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MAGNETIC RESONANCE IMAGING IN THE DIAGNOSIS OF ENDOMETRIOSIS: AN INTEGRATIVE REVIEW

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ABSTRACT

The diagnosis of endometriosis requires a comprehensive approach, combining clinical history, invasive and non-invasive examinations. Laparoscopy, the gold standard for definitive diagnosis, is invasive, expensive and involves risks. In this sense, imaging diagnosis has gained prominence, especially transvaginal ultrasound (TVUS), the first choice in investigation, and magnetic resonance imaging (MRI). Despite being the secondary imaging examination, MRI plays an essential role in determining the extent of the disease, aiding in surgical and multidisciplinary planning. Its high sensitivity allows the identification of deep lesions and provides a precise anatomical view, and is therefore especially useful in the evaluation of deep pelvic endometriosis. In addition, MRI allows the differentiation of endometriosis from other gynecological pathologies and the evaluation of adhesions and complications, being an indispensable tool for more effective therapeutic planning.

Keywords: Diagnostic Imaging, Endometriosis, Endometrioma, Magnetic resonance imaging, Review.

INTRODUCTION

The The diagnosis of endometriosis requires a comprehensive approach that considers the patient's clinical history, as well as invasive and non-invasive techniques. The definitive diagnosis is made through laparoscopy, with histological confirmation of the presence of ectopic endometrial glands and/or stroma. However, laparoscopy is an invasive procedure, costly, and involves surgical risks.

In this context, imaging diagnosis has become a fundamental tool, especially in therapeutic planning. Transvaginal ultrasound (TVUS) is often the first choice for diagnosis, while magnetic resonance imaging (MRI) is used for a more detailed anatomical evaluation of the pelvic organs, particularly in cases of deep pelvic endometriosis, with the aim of optimizing the surgical strategy and the work of a multidisciplinary team.[1]

Although magnetic resonance imaging (MRI) is considered a secondary modality for the diagnosis of endometriosis, it plays an essential role in evaluating the extent and location of lesions, especially

in more advanced stages. MRI provides an accurate anatomical representation of the pelvic organs, allowing for the identification of endometriotic lesions with greater sensitivity due to its ability to distinguish soft tissues more clearly. This technique has become established as a crucial diagnostic tool, particularly for determining the stage of the disease and planning more suitable surgical approaches.[1]

The conduct of this integrative review is justified by the growing importance of accurate diagnosis and the appropriate choice of imaging modalities in the management of endometriosis. Despite significant advances in diagnostic techniques, challenges still exist in recognizing and thoroughly evaluating the different forms of the disease, especially in cases of deep pelvic endometriosis, which require a more refined analysis of the pelvic anatomy. Transvaginal ultrasound and magnetic resonance imaging have emerged as complementary tools in diagnosis and therapeutic planning, but their indications, limitations, and effectiveness vary depending on the clinical context and the stage of the disease.

Thus, an integrative review on the topic becomes essential to consolidate the existing scientific evidence, updating knowledge about imaging diagnostic modalities and their implications in the management of endometriosis. This analysis will not only identify gaps in current knowledge but also provide support for future research, as well as contribute to clinical practice, helping healthcare professionals make more informed decisions in the diagnosis and treatment of this complex condition.

METHODS

A The present narrative review aimed to analyze the role of magnetic resonance imaging (MRI) in the study of endometriosis, focusing on its application in the diagnosis and clinical management of the disease. Studies published between 2005 and 2025, in English, Portuguese, and Spanish, that addressed the use of MRI in the evaluation of endometriosis were included. The research was conducted in the PubMed, Scopus, Google Scholar, and Lilacs databases, using keywords such as “endometriosis,” “magnetic resonance imaging,” “imaging diagnosis,” and related terms.

