IE, Artner A, Westhoff C, Warren WB. Transvaginal sonographic characterization of ovarian disease: evaluation of a new scoring system to predict ovarian malignancy. Obstet Gynecol 1991; 78: 70-76.