



## Original Article

# Correlation of the three-dimensional ultrasound findings with pathology in patients with deep pelvic infiltrating endometriosis submitted to surgery<sup>☆</sup>



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## ABSTRACT

**Objective:** This study aims to correlate the findings of the three-dimensional anorectal ultrasonography (3D-AUS) with pathological findings in patients with deep pelvic infiltrating endometriosis.

**Methods:** Prospective study of a series of 40 patients with deep pelvic infiltrating endometriosis diagnosed by three-dimensional anorectal ultrasonography and who were submitted to a laparoscopy. The specimens were examined histologically and compared with the results of the three-dimensional anorectal ultrasonography. The research was conducted between March 2008 and March 2011.

**Results:** The results of the examinations were: 72.5% of patients ( $n = 29$ ) with endometriosis, 12.5% ( $n = 5$ ) with nonspecific chronic inflammatory reaction, 5% ( $n = 2$ ) with nonspecific fibrous tissue, 2.5% ( $n = 1$ ) with adenomyoma, 2.5% ( $n = 1$ ) with colonic mucosa with foci of recent hemorrhage, edema of lamina propria and superficial erosions, 2.5% ( $n = 1$ ) with hyperplasia of lymphoid follicles, and the remaining 2.5% ( $n = 1$ ) with peritoneal tissue within normal limits.

**Conclusion:** We conclude that the use of three-dimensional anorectal ultrasonography in patients with deep pelvic infiltrating endometriosis aid in the diagnosis of rectal lesions, when compared with the pathological findings of surgical specimens.

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<sup>☆</sup> This study was conducted in Hospital Genesis, Gastroclínica Cascavel, Cascavel, PR, Brazil and in the Faculdade Assis Gurgacz (FAG), Cascavel, PR, Brazil.

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## Correlação dos achados da ultrassonografia tridimensional com o anatomopatológico em pacientes com endometriose pélvica infiltrativa profunda submetidos a tratamento cirúrgico

### R E S U M O

#### Palavras-chave:

Endometriose  
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**Objetivo:** Este estudo visa correlacionar os achados da ultrassonografia tridimensional com os achados anatomopatológicos em pacientes com endometriose pélvica infiltrativa profunda submetidos a tratamento cirúrgico.

**Métodos:** Estudo prospectivo de uma série de 40 pacientes com endometriose pélvica infiltrativa profunda diagnosticados pela USR-3D e submetidos à videolaparoscopia. As peças cirúrgicas foram analisadas histologicamente e comparadas com os resultados das USR-3D. A pesquisa foi desenvolvida entre março de 2008 a março de 2011.

**Resultados:** Os resultados dos estudos histopatológicos foram: 72,5% das pacientes ( $n = 29$ ) com endometriose, 12,5% ( $n = 5$ ) com reação inflamatória crônica inespecífica, 5% ( $n = 2$ ) com tecido fibroso inespecífico, 2,5% ( $n = 1$ ) com adenomioma, 2,5% ( $n = 1$ ) com mucosa colônica com presença de focos de hemorragia recente, edema de lâmina própria e erosões superficiais, 2,5% ( $n = 1$ ) com hiperplasia de folículos linfóides e o restante, 2,5% ( $n = 1$ ), com tecido peritoneal dentro dos limites da normalidade.

**Conclusão:** Conclui-se, portanto que a ultrassonografia anorretal tridimensional em pacientes portadoras de endometriose pélvica infiltrativa profunda ajuda no diagnóstico de lesões retais, quando essa técnica é comparada com os achados anatomopatológicos das peças cirúrgicas.

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## Introduction

Endometriosis is characterized by the presence of tissue similar to the endometrium outside the uterus, leading to a chronic inflammatory reaction.<sup>1</sup> The estimated prevalence of endometriosis is 5–15% of all women of childbearing age.<sup>2,3</sup> Among women suffering from infertility, 20–68% show an associated endometriosis.<sup>4</sup> Studies report that 15–30% of women with endometriosis have profound infiltrative disease.<sup>5,6</sup> Colorectal involvement is present in about 5–10% of cases of the disease in its deep infiltrative form.<sup>7</sup>