Articles that addressed the application of magnetic resonance imaging (MRI) in the diagnosis and clinical management of endometriosis were selected, including clinical studies, systematic reviews, and guidelines. Works that focused on other diagnostic methods, distinct gynecological pathologies, or studies conducted in non-human populations were excluded. The topics covered in the analysis include: the role of MRI in the study of endometriosis, with an emphasis on the location of lesions, and the interpretation of images in relation to the anatomy of the pelvis. A detailed analysis of the anatomical compartments of the pelvis was conducted, considering the anterior compartment (bladder and uterus), the middle compartment (ovaries and adnexal structures), and the posterior compartment (rectum, intestines, and retroperitoneal space). Furthermore, the review addressed the different forms of endometriosis, such as superficial, ovarian, deep, and extra-pelvic, with the specific characteristics of each in the context of MRI. The analysis was conducted through the qualitative selection of studies, with a critical approach to the most relevant evidence.

ROLE OF MAGNETIC RESONANCE IMAGING IN THE STUDY OF ENDOMETRIOSIS

An MRI examination is necessary because deeper structures are difficult to visualize using ultrasound (USG) techniques. Although endometriosis lesions can be diagnosed in any organ, pelvic involvement is by far the most common. There are three different types of involvement due to endometriosis in the pelvis: ovarian endometriomas, endometriotic implants on the peritoneal surface, and deep pelvic endometriosis, which is considered when it affects at least 5 mm below the peritoneal surface. In this

context, the European Society of Urogenital Radiology provides recommendations on the ideal MRI protocol and guidelines for the diagnosis of pelvic endometriosis.[2]

For patient preparation, fasting for 3 to 6 hours and bladder emptying one hour before the exam are recommended. The study can be performed on any day of the menstrual cycle, and knowing the date of the last menstruation can help in the interpretation of some MRI findings. Additionally, an antiperistaltic agent is recommended to prevent evacuation artifacts, unless contraindicated, and the distension of the vagina or rectum with gel can make pelvic endometriosis easier to visualize.[3]

As a standard protocol, images weighted in T2WI and T1WI (with and without fat suppression) were considered, as well as rapid spin-echo images and single-shot imaging. Oblique axial T2WI is useful for evaluating endometriosis of the uterosacral ligament (USL). T1WI with contrast, diffusion-weighted imaging (DWI), and susceptibility-weighted imaging (SWI) are not recommended for evaluating ovarian endometriotic cysts in deep endometriosis.3 DWI is a rapid imaging sequence that helps detect suspicious lesions (neoplastic, inflammatory, lymphadenopathies). Contrast enhancement and DWI are recommended for patients with suspected ovarian malignancy, and T1-weighted images, with and without fat suppression, are essential for evaluating and characterizing possible hemorrhagic foci (Table 1).[2]

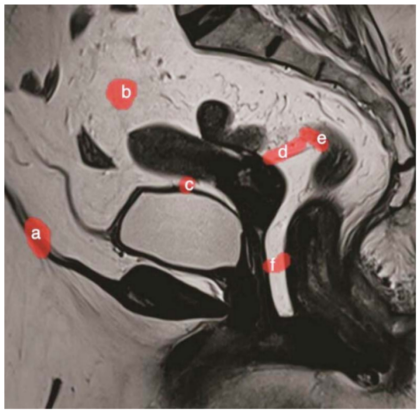
Table 1. Suggested protocols for the diagnosis of endometriosis and related diseases based on the European Society of Urogenital Radiology guidelines. DIE = Deep Infiltrative Endometriosis; DWI = Diffusion-weighted Imaging; T1WI = T1-weighted Imaging; T2WI = T2-weighted Imaging.

Ideal MRI Protocols for the Diagnosis of Endometriosis	
Patient Preparation	Fasting for 3 to 5 hours
	Bladder emptying one hour before the exam
	Use of antiperistaltic agents (unless contraindicated)
	(Optional) Vaginal/rectal opacification with gel
T2WI	Axial/sagittal images and oblique (optional) 3D images-T2WI
T1WI	Images with or without fat saturation
DWI, Enhanced Contrast T1WI:	Not recommended for ovarian endometriomas/DIE, necessary in case of suspected ovarian malignancy

LOCATION OF ENDOMETRIOSIS

Common sites for finding endometriosis include the anterior abdominal wall (a), ovaries (b), vesicouterine septum (c), rectouterine septum (d), rectum (e), and rectovaginal pouch (f), as illustrated in Figure 1.[4]

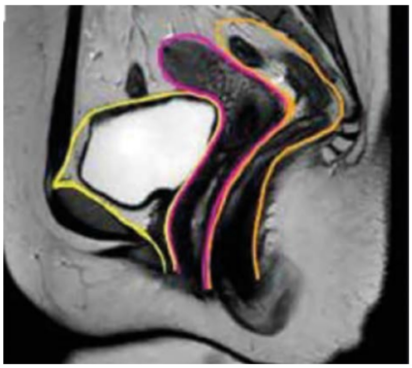
Figure 1. Most Common Locations of Endometriosis.[4]



ANATOMY AND INTERPRETATION OF MAGNETIC RESONANCE IMAGING

Guidelines from the European Society of Urogenital Radiology have established techniques to be used for MRI in endometriosis. It was recommended to divide the pelvic compartment for analysis, as well as to include the investigation of the intestines and urinary system, regions that are also affected by endometriosis. The pelvic compartment is divided into three parts: anterior, middle, and posterior. The anterior compartment includes the space between the posterior pubic symphysis and the anterior surface of the uterus, including the prevesical space, round ligaments, urinary bladder, distal ureters, vesicouterine space, and vesicovaginal space. The middle compartment includes the uterus, ovaries, fallopian tubes, broad ligament, and vagina. The posterior compartment includes the rectosigmoid colon, rectouterine space, rectovaginal space, and uterosacral ligaments. It is important to note that in the posterior compartment, deep infiltrative endometriosis is more frequently found (Figure 2).[5]

Figure 2. Sagittal section of the female pelvis delineating the three compartments: anterior, middle, and posterior, from left to right, respectively.[5]



ANTERIOR COMPARTMENT

MRI is an indispensable tool in the evaluation of deep infiltrative endometriosis present in the anterior compartment, as its assessment through ultrasound presents limitations. Deep endometriosis in the anterior compartment is less frequent than in the posterior compartment, accounting for approximately 6% of cases, with the most commonly affected areas being the vesicouterine space and the urinary bladder.[5]

The vesicouterine space is the peritoneal recess between the uterus and the bladder, and when affected by endometriosis, it results in the formation of adhesions, uterine anteversion, and even complete obliteration in severe cases. Bladder involvement, in turn, is rare (<1% of endometriosis cases), but it is the most common site of involvement in the urinary tract, followed by the distal ureters.[5]

Bladder endometriosis is almost always associated with endometriosis in the vesicouterine space (anterior pouch); therefore, the dome, posterior wall, and trigone are the most common areas of involvement. Depending on the depth of bladder wall involvement, multifocal involvement can occur in two patterns: extrinsic, where the involvement is restricted to the serosa, with no involvement of the detrusor muscle layer and the mucosa, making it not evident in cystoscopy; or intrinsic, where there is infiltration of the bladder wall, affecting the detrusor muscle layer, creating mural masses that can be visualized in cystoscopy. In cases of involvement of the mucosa, in cases of full-thickness endometriosis, the lesions can even simulate bladder carcinoma. Therefore, when reporting bladder endometriosis, the essential information that the surgeon needs for planning is: the precise location of the lesion, the depth of detrusor invasion, and the distance from the ureteral orifice, which will require ureteral reimplantation if involved.[5]

Ureteral endometriosis can affect any segment, with distal ureters being the most commonly involved. It can present in two varieties: extrinsic and intrinsic, similar to bladder involvement. The extrinsic variety is more common and presents as dense hypointense nodules adjacent to the distal ureter. Because ureters are smaller structures (4 mm to 5 mm in diameter), their direct evaluation is limited in MRI due to lower spatial resolution. Ureteral dilation is one of the few findings that can indirectly suggest its presence. When present, it is strongly associated with deep endometriosis in other locations, such as endometriomas, uterosacral ligaments, endometriosis larger than 3 cm in the rectovaginal space, vagina, bladder, and intestines.[4]

Finally, another structure in the anterior compartment is the round ligament, which originates from the anterolateral part of the fundus below the fallopian tube, running anterolaterally and terminating at the labia after passing through the inguinal canals. The portion affected by endometriosis is the proximal part of the ligament adjacent to the uterus, resulting in shortening, thickening, and a nodular appearance. Other rarely involved locations in the anterior compartment include the pre-vesical space, vesicocervical, and vesicovaginal endometriosis. In the case of pre-vesical endometriosis, obliteration of the spaces and mass effect on the bladder can occur. Urachus involvement is also rarely reported.[5]

MIDDLE COMPARTMENT

In the middle compartment, formed by the ovaries, uterus, fallopian tubes, and broad ligament, a range of changes can be observed. Regarding the ovaries, in addition to endometriomas, another form of ovarian involvement is secondary adhesions caused by deep endometriosis, which result in the medial retraction of the ovaries through the midline behind the uterus in the retro-uterine space. Medially displaced ovaries are close to each other, a condition referred to as "kissing ovaries." Medialized

ovaries in preoperative imaging are an important marker of moderate to severe endometriosis.[6]

The uterus can be affected either directly or indirectly in deep endometriosis. The uterine axis becomes distorted due to retraction caused by dense adhesions, which may result in a retroverted uterus when the posterior compartment is affected and an anteverted uterus when the anterior compartment is involved. Additionally, the uterine torus, where the uterosacral ligaments attach, is typically not visible in healthy individuals but becomes thickened due to endometriosis implants. Finally, the uterus may be involved in serous plaques on the anterior and posterior surfaces, which can be highly invasive and mimic focal adenomyosis, particularly in the posterior wall. However, deep endometriosis should not be mistakenly diagnosed as focal adenomyosis, as deep uterine endometriosis is an "outside-in" process, whereas focal adenomyosis occurs "inside-out." When analyzing the junctional zone, it may appear diffusely thickened with altered signal in adenomyosis.[5]

Involvement of the fallopian tubes occurs in about 30% of women with endometriosis. Deep endometriosis implants in the serosa or subserosa of the tubes are usually not visible on imaging. In contrast, chronic repeated bleeding within the implant and potential peritubular adhesions can cause tubal obstruction and dilation.[5,7]

Hematosalpinx is considered a distinctive finding in endometriosis and may be the only imaging finding indicating its presence, as intraluminal T1W hyperintensity, suggesting hematosalpinges, was observed in only 40% of cases. In the remaining 60% of cases, no T1W hyperintensity is observed in the dilated fallopian tube. Additionally, unlike endometriomas, hypointensity on T2 is not a characteristic of tubal involvement because endometriotic implants affect the serosal surface of the tube rather than the lumen itself. Differential diagnoses for hematosalpinx include pyosalpinx (associated with significant fat deposition around the tube, with a history of fever and elevated white blood cell count) and fallopian tube malignancy (more common in older age groups, presenting with enhanced solid nodules).[5]

Like the uterus, vaginal involvement in endometriosis can be direct or indirect. Directly, the most common site is the posterior vaginal fornix, usually secondary to a lesion that extends from the retrocervical region. Vaginal endometriosis has a very high association with recurrence and the formation of rectovaginal fistulas post-surgery. Therefore, meticulous evaluation of this region and communication about the exact depth of involvement are essential for pre-surgical planning. Indirect involvement due to adhesions in the surrounding area will cause an angled and elevated posterior vaginal fornix, situated above the uterine isthmus.[5]

POSTERIOR COMPARTMENT

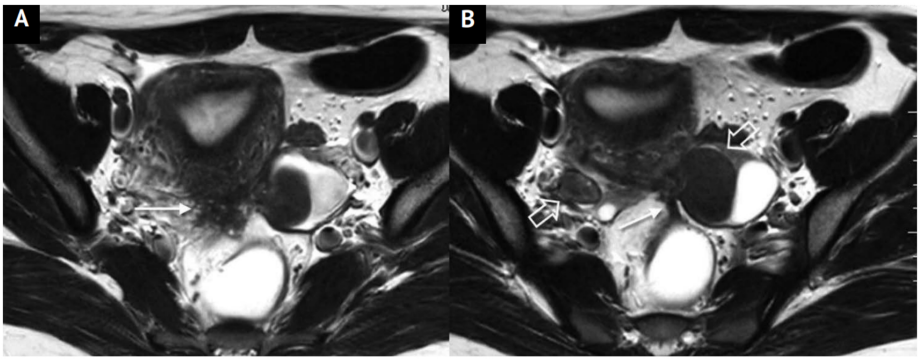
The posterior compartment, which includes the rectouterine pouch, rectovaginal septum, sigmoid colon, and uterosacral ligaments, is the most common site of deep endometriosis in the pelvis. The rectouterine pouch or posterior fornix is responsible for the majority of symptomatic endometriosis cases and is associated with severe disease. Due to its deep position and being the most dependent portion of the peritoneal cavity, it becomes inaccessible to laparoscopy, making it even more problematic in endometriosis due to obliteration of the compartment. Therefore, magnetic resonance imaging becomes crucial in evaluating endometriosis and adhesions in the rectouterine pouch. Typical imaging findings include endometriosis implants, either active glandular or chronic stromal/fibrotic, hypointense linear adhesions, and tethering between the uterus and the anterior rectum (Figure 3). The rectovaginal septum is an extraperitoneal space between the vagina and the lower rectum, extending from the rectouterine pouch to the perineal body. Preoperative mapping of this region is critical, as resection

of the implants predisposes to rectovaginal fistula formation. Depending on the location, lesions may occur in the septum (10%) or the posterior vaginal fornix (65%), with some lesions presenting as a funnel-shaped form involving the posterior fornix with extension to the anterior rectum (Figure 3).[5]

The uterosacral ligaments originate from the uterine torus, attach posteriorly to the sacrum, and are considered the second most common site of endometriosis after the ovaries in some studies. The proximal third is the most commonly involved area, presenting as asymmetric shortening, thickening (>4 mm), and nodularity of the affected ligament.[8]

Figure 3. A) Deep endometriosis in the rectouterine pouch in axial T1W; B) Fat-suppressed in T1W; C) Axial image in T2W. Obliteration of the rectouterine pouch with a star-shaped ill-defined lesion (white arrows) appearing hypointense on T1W and T2W images with associated uterine retroversion. Presence of multiple foci seen within the lesion, appearing hyperintense on T1W and hypointense on T2W images, suggestive of hemorrhagic foci within the ectopic glands.[5]

Figure 4. Representation of an implant on the posterior uterine side with adhesions to the ovaries and rectal fascia. Axial T2-weighted images. Endometriosis implant identified on the posterior surface of the uterus in the uterine torus region [(arrow in image A)]. Both ovaries [(empty arrows in image B)] are located behind the uterus with adhesions between the uterus and ovaries, and an endometrioma in the left ovary. Additionally, in this case, a fibrous band can be seen due to adhesions between the anterior surface of the rectum and the uterine implant [(long arrow in B)].[9]



SUPERFICIAL ENDOMETRIOSIS

Of the three types of pelvic endometriosis, the most difficult to diagnose on magnetic resonance imaging are the implants on the peritoneal surface, which can be millimeter-sized in laparoscopy. In magnetic resonance imaging, they can only be properly diagnosed when they have hemorrhagic contents, appearing as hyperintense foci in T1-weighted images with fat suppression. Peritoneal implants can cause adhesions between the pelvic organs and the intestinal loops. In pelvic magnetic

resonance imaging of women with endometriosis, it is common for the ovaries to be located in a lower position, centered in the pelvis, while the uterus remains in retroflexion. Hypointense bands can also be found between the organs, which are "peaks" of retraction on the intestinal wall or loculations in the peritoneal fluid.[9]

OVARIAN ENDOMETRIOSIS

The ovary is the most common location for endometriosis, and the most common imaging findings are endometriomas or endometriotic cysts. These cysts are due to cyclical bleeding of the endometrial tissue, and their content consists of blood decomposition products at different stages of evolution. On magnetic resonance imaging, these cysts are typically diagnosed as hyperintense cysts on T1-weighted images with fat suppression and shadowed on T2-weighted images. Signal loss on T2-weighted images is a very specific sign of endometrioma, whether it is intense, subtle, or layered. Additionally, the identification of hyperintense foci on T1, even without signal loss on T2 images, is also suggestive of endometriosis.[10]

DEEP ENDOMETRIOSIS

Regarding deep endometriosis, the most frequently affected area is the retrocervical portion (Figure 2), located in the posterior compartment of the pelvis with an obliterated Douglas pouch at the lower part, although it can also be present in all areas of the pelvis. In this scenario, attention should be given to any invasions, thickening, or tissue retractions that appear hypointense in the most common locations: the posterior face of the uterus, retrocervical area, uterosacral ligaments, posterior fornix of the vagina, retrovaginal septum, and anterior retosigmoid face. The presence of hemorrhagic foci helps and ensures the diagnosis, but any hypointense thickening, nodularity, or plaque in any of these structures on T2-weighted images should be suspected.

Figure 5. Bilateral Ovarian Endometriosis. Image (A) T2-weighted and Image (B) T1-weighted. Both ovaries are located in a more central and posterior position than usual, and in both ovaries, we can see cysts with characteristic signs of endometriomas: they are hyperintense on the T1-weighted image with fat suppression (B), while on the T2-weighted image (A) they show slight shading.[9]

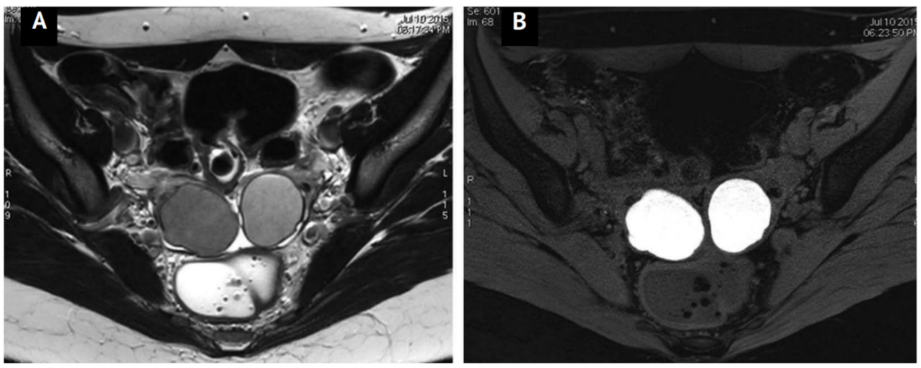
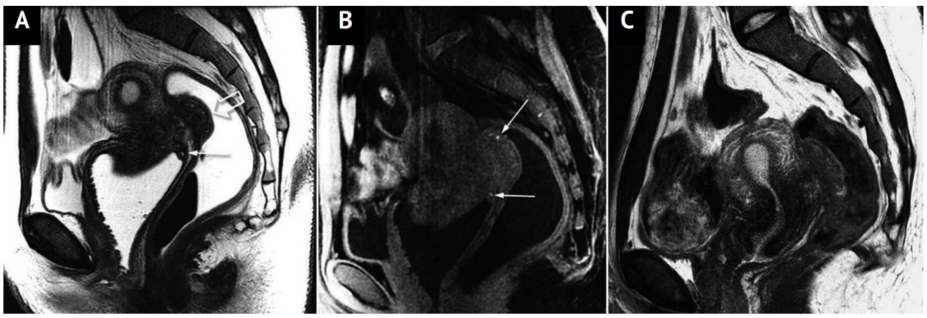


Figure 6. Deep Endometriosis of the Rectal Wall and Vaginal Fornix. Sagittal image (A) T2-weighted showing hypointense thickening of the posterior vaginal recess wall with small hyperintense glandular foci (arrow). Significant focal thickening of the rectal wall (hollow arrow in A) is indicative of deep involvement, although it does not reach the rectal lumen: on posterior endoscopy, it was described as extrinsic compression. On the T1-weighted image with fat suppression (B), small hyperintense hemorrhagic foci (arrows) are observed both in the rectal lesion and in the vaginal wall. The endometriotic involvement of the rectum and vagina is in continuity with the implant at the bottom of the Douglas pouch. As a correlation, (C) shows a sagittal T2-weighted image from the same patient's MRI study acquired weeks earlier; this image contributes to the diagnosis of pelvic endometriosis.[8]



