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ADVANCES IN EARLY DETECTION OF ENDOMETRIOSIS: THE CRUCIAL ROLE OF TRANSVAGINAL ULTRASONOGRAPHY WITH COLOR DOPPLER AND BOWEL PREPARATION

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ABSTRACT

INTRODUCTION: Endometriosis is a common gynecological condition that affects many women of reproductive age, characterized by the presence of tissue similar to the endometrium outside the uterus. Early and accurate detection of endometriosis is essential for proper disease management and to improve the quality of life of patients.

OBJECTIVE: The aim of this study was to evaluate the efficacy of transvaginal ultrasonography with color Doppler and intestinal preparation in the detection of endometriosis in women attending an imaging diagnostic clinic in São José dos Campos.

METHODS: A cross-sectional study was conducted, analyzing 50 transvaginal pelvic ultrasound exams for the detection of endometriosis. Variables such as patients' age, reported symptoms, exam quality, location, and characteristics of endometriotic lesions were considered.

RESULTS: Out of the 50 exams analyzed, 22 diagnosed endometriosis, 26 showed no signs of the disease, and two were inconclusive. The majority of positive cases were observed in women between 30-39 years old. In some cases, magnetic resonance imaging was suggested as a diagnostic complement.

DISCUSSION: Transvaginal ultrasonography has proven to be a useful tool in the detection of endometriosis, allowing the identification of lesions and adhesions characteristic of the disease. The combination of clinical symptoms with ultrasound findings can improve diagnostic accuracy.

Conclusion: Transvaginal ultrasonography with color Doppler and intestinal preparation is a promising technique for the detection of endometriosis, as it can assist in the early identification of the disease and guide appropriate treatment for patients. Further studies are needed to validate its efficacy and compare it with other diagnostic modalities.

KEYWORDS: ULTRASONOGRAPHY; ENDOMETRIOSIS; DIAGNOSIS; SIGNS; SYMPTOMS.

INTRODUCTION

Endometriosis is a chronic gynecological disease defined by the presence of endometrial tissue outside the uterine cavity. The endometrium is the tissue responsible for lining the uterus. When a woman is not pregnant, this tissue sheds and is expelled during menstruation. Endometriosis occurs when endometrial cells travel along a different path than expected and instead of being expelled by the uterus, they move to other locations.[1]

There is no scientific consensus on the causes of endometriosis. In the literature, three theories are commonly cited. The theory of retrograde menstruation suggests that due to the presence of free fluid in the pelvis during the menstrual cycle, fragments of endometrial tissue implant in the organs of the region by refluxing through the uterine tubes, causing the lesions. The theory of celomic metaplasia states that the origin of endometriosis comes from normal tissues that have undergone a process of metaplastic differentiation. The genetic theory relates to genetic predisposition or epigenetic changes due to alterations in the peritoneal environment.[2]

In general, some studies indicate that genetic factors, a woman's lifestyle, early menarche, a prolonged period of time between menarche and first pregnancy, and short menstrual cycles are possible reasons for its onset. Because of these characteristics, it is known as the disease of the modern woman.[1]

The foci of endometrial cells outside the uterine cavity also have vascularization, which allows their growth. Even though they are not in the uterine cavity, these cells remain functional. Thus, during menstruation, bleeding occurs, leading to an inflammatory response that generates most of the characteristic symptoms of endometriosis.[3]

The involvement of other sites by endometrial tissue can

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regress, progress, or stabilize over time, also relating to hormonal variations between adolescence and adulthood, since the growth of endometrial tissue depends on estrogen.[4]

It is a disease frequently diagnosed and affects about 10-15% of women of reproductive age. One in ten patients presents characteristic symptoms such as pelvic pain, intestinal and urinary alterations, dyspareunia, dysmenorrhea, anxiety, lower back pain, fatigue, and hematuria. It can also disrupt menstruation, cause difficulty in conceiving, and in more severe cases, lead to infertility. In rare and specific cases involving the diaphragm or lungs, symptoms such as shoulder pain, cough, and chest pain can be evident. [6]

The classification of endometriosis is defined by stages, with the first referring to the size of the lesion and the degree of involvement of the peritoneum and ovaries. The second relates to the destruction of the posterior cul-de-sac, which can be partial or complete. The third is related to the type of adhesion in the ovaries and fallopian tubes. Endometriosis is characterized as infiltrative when the lesions are identified at a depth of more than 5mm into the peritoneum.[8]

The treatment for endometriosis needs to take into consideration several factors, such as the severity of the disease in relation to symptoms and its extent, the woman's desire to conceive, and the patient's age.[9] Medication treatment is usually hormonal and tends to be effective in controlling pain. In the case of women who wish to conceive, laparoscopy or in vitro fertilization are available alternatives. Surgical treatment is indicated for cases where pain does not respond to hormonal treatment and the disease begins to affect other organs such as the bladder, kidneys, ureter, or intestine.[10]

For diagnostic purposes, the most indicated exam is transvaginal ultrasound (TVUS) with intestinal preparation, as it is non-invasive and more cost-effective than magnetic resonance imaging.11 Studies conducted by an Australian group in 2020 indicated that the accuracy of TVUS before surgery is high, demonstrating an overall sensitivity of 85% and specificity of 97%, especially in the posterior compartment. However, in some studies, sensitivity was found to be low in the anterior compartment, such as the bladder.[12]

Despite being one of the best exams for diagnosing endometriosis, transvaginal ultrasound has its drawbacks. One of them is the discomfort it causes the patient during the exam. [13]

Early diagnosis is important and helps in the treatment of endometriosis, offering a better quality of life for women affected by the disease. As it is the most indicated exam for detection, it is necessary to evaluate the procedure for transvaginal ultrasound with intestinal preparation, as well as its effectiveness in the diagnosis and prognosis of endometriosis.

METHODS

A cross-sectional study was conducted using medical records data from an imaging diagnostic clinic in São José dos Campos, from November 2020 to August 2023. During the study period, data were collected from transvaginal pelvic ultrasound exams with color Doppler and intestinal preparation for the detection of endometriosis, with referrals from public and private health services.

The results of 50 TVUS exams for the detection of endometriosis, recorded in the clinic's reporting system, were analyzed. Subsequently, a comparative study was conducted between the exams that confirmed the diagnosis of endometriosis and those that required further diagnostic methods. In cases where the endometriosis research yielded negative results, the quality of the exam was evaluated to determine if it was good and if differentiation from other gynecological anomalies, when present, was possible.

The database for analysis was organized according to the study's variables of interest. The dependent variable was the detection of endometriosis using ultrasound. The independent variables analyzed were: patients' age; signs and symptoms such as pelvic pain, intestinal and urinary alterations, dyspareunia, dysmenorrhea, anxiety, lower back pain, fatigue, hematuria, irregular menstruation, difficulty conceiving, and infertility; adequate preparation performed by the patients; experience of the physician responsible for the exam; the site of adhesion; and the size and depth of endometriotic lesions.

For descriptive purposes, patients who sought the clinic for transvaginal ultrasound for the detection of endometriosis underwent the following procedures:

Patient preparation:

On the day before the exam, the patient should follow a low-residue diet. They should prefer liquids such as water, tea, strained fruit juices, vegetable soup, gelatin, and purees. In addition to the diet, the patient should take medication to aid in intestinal preparation. Muvinlax is the most indicated because it has fewer side effects than other medications. On the day of the exam, the patient is asked to take their medications as usual and only suspend them if the doctor requests it.

One hour before the scheduled exam time, while still at home, the patient should perform rectal intestinal lavage using a Phosfoenema enema bottle. This is the most important part of the intestinal preparation. The patient should also drink 600-800ml of water.

The intestinal preparation eliminates fecal residues, which facilitates the analysis and identification of the layers of the intestinal wall, as well as the detection of deep endometriosis foci.

Exam

Transvaginal pelvic ultrasound with color Doppler and intestinal preparation, including mapping of the total abdomen and abdominal wall, for the detection of endometriosis is performed using an ultrasound machine with endocavitary and multifrequency convex transducers.

The lubricating gel should be placed on the tip of the transvaginal transducer to facilitate insertion into the patient's vagina. Another technique used to improve detection is to apply an injection of 20-50ml of ultrasound gel into the posterior fornix of the vagina, using a syringe. The patient should have an empty bladder and be positioned properly to ensure adequate mobility with the transducer. For this, the knees should be flexed, legs apart, and the hips elevated by a wedge pillow.[14]

The duration of the exam depends on the complexity of the lesions and the skills and experience of the examiner, taking about an hour. The ultrasound report describes the characteristics of the findings in the upper abdomen - evaluating the diaphragm, kidneys, and gallbladder - abdominal wall, uterus, ovaries, cecum, ascending and descending colons, rectum and sigmoid, retrocervical region, uterosacral ligaments and vaginal fornices, rectovaginal septum, bladder, vesicouterine recess, ureters, and finally, adhesions.

To ensure the accuracy of the information obtained in the reports, an analysis of duplicate records belonging to the same individual was conducted, maintaining an organization according to the individual's name and date of birth. Duplicate cases were excluded from the study.

