

ULTRASONOGRAPHIC FINDINGS IN PATIENTS WITH ENDOMETRIOSIS IN OVARIES AND ADNEXA – IMAGE COMPILATION

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ABSTRACT

INTRODUCTION: Endometriosis is a condition in which endometrial tissue grows outside the uterine cavity, causing chronic inflammation and disabling pain, depending on its location and severity. Transvaginal ultrasonography is the preferred non-invasive diagnostic method due to its accessibility and low cost, and it is effective in identifying endometrial lesions and signs of pelvic involvement. Ovarian involvement, or endometrioma, is characterized by cystic lesions with dense and uniform content, associated with pelvic pain and infertility, and may also indicate the presence of other endometriotic lesions.

OBJECTIVE: To review and describe the ultrasonographic characteristics of endometriosis in the ovaries and adnexa.

METHODS: This narrative review focuses on compiling images from articles published in the last five years using the MEDLINE database via PubMed. The Medical Subject Headings (MeSH terms) in English used were “Endometriosis,” “Diagnostic Imaging,” and “Ultrasonography,” in the following search strategy: (Endometriosis) AND (Diagnostic Imaging) OR (Ultrasonography).

RESULTS: The typical ultrasonographic finding of endometrioma is presented as a unilocular or multilocular cyst with homogeneous echogenicity and low echogenicity of its contents. However, it may also present anechoic characteristics, mixed echogenicity, or a “ground glass” appearance. Involvement of the adnexa can be evidenced by adhesions or deep infiltrative endometriosis foci on the tubal walls.

DISCUSSION AND CONCLUSION: Although there are several classic signs, the importance of a scanning protocol for endometriotic lesions is emphasized. Early detection of lesions is crucial to guide the surgical approach and plan a multidisciplinary strategy, which is essential for more accurate diagnosis and to reduce complication rates. Additional efforts are needed to improve physicians' knowledge of imaging criteria for the early detection of this debilitating disease, as endometriosis has a negative impact on women's lives in various stages and aspects.

KEYWORDS: ENDOMETRIOSIS, ENDOMETRIOMA, OVARIES, ULTRASONOGRAPHY, DIAGNOSTIC IMAGING.

INTRODUCTION

Endometriosis is characterized by the presence and development of endometrial stroma and glands outside the uterine cavity, resulting in a chronic inflammatory reaction. The exact cause is still unknown, but its likely etiology is multifactorial, related to early menarche and exposure to steroid hormones, body mass index between late childhood and early adolescence, family history of endometriosis, environmental factors, and lifestyle.¹

Transvaginal ultrasonography is the non-invasive examination of choice due to its low cost and easy access, as well as its ability to identify both endometriotic lesions and indirect signs of pelvic involvement. It is performed in four stages, not necessarily in this order: evaluation of the uterus and adnexa, assessment of involvement of the pouch of Douglas, evaluation of the anterior and posterior compartments,

and identification of “soft markers” (evaluation of ovarian mobility and areas with altered consistency). If any lesion is found, the examination report should include its location, size, distance from the anal verge, and whether it involves the intestines.²

Ovarian involvement in endometriosis, known as an endometrioma, is characterized by a cystic lesion with thick, homogeneous content and a “ground glass” appearance. It is important to always be aware of lesions suggestive of endometriomas in the adnexa, as they can cause intense pelvic pain and infertility issues and may also indicate the presence of other endometriotic lesions.²

OBJECTIVES

To review, identify, and describe the ultrasonographic characteristics of endometriosis in the ovaries and adnexa.

METHODS

This is a narrative review focusing on the compilation of images. The database used was MEDLINE via PubMed. The Medical Subject Headings (MeSH terms) in English were “Endometriosis,” “Diagnostic Imaging,” and “Ultrasonography,” in the following search strategy: (Endometriosis) AND (Diagnostic Imaging) OR (Ultrasonography). Studies included (clinical trials, pictorial essays, literature reviews, case reports, among others) addressed the topic, contained ultrasonographic images, met the research objective, and were available online in full text, published in the last five years, in English, Spanish, and Portuguese. A total of 272 articles were found and initially selected through title screening, from which 86 were excluded. Of the remaining 186 articles, 132 were chosen after abstract screening, and 73 were selected based on the presence of ultrasonographic images. Seven of these studies specifically addressed ovarian and adnexal endometriosis and were included in this review (see flowchart - Figure 1).