EXTRAPELVIC ENDOMETRIOSIS

Extrapelvic endometriosis is a rare condition of endometriosis found in locations distant from the pelvic organs, with abdominal wall endometriosis and thoracic endometriosis being the most common. Regarding abdominal wall endometriosis, the most frequent sites are the inguinal and umbilical regions. These patients are often admitted to the hospital with cyclical abdominal pain and are not referred to a gynecologist. Magnetic resonance imaging (MRI) shows a solid hypointense mass on T2-weighted images (T2WI) with hyperintense hemorrhagic cysts or hyperintense hemorrhagic cysts on T1-weighted images (T1WI). Saturated fat T1WI is recommended for the diagnosis of abdominal wall endometriosis (Figure 7).[11]

Thoracic endometriosis is characterized by the presence of endometriotic lesions in the thoracic cavity. The most common clinical presentation is catamenial pneumothorax, which occurs in 70% of cases of thoracic endometriosis, followed by catamenial hemothorax and pulmonary nodules.[2]

Much less frequently, endometriotic implants affect other parts of the intestinal tract, such as intestinal loops, the cecum, or appendix. The diagnosis of these lesions is difficult to make through pelvic magnetic resonance imaging, and when there is clinical suspicion of small bowel involvement, a magnetic resonance enterography or computed tomography scan may be indicated. Figure 8 represents intestinal endometriosis. In cases of suspected small bowel involvement, magnetic resonance enterography should be performed, as the distension of the intestinal loops with liquid facilitates the detection of implants in the intestinal wall.

Figure 7. Axial FS T1WI (B); axial T2WI (C); axial F1 T1WI with contrast (D). The lesion (arrows) shows low signal on T1 and T2WI with an ill-defined border. There is a small point of intensity on FS T1WI (arrow). The mass is almost uniformly enlarged. The patient received hormonal therapy, which reduced the lesion. FS = fat saturation; WI = weighted imaging.[2]

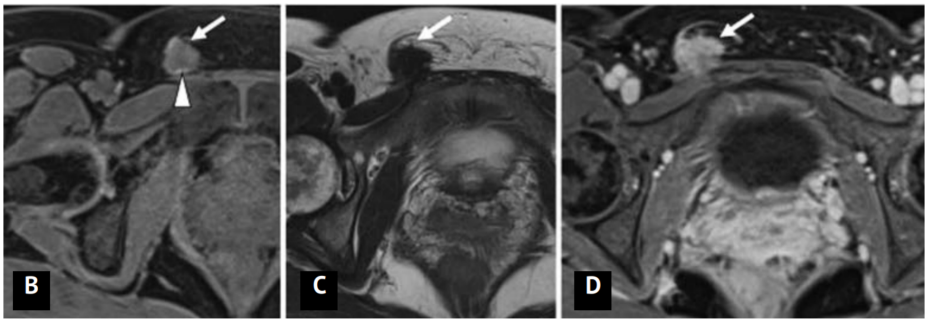


Figure 8. Patient with clinical signs of intestinal obstruction, showing in image (A) an incomplete obstruction due to an extrinsic lesion in an ileal loop in the pelvis (arrow) with adhesions between the loops. The MRI enterography (B and C) identified two endometriosis implants affecting the small intestine, one in the pelvis and another more cranially (arrows).

CONCLUSION

Endometriosis is a common chronic inflammatory disease that affects women of reproductive age and can severely impact their quality of life, as well as interfere with fertility. The initial imaging study in suspected endometriosis should be performed through detailed ultrasound. Magnetic resonance imaging (MRI) analysis is beneficial for detailing some lesions detected by ultrasound and, due to its high contrast and objectivity, can contribute to the early and accurate diagnosis of ovarian endometriotic cysts and deep disease involvement, avoiding the need for invasive procedures. Furthermore, MRI plays an important role in assessing the severity, leading to the selection of the ideal treatment and preoperative planning.[5]

The different forms of involvement make endometriosis a challenging disease in terms of its nonspecific symptoms and the complexity involved in interpreting diagnostic exams, leading to diagnostic errors and delays in treatment. Although laparoscopy is the gold standard for diagnosis, it is an invasive procedure and has limitations in extensive disease with obliteration of spaces. Therefore, imaging becomes essential in its evaluation when there is mastery of anatomy and interpretation of findings, with magnetic resonance imaging being the ideal tool for accurately observing the pelvic organs.[12]

In this way, the magnetic resonance imaging study protocol must be fully understood in order to establish a thorough analysis of endometriotic lesions, especially deep ones, as they are often very subtle. This is because, in magnetic resonance imaging, the fibrous component is usually predominant. It is crucial that radiologists are familiar with both common and uncommon locations of endometriosis, its characteristic imaging findings, and are capable of correlating these findings with the severity of the disease, to better describe the sites of involvement and guide treatment selection.

REFERENCES

1. Baușic A, Coroleucă C, Coroleucă C, Comandașu D, Matasariu R, Manu A, Frîncu F, Mehedințu C, Brătilă E. Transvaginal Ultrasound vs. Magnetic Resonance Imaging (MRI) Value in Endometriosis Diagnosis. Diagnostics (Basel). 2022 Jul 21;12(7):1767.

2. Kido A, Himoto Y, Moribata Y, Kurata Y, Nakamoto Y. MRI in the diagnosis of endometriosis and related diseases. Korean J Radiol. 2022 Apr;23(4):426-45.

3. Bazot M, Bharwani N, Huchon C, Kinkel K, Cunha TM, Guerra A, Manganaro L, Buñesch L, Kido A, Togashi K, Thomassin-Naggara I, Rockall AG. European society of urogenital radiology (ESUR) guidelines: MR imaging of pelvic endometriosis. Eur Radiol. 2017 Jul;27(7):2765-2775.

4. Sud S, Buxi TBS, Sheth S, Ghuman SS. Endometriosis and its myriad presentations: Magnetic resonance imaging-based pictorial review. Indian J Radiol Imaging. 2021 Han;31(1):193-202.

5. Zuber M, Shoaib M, Kumari S. Magnetic resonance imaging of endometriosis: a common but often hidden, missed, and misdiagnosed entity. Pol J Radiol. 2022 Aug 15;87:e448-e461.

6. Ghezzi F, Raio L, Cromi A, Duwe DG, Beretta P, Buttarelli M, Mueller MD. "Kissing ovaries": a sonographic sign of moderate to severe endometriosis. Fertil Steril. 2005 Jan;83(1):143-7.

7. Kim MY, Rha SE, Oh SN, Jung SE, Lee YJ, Kim YS, Byun JY, Lee A, Kim MR. MR Imaging findings of hydrosalpinx: a comprehensive review. Radiographics. 2009 Mar-Apr;29(2):495-507.

8. Tang X, Ling R, Gong J, Mei D, Luo Y, Li M, Xu J, Ma L. Deep infiltrating endometriosis MR imaging with surgical correlation. Quant Imaging Med Surg. 2018 Mar;8(2):187-195.

9. Méndez Fernández R, Barrera Ortega J. Magnetic resonance imaging of pelvic endometriosis. Radiologia. 2017 Jul-Aug;59(4):286-296.

10. Coutinho A Jr, Bittencourt LK, Pires CE, Junqueira F, Lima CM, Coutinho E, Domingues MA, Domingues RC, Marchiori E. MR imaging in deep pelvic endometriosis: a pictorial essay. Radiographics. 2011 Mar-Apr;31(2):549-67.

11. Andres MP, Arcoverde FVL, Souza CCC, Fernandes LFC, Abrão MS, Kho RM. Extrapelvic Endometriosis: A Systematic Review. J Minim Invasive Gynecol. 2020 Feb;27(2):373-389.

12. Casper RF. Introduction: A focus on the medical management of endometriosis. Fertil Steril. 2017 Mar;107(3):521-522.

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