Physical examination, even during menstruation, has a limited ability to diagnose and quantify the disease.<sup>8</sup> The diagnosis is usually established by laboratory tests, especially by imaging techniques such as transvaginal ultrasound (TVUS),<sup>9–12</sup> anorectal ultrasonography (AUS),<sup>13,14</sup> endoscopic transrectal ultrasonography (ETRUS),<sup>9,15</sup> magnetic resonance imaging (MRI),<sup>10</sup> computed tomography (CT),<sup>16</sup> and barium enema.<sup>17</sup> The imaging procedure must be able to indicate the number of foci present, the size and depth of the lesion, as well as its distance from the anal margin.<sup>18,19</sup> Many studies have recently shown that preoperative AUS may be useful in predicting rectal infiltration in patients with deep pelvic endometriosis,<sup>18,20</sup> and in the surgical decision making in favor of an intestinal resection.<sup>13</sup>

With the recent development of ultrasound equipment with multiplanar vision and the acquisition of automatic images, the mode that uses the three-dimensional probe was established in the anorectal complex assessment for the study of benign and malignant diseases,<sup>21–27</sup> making it possible to

evaluate and accurately measuring the longitudinal length of lesions and their distance to the sphincter muscles; thus, additional information necessary for choosing the therapeutic approach can be obtained.

To date, surgery remains as the most successful option for treating endometriosis, even in the face of the possible limitations, complications and sequelae.<sup>28</sup>

This study intends to correlate the findings of three-dimensional ultrasonography with histopathological studies in patients with deep pelvic infiltrating endometriosis submitted to surgery.

## Materials and methods

This is a prospective study of a series of 40 patients with suspected deep pelvic infiltrating endometriosis (DPIE) referred from the Gynecology outpatient clinic to the Coloproctology Service outpatient clinic, Hospital Genesis/Gastroclínica Cascavel, in the period between March 2008 and March 2011. The patients had complaints such as dyspareunia, rectal pain, pain in right iliac fossa (RIF), constipation and/or tenesmus.

The patients were then submitted to a three-dimensional anorectal ultrasonography (3D-AUS) for evaluation. Those women with suspicious findings of rectal involvement by 3D-AUS were referred to videolaparoscopic surgery performed by a multidisciplinary team involving gynecologists and colorectal surgeons with experience in videolaparoscopy. The surgical specimens were analyzed histologically and compared with the results of 3D-AUS. Some patients had undergone hormone treatment previous to 3D-AUS.

3D-AUS was performed by a colorectal surgeon with 2-year experience in this type of exam. The device used in this study was a BK Medical (Herlev, Denmark), with Pro-Focus probe with transducer with 360, model 2050 rotatory with frequency of 9–16 MHz, with a focal length of 2.8–6.2 cm, with a 50 s automatic scan, resulting in a 3-D cube displayed as a multiple sequence of axial images, as a cube image. For this examination, the patients were positioned in left lateral decubitus, after a rectal enema performed 2 h before the examination and using a digital rectal examination, all of them under anesthetic sedation and without using a rigid rectoscope. Four automatic scans were performed in order to evaluate the anal canal, anorectal junction, and the lower and middle aspects of the rectum, respectively. The images obtained were evaluated in the axial and longitudinal planes and, if needed, were associated with the diagonal plane. After completion of the scans, still images have been properly analyzed. We considered as normal those patients with no change in perirectal fat, and with intact rectal wall layers.

The characteristics of the ultrasound lesions were as follows: size of the endometriotic focus; the distance from this focus to the puborectal muscle, and which layers of the intestinal wall that were affected. These findings allowed the surgeon to choose his/her surgical approach. The analyzed histopathological criteria were: areas of fibrosis associated with endometrial tissue, characterized by glands and stroma well differentiated and without atypia.

Patients with deep pelvic infiltrating endometriosis confirmed by 3D-AUS who underwent videolaparoscopy by the teams of gynecologic surgery and of colorectal surgery, and who subsequently obtained histopathological results, were included in this study. Patients with deep endometriosis who refused the examination, patients who underwent the examination, but with negative results, patients who had a positive result of 3D-AUS but were not submitted to laparoscopy, and patients who refused to participate in the study were excluded from the study.

The study was approved by the Ethics Committee in Research of Faculdade Assis Gurgacz (protocol 232/2012).