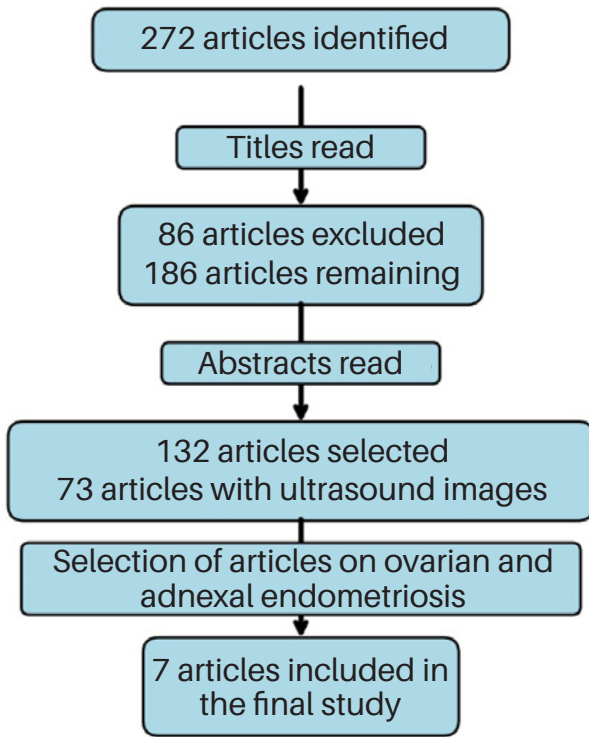


Figure 1. Flowchart - illustrates the article selection process as described.

RESULTS

Table 1 illustrates the selected studies for the research, highlighting the criteria and images used.

Articles	Author	Images Used	Important Data Used
Ultrasound imaging for ovarian and deep infiltrating endometriosis ³ .	Eracoustos C, Zupi E, Piccione E. (2017)	4	Imaging characteristics of typical endometriomas: unilocular cyst with ground-glass echogenicity and analysis of the affected adnexa.
The sonographic spectrum of pelvic endometriosis: pearls, pitfalls, and mimics ⁴ .	Jones LP, Morgan MA, Chauhan A. (2019)	1	The "kissing ovaries" sign characterizes the imaging of ovarian endometrioma.
Ultrasound of pelvic pain in the nonpregnant woman ⁵ .	Patel MD, Young SW, Dahiya N. (2019)	1	Diagnostic specificity of using color Doppler in endometriomas.
Complete evaluation of anatomy and morphology of the infertile patient in a single visit: the modern infertility pelvic ultrasound examination ⁶	Groszmann YS, Benacerraf BR. (2016)	2	Image analysis with color Doppler of ovarian endometrioma demonstrating internal flow.
Transvaginal US of endometriosis: looking beyond the endometrioma with a dedicated protocol ⁷ .	Collins BG, Ankoia A, Gola S, McGillen KL. (2019)	1	Color Doppler analysis of a unilocular endometrioma cyst.
The 'kissing ovaries' sign on ultrasound ⁸ .	Chen F, Carrigliaro J, Desai IV, Bhatt S. (2019)	1	Imaging characteristics of severe deep pelvic endometriosis.
Imaging evaluation of fallopian tubes and related disease: a primer for radiologists ⁹ .	Revzin MV, Moshiri M, Katz DS, Pellerito JS, Gettle LM, Menias CO (2020)	1	Analysis of endometriotic implants in the fallopian tubes.

Table 1. Illustrates the main criteria used in the selected studies.

In the ultrasonographic evaluation of the pelvis, it is possible to trace ovarian involvement due to endometriosis, referred to as an endometrioma. Endometriomas are often associated with other lesions, such as deep infiltrative endometriosis and adhesions.³

The typical endometrioma can be visualized on ultrasonography as a unilocular or multilocular cyst with homogeneous low-level echogenicity of the cyst content. Alternatively, it may appear as a unilocular cyst with a ground glass echogenicity and no vascularization, or as a unilocular cyst with ground glass appearance, papillary projections, and no flow within the papillary projection, indicating an atypical endometrioma.³ It is believed that echogenic wall foci occur due to cholesterol deposits.⁴

Figures 2 to 4 present characteristic endometriomas.

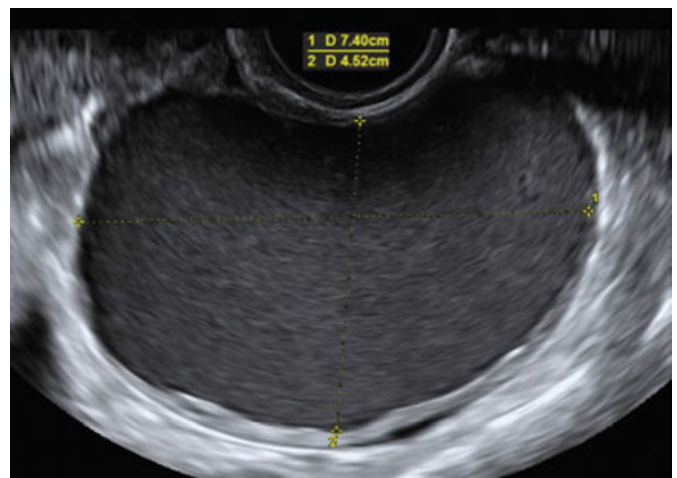


Figure 2: Typical ultrasonographic appearance of an ovarian endometrioma: unilocular cyst with ground glass echogenicity.³

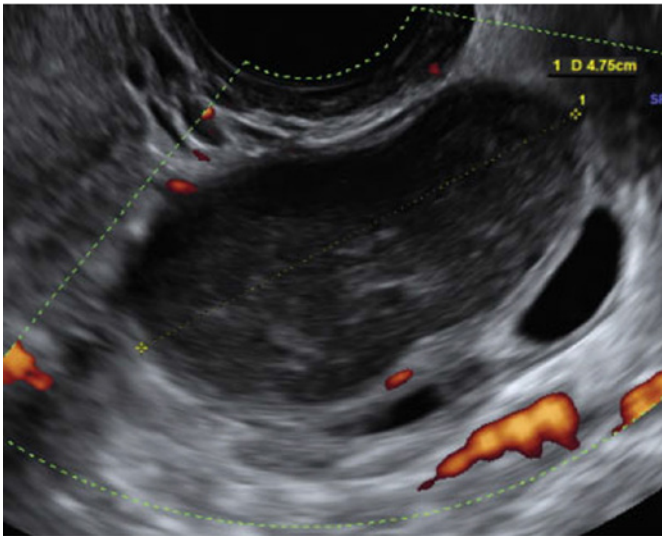


Figure 3: Ultrasonographic appearance of an ovarian endometrioma: a unilocular cyst with irregular ground glass echogenicity due to hyperechoic stripes and no vascularization in the hyperechoic internal tissue, consisting of fibrin densities from the blood content.³

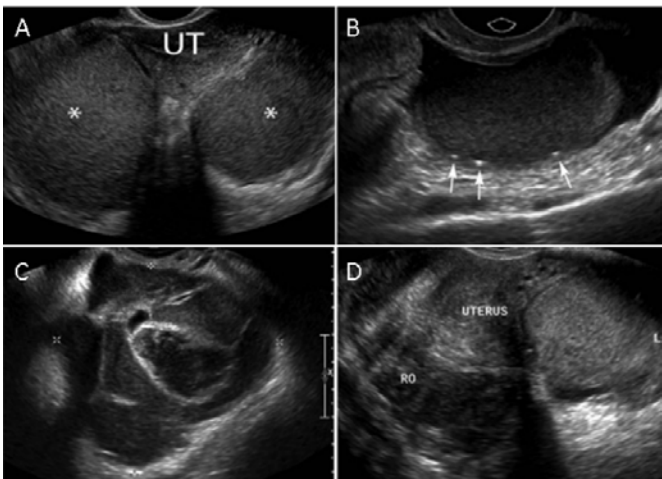


Figure 4: (A) Endovaginal image showing bilateral ovarian endometriomas characterized by diffuse low-level internal echoes. UT, uterus. (B) Endovaginal image of an endometrioma demonstrating diffuse low-level echoes and peripheral echogenic foci. (C) Endovaginal image showing a multilocular endometrioma. (D) Endovaginal image demonstrating bilateral endometriomas with adhesions to the uterus, producing the “kissing ovaries” sign.⁴

Studies show that nearly 50% of analyzed endometriomas had characteristics different from those of a typical endometrioma. Furthermore, the aspects of endometriomas between premenopausal and postmenopausal patients were divergent. In postmenopausal women, solid multilocular tumors and anechoic cyst fluid or cysts with mixed echogenicity were more frequently observed. In contrast, premenopausal women exhibited ground glass echogenicity, one to four follicles, and an absence of detectable blood flow in papillary projections.³

Figure 5 presents an endometrioma with a clot or fibrin simulating a papillary projection.

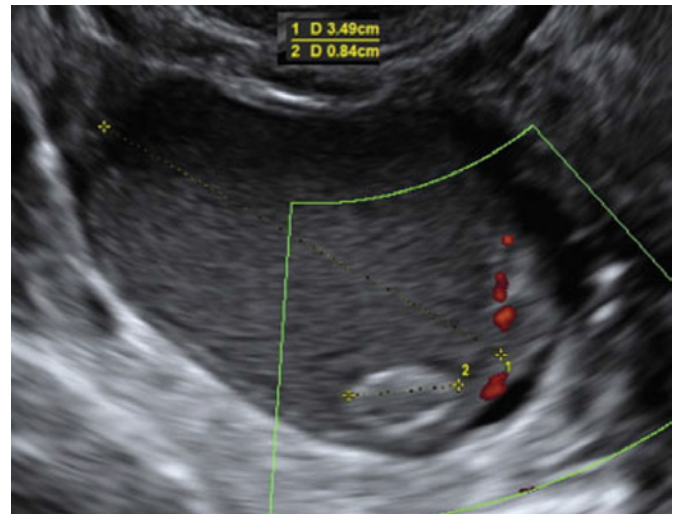


Figure 5: Ultrasonographic image of an atypical ovarian endometrioma: unilocular cyst with ground glass echogenicity, internal papillation (line 2), and absence of vascularization in the papillary projection. This is not true papillation but rather hyperechoic tissue consisting of blood clots or fibrin adjacent to the cyst wall.³

Color Doppler is used to demonstrate the absence of flow within the cystic component, which, along with the presence of echogenic wall foci, increases diagnostic specificity.⁵ Figures 6 and 7 present endometriomas without flow on Doppler imaging.

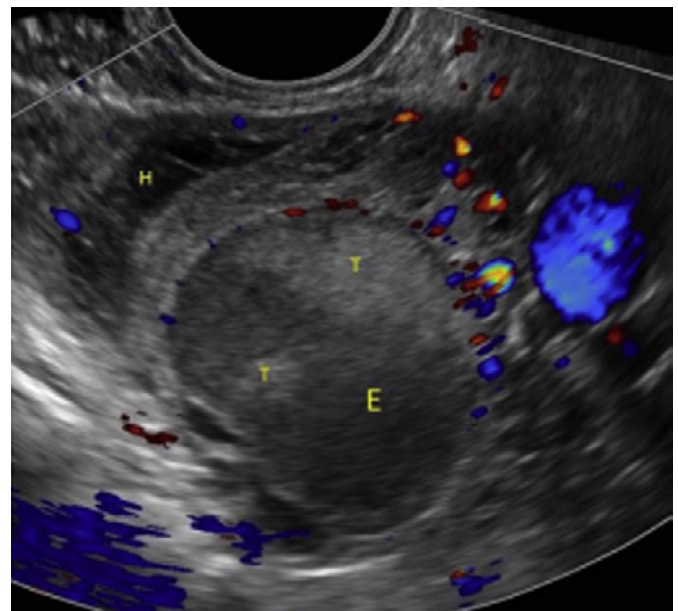


Figure 6: Color Doppler image of an ovarian endometrioma (E) with tumefactive debris (T). A hemorrhagic cyst is also present (H).⁶

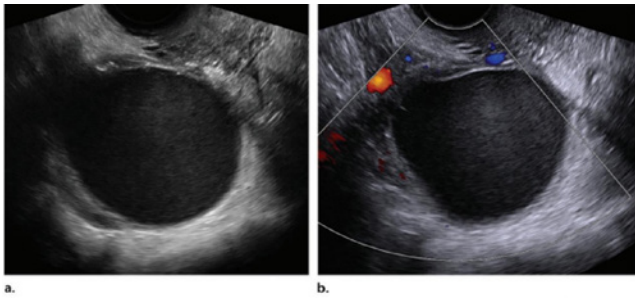


Figure 7: Transverse grayscale (a) and color Doppler (b) showing the presence of a unilocular cyst containing homogeneous low-level echoes and no internal vascularization on color Doppler.⁷

On the other hand, Figure 8 presents an endometrioma with the presence of flow without septation.

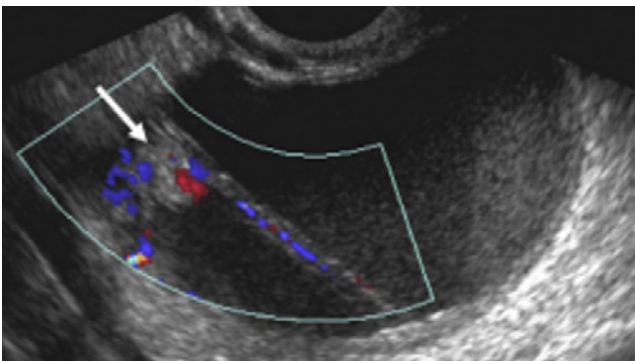


Figure 8: Color Doppler image of an ovarian endometrioma with a nodule and septation demonstrating internal flow (arrow). These nodules may be fibrotic or related to adjacent deformed ovarian parenchyma.⁶

The "kissing ovaries" sign, where the ovaries are juxtaposed, demonstrates the appearance of the ovaries when they are pulled toward the midline, joined due to pelvic adhesions (Figure 9). The imaging techniques that enable this visualization include computed tomography, magnetic resonance imaging, and ultrasonography. This sign can be observed in both pelvic endometriosis and pelvic inflammatory disease, representing an indicator of severity.⁸

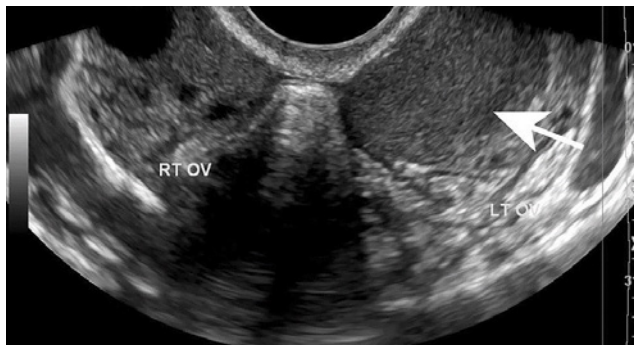


Figure 9: Grayscale transvaginal ultrasound of the pelvis. In the midline, both ovaries (RT OV and LT OV) are in close proximity. A complex cystic lesion is also seen in the left ovary (arrow), with diffuse low-level echoes, representing an endometrioma in this patient with deep pelvic endometriosis.⁸

Uterine tube involvement can occur through adhesions or by foci of deep infiltrating endometriosis of the tubal walls. Endometriosis of the uterine tube is characterized by dilation of the tube, thickening of the walls, and incomplete septa, with dense liquid content resembling an endometrioma, known as hematosalpinx. In cases of tubal obstruction due to adhesions or deep infiltrating endometriosis, with involvement of the distal part and fibrin, there is the presence of hydrosalpinx with a "string of beads" sign, characterized by hyperechoic mural nodules measuring 2-3 mm.³ Figure 10 presents these characteristics.

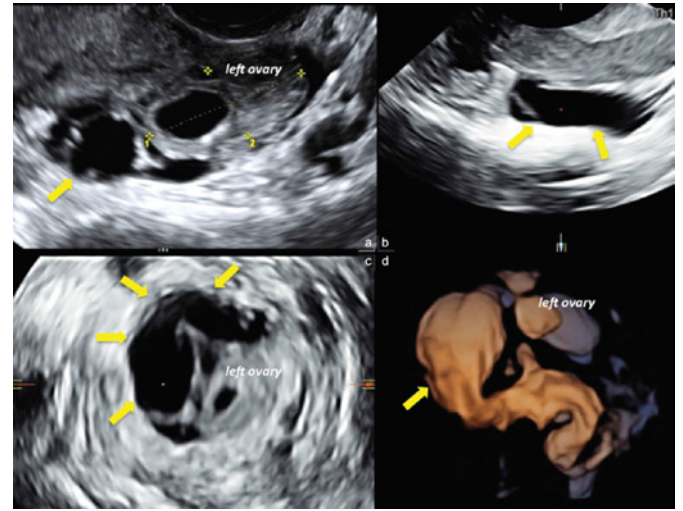


Figure 10: 3D ultrasound with multiplanar view of a hydrosalpinx (yellow arrows) adhered to the left ovary. Presence of a dilated uterine tube with liquid content, thin walls (c), incomplete septa (b), and small hyperechoic mural papulations in the transverse section (a). The 3D volume reconstruction clearly shows the typical flask-shaped tubular structure.³

Approximately 30% of women with endometriosis have affected fallopian tubes. In these cases, endometriosis can be classified as extraluminal (when the implants are superficial non-invasive peritoneal lesions located on the surface of the serosa of the tubes) or intraluminal (when there is implantation along the mucosa of the tubes).⁹

Bleeding in intraluminal implants can lead to hematosalpinx, and ultrasound and magnetic resonance imaging (MRI) are the best imaging modalities for diagnosis.⁹

On ultrasound, a dilation greater than 5 mm in diameter is observed in the tube, filled with complex fluid. However, its wall does not show signs of thickening or hyperemia.⁹ Figure 11 presents a dilated tube with liquid content.

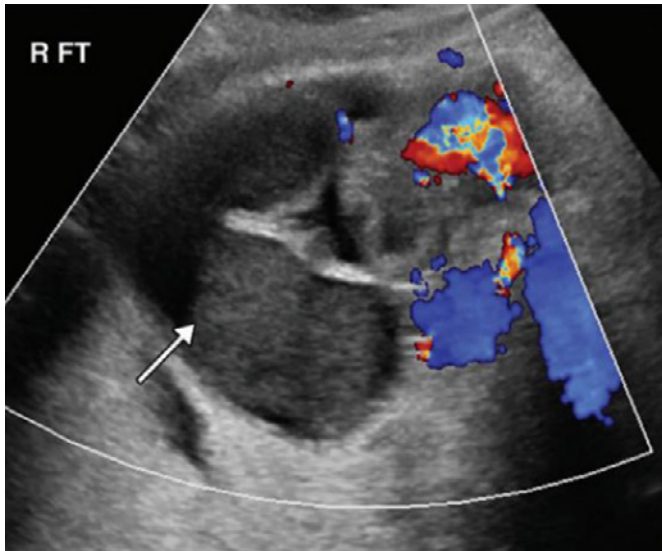


Figure 11: Color Doppler ultrasound shows a dilated tube containing debris and liquid fluid (arrow). Note the absence of thickening of the tube wall or hyperemia.⁹

CONCLUSION

While there are many classic indicators, the examination protocol for identifying endometriotic lesions deserves special attention. Early detection of these lesions is highly recommended, as it assists in choosing the appropriate surgical approach and developing a multidisciplinary team strategy, which is essential for more accurate diagnosis and reducing complication rates.

It is imperative that additional efforts be made to enhance physicians' understanding of imaging criteria for the early detection of this debilitating condition, as endometriosis negatively impacts women's lives in various areas and stages of their lives.

REFERENCES

- 1- Saboia DM, Frota IPR, Augusto KL, Oliveira Sombra K, Oliveira Lima LA, Holanda LC, Rebouças NP, Coelho RR. Endometriose: diagnóstico e tratamento clínico. *PRO.MED-GIN-MEAC* [Internet]. 2023 Aug [Cited 2024 Aug 12];1-11. Available from: <https://www.gov.br/ebserh/pt-br/hospitais-universitarios/regiao-nordeste/ch-ufc/aceso-a-informacao/protocolos-e-pops/protocolos-meac/maternidade-escola-assis-chateaubriand/ginecologia/promed-gin-015-endometriose-diagnostico-e-tratamento-clinico.pdf/view>
- 2- Silva JCR, Valerio FP, Herren H, Troncon JK, Garcia R, Poli Neto OB. Endometriose: do diagnóstico ao tratamento. *Femina*. 2021;49(3):134-41.
- 3- Exacoustos C, Zupi E, Piccione E. Ultrasound imaging for ovarian and deep infiltrating endometriosis. *Semin Reprod Med*. 2017;35(1):5-24.
- 4- Jones LP, Morgan MA, Chauhan A. The sonographic spectrum of pelvic endometriosis: pearls, pitfalls, and mimics. *Ultrasound Q*. 2019;35(4):355-75.
- 5- Patel MD, Young SW, Dahiya N. Ultrasound of pelvic pain in the nonpregnant woman. *Radiol Clin North Am* [Internet]. 2019 May [Cited 2024 Aug 12];57(3):601-16. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0033838919300132?via%3Dihub> doi: 10.1016/j.rcl.2019.01.010
- 6- Groszmann YS, Benacerraf BR. Complete evaluation of anatomy and morphology of the infertile patient in a single visit; the modern infertility pelvic ultrasound examination. *Fertil Steril* [Internet]. 2016 Jun [Cited 2024 Aug 12];105(6):1381-93. Available from: <https://pubmed.ncbi.nlm.nih.gov/27054310> doi: 10.1016/j.fertnstert.2016.03.026

- 7- Collins BG, Ankola A, Gola S, McGillen KL. Transvaginal US of endometriosis: looking beyond the endometrioma with a dedicated protocol. *Radiographics* [Internet]. 2019 Sep-Oct [Cited 2024 Aug 12];39(5):1549-68. Available from: <https://pubmed.ncbi.nlm.nih.gov/31498746> doi: 10.1148/rg.2019190045
- 8- Chen F, Cernigliaro J, Desai M, Bhatt S. "The 'kissing ovaries' sign on ultrasound". *Abdom Radiol* [Internet]. 2019 Sep 26 [Cited 2024 Aug 12];45:243-4. Available from: <https://link.springer.com/article/10.1007/s00261-019-02242-6> doi: 10.1007/s00261-019-02242-6
- 9- Revzin MV, Moshiri M, Katz DS, Pellerito JS, Gettle LM, Menias CO. Imaging evaluation of fallopian tubes and related disease: a primer for radiologists. *Radiographics*. 2020;40(5):1473-501

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