The study project was approved by the Research Ethics Committee of the Universidade Paulista (UNIP), under substantiated opinion No. 6,103,353, issued on June 6, 2023, based on the Certificate of Presentation for Ethical Appreciation (CAAE) No. 69655923.7.0000.5512.

RESULTS

In this study, the results of 50 transvaginal pelvic ultrasound exams with color Doppler and intestinal preparation for the detection of endometriosis in women aged 18-50 years were analyzed. Among them, 22 were diagnosed with the disease, while 26 exams showed no signs of deep endometriosis. Two exams had inconclusive results, where, although endometriosis was not detected by ultrasound, it was not possible to rule it out due to the presence of specific signs such as adhesion of the ovaries, suggesting pelvic magnetic resonance imaging as a complementary exam.

During the analysis of the reports, the ages of patients diagnosed with endometriosis were also identified, with a higher number of positive cases in the age group of 30-39 years, 59% (13/22). Seven patients (32%) were aged 20-29 years, and two patients (9%) were in the age group of 40-49 years.

In addition to the positive results for endometriosis, the main symptoms reported by patients during the anamnesis conducted by the physician before the exam were evaluated. The symptoms of dysmenorrhea and dyspareunia were frequently reported together. The relationship and frequency of symptoms are described in Table 1.

Symptoms	n	%
Dysmenorrhea	13	59.0
Dyspareunia	10	45.4
Menorrhagia	5	22.7
Irregular menstrual cycle	3	13.6
Difficulty getting pregnant	2	9.0
Pain during urination	1	4.5
Discomfort in the hypogastric region	1	4.5

Table 1 - Frequency of symptoms in 22 patients diagnosed with endometriosis.

Regarding the locations affected by endometriosis lesions, the ovaries (figure 1), rectum, uterosacral ligaments (figure 2), vesicouterine recess, retrocervical region (figure 3), and retrovaginal peritoneal region (figure 4) were the most affected regions. The frequency of lesions found in the evaluated locations is reported in Table 2.

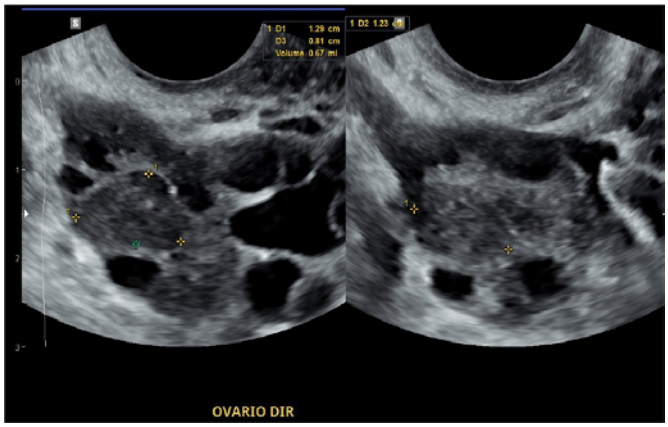

Figure 1 - Endometrioma in the right ovary. Rounded ovarian cyst, with regular margins and echogenicity with a characteristic matte glass appearance of an endometrioma. Source: Dr. Renata Glória

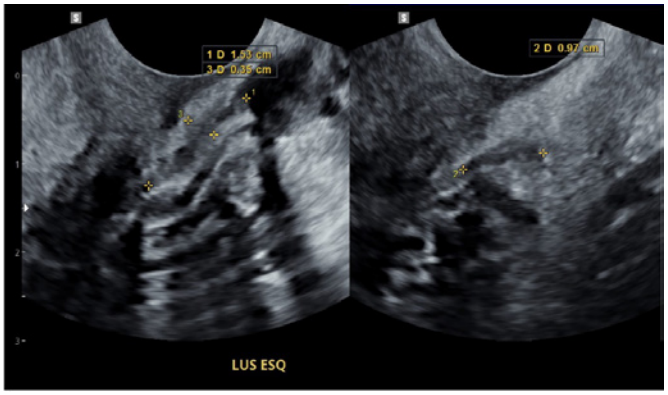

Figure 2 - Signs of deep endometriosis identified in the uterosacral ligaments. Hypoechoic and irregular tissue can be seen in the region of the left uterosacral ligaments, measuring 1.53 x 0.97 x 0.35cm. Source: Dr. Renata Glória.

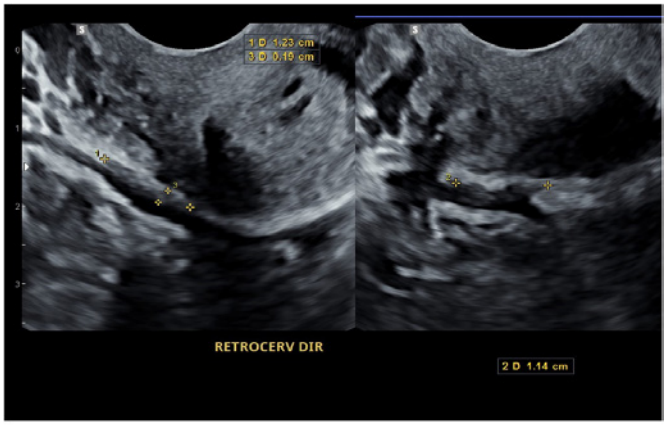

Figure 3 - Signs of deep endometriosis in the retrocervical region. Hypoechoic and irregular tissue can be seen in the retrocervical region to the right, measuring 1.23 x 1.14 x 0.19cm. Source: Dr. Renata Glória.

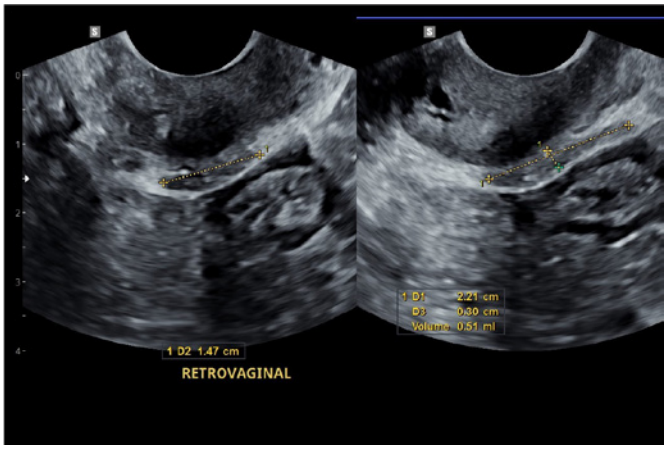

Figure 4 - Signs of deep endometriosis in the retrovaginal peritoneal region. Hypoechoic and irregular tissue can be seen in the retrovaginal region, measuring 2.21 x 1.47 x 0.30cm. Source: Dr. Renata Glória.

Location of the lesion	Frequency of the lesions	%
Ovaries (endometrioma)	7	31.8
Rectum	9	40.9
Uterosacral ligaments	17	77.2
Vesicouterine recess	5	22.7
Retrocervical region	14	63.6
Retrovaginal peritoneum	2	9.1

Table 2 - Frequency of lesions observed in 22 patients diagnosed with endometriosis.

An analysis was performed on the 26 exams that showed negative results for endometriosis. Among these exams, eight (31% - false negative) showed signs of adenomyosis, the presence of endometrial cells infiltrating the myometrium. For the remaining 18 exams (69%), it was possible to differentiate other gynecological alterations, such as pelvic varices, uterine fibroids, and ovarian cysts, when present, as well as normal results and additional findings that are not part of the exam.

Também foi realizada uma análise comparativa entre os resultados dos exames de pacientes que receberam o diagnóstico de endometriose e constatou-se a presença de adenomiose concomitante com endometriose em 40% (9/22) exames avaliados.

A comparative analysis was also conducted between the results of exams from patients who received a diagnosis of endometriosis, revealing the presence of concomitant adenomyosis with endometriosis in 40% (9/22) of the evaluated exams.

Furthermore, the results of two exams (25%) that showed negative results for endometriosis were compromised due to inadequate preparation by the patients, making it difficult to visualize the areas closest to the intestine optimally.

DISCUSSION

Endometriosis is a disease that presents with a variety of clinical manifestations. It affects women of reproductive age and can impair the quality of life of those diagnosed, whether in their work routine or personal life.[6]

This study demonstrated, in the studiedpopulation diagnosed with endometriosis, the predominance of painful symptoms, mainly dysmenorrhea and dyspareunia, which is

consistent with the research conducted by Barreto & Figueiredo[5], where pelvic pain, intestinal and urinary alterations, dyspareunia, dysmenorrhea, anxiety, lower back pain, fatigue, hematuria, irregular menstruation, difficulty getting pregnant, and infertility were described.[5]

The ages of the patients affected by endometriosis in this study ranged from 20 to 50 years, with the majority being between 30 and 39 years old, consistent with the range indicated in the work of Fernandez15, where the peak of the disease occurred between 25 and 44 years old.[15]

Based on the standardized protocols defined by the IDEA Group Consensus (International Deep Endometriosis Analysis)[16], the ultrasound reports used as the basis for this study describe the characteristics of findings in the upper abdomen - evaluating the diaphragm, kidneys, and gallbladder - abdominal wall, uterus, ovaries, cecum, ascending and descending colons, rectum and sigmoid, retrocervical region, uterosacral ligaments and vaginal fornices, rectovaginal septum, bladder, vesicouterine recess and ureters, and finally, adhesions.

The most affected locations by the lesions caused by endometriosis described in the diagnostic impressions of the exams evaluated in this study were: uterosacral ligaments, retrocervical region, rectum, ovaries, vesicouterine recess, and rectovaginal peritoneum. Mendonça et al[17] and Brunelli6 showed in their research that the most affected locations by endometriosis are the ovaries, pelvic organs such as the bladder, peritoneum, rectum, sigmoid, fallopian tubes, uterosacral ligaments, and in more severe and rare cases, it can affect distant organs such as the diaphragm, lungs, and central nervous system.[6,17] No cases of endometriosis lesions in locations outside the pelvis were identified in this study.

Adenomyosis, the presence of endometrial tissue infiltrating the myometrium and studied as a separate disease from endometriosis, was diagnosed in 9 out of 22 (40.9%) patients who tested positive for endometriosis. This result differs from that found by Brunelli6 in her research, where she reported signs of concomitant adenomyosis with endometriosis in about 18-21% of cases.[11]

Regarding the negative results for endometriosis, the ultrasound examination identified the presence of adenomyosis in 8 out of 26 (30.8%) exams analyzed. Additionally, it was possible to differentiate other lesions that were causing discomfort to the patient but did not characterize endometriosis, such as pelvic varices, uterine fibroids, ovarian cysts, kidney stones, as well as additional findings that are not part of the examination, such as the presence of a hepatic nodule.

This data highlights the importance of the ultrasound method for a differentiated and well-characterized diagnosis, as advocated in the work of Scioscia et al.[18] This contributes to the physician accompanying the patient initiating the most appropriate treatment for the case.[18]

Regarding the inconclusive results, typical signs of endometriosis were observed, such as the absence of the penetration sign and the beginning of applications of the ovaries to the uterus, corroborating the symptoms reported by the patient and the protocol of the IDEA Group defined by Oliveira et al. [16]. However, the characteristic lesions of endometriosis could not be discerned on ultrasound, indicating the need for complementary exams, such as magnetic resonance imaging, as suggested by Lima et al. [19], which can identify more subtle lesions.

In the present study, two exams were compromised due to inadequate preparation. It is recommended to follow a liquid diet and use a laxative as instructed by the doctor one day before the exam. On the day of the exam, it is vital to perform a rectal washout and ingest 600-800ml of water. According to Ros et al [20], this intestinal preparation improves the accuracy of transvaginal ultrasound in diagnosing endometriosis.

Most of the patients who sought the clinic for a transvaginal ultrasound (TVUS) exam to investigate endometriosis had been experiencing characteristic symptoms for a long time but considered them normal for the menstrual cycle. Other patients took longer to notice the symptoms due to contraceptive use, which could make the disease asymptomatic for a while. Patients with difficulty getting pregnant also sought the exam after a period of attempts. According to Alves et al. [1] and Barreto & Figueiredo[5], the diagnosis of endometriosis is usually made late due to lack of information, which sometimes leads women to believe that the symptoms are normal and expected during the menstrual cycle. This scenario worsens the quality of life of the patients and leads to more serious problems due to the delay in starting treatment, such as infertility.[1,5]

Moreira et al. [3] argue in their studies that it is necessary to be aware of the signs and symptoms of endometriosis and to seek a gynecologist if there is suspicion of the disease. However, professionals need to be properly qualified and ready for specialized care, both in the follow-up with the gynecologist and in imaging diagnosis, especially in ultrasound.[3]

CONCLUSION

From the exposition of the researches reported above, it can be concluded that:

a) Transvaginal pelvic ultrasound with Doppler and intestinal preparation is the most used technique for detecting deep endometriosis because it is more economical, faster, non-invasive, and has high sensitivity and specificity to identify and classify lesions with more than 5mm of infiltration.

b) Some factors are determinants for the effectiveness of the ultrasound method in the diagnosis of endometriosis, namely: the existence of deep lesions, since ultrasound is not very effective for detecting mild lesions; a good intestinal preparation performed by the patient, to ensure adequate visualization of the intestinal walls and foci of deep endometriosis; and professionals trained about the disease to ensure efficient care and support for the patients, as well as the performance of a good diagnostic exam.

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