## Results

The mean age of patients in this study was 35.1 (21–47) years. Of the 40 patients evaluated, 13 (32.5%) had as main indication an endometriosis, and had previously been diagnosed and treated with hormone. Nine patients (22.5%) had clinical pain when defecating in the menstrual period, associated with dysmenorrhea and dyspareunia. Seven patients (17.5%) had abdominal complaints of pain in the lower abdomen, with worsening during menstruation, in association with dyspareunia. Five patients (12.5%) reported only dysmenorrhea. Four patients (10%) reported infertility and dyspareunia, and two other patients (5%) reported pain in the lower abdomen, dyspareunia and constipation.

The characteristics of 3D-AUS lesions are round or triangular, irregular, heterogeneous hypoechoic masses, with a behavior of an invasion of the rectum into the perirectal intestinal lumen (located only in the perirectal fat) (Fig. 1A). Such finding was found 25 patients (62.5%) in this study, or

already invading at least the muscular layer of the rectum, which was observed in 15 patients (37.5%) (Fig. 1B). The mean size of the foci was 2.1 (0.5–4) cm, the average distance from the focus to the anal sphincter was 4.2 (1.5–6) cm (Fig. 2A and B).

Three types of surgery were carried out: 20 patients (50%) underwent excision of endometriosis foci, 13 patients (32.5%) were treated with rectosigmoidectomy, and 7 patients (17.5%) underwent a segmental colectomy with a stapled anastomosis. Decisions were based on 3D-AUS and laparoscopy findings. The surgical specimens were sent for histopathological evaluation by 2 pathologists.

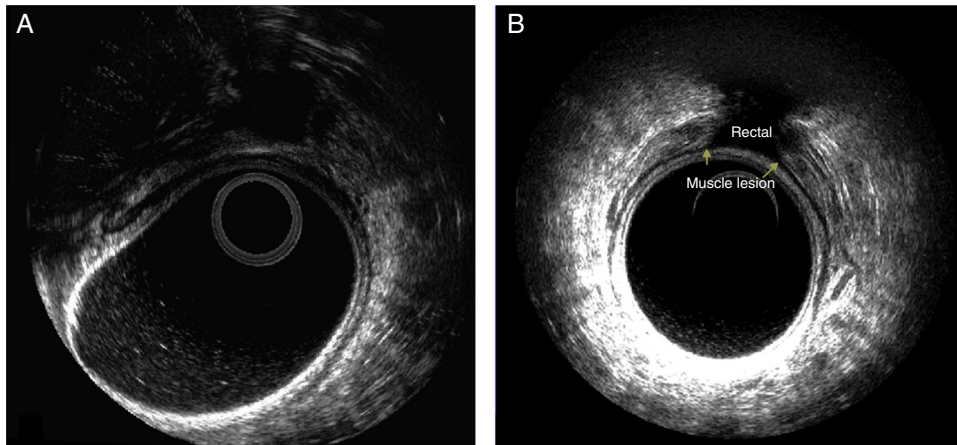
The histopathological results were as follows: 72.5% of patients with endometriosis, 12.5% with nonspecific chronic inflammatory reaction, 5% with nonspecific fibrous tissue, 2.5% with adenomyoma, 2.5% with colonic mucosa with foci of recent hemorrhage, edema of lamina propria and superficial erosions, 2.5% with hyperplasia of lymphoid follicles, and the remaining 2.5% with peritoneal tissue within normal limits.

## Discussion

In cases of deep endometriosis, is not always that the clinical treatment is effective, due to the high rate of occurrence of fibrous lesions that are less likely to respond to hormonal therapy.<sup>6</sup> Surgical treatment may be the only appropriate therapeutic option for severe endometriosis.<sup>29</sup> However, if the lesions have not been previously diagnosed, these patients will undergo an incomplete surgical treatment, and often there may be a need for more than one surgery. There are several modalities for staging these lesions; the more accurate ones are the nuclear magnetic resonance imaging and transvaginal ultrasonography with preparation.<sup>30</sup> AUS has been used as an alternative to these modalities in the evaluation of rectal infiltration by endometriosis.<sup>31</sup>

The purpose of this study was to emphasize the importance of the three-dimensional anorectal transducer in the posterior pelvic assessment in patients with endometriosis. Due to the limitation to the examination of images in the longitudinal plane, a transducer was developed which allows three-dimensional reconstruction after the capture of images in two-dimensional mode. With AUS together with three-dimensional mode used preoperatively, the surgeon can evaluate the lesions in multiple planes and also determine accurately the longitudinal length and the distance with respect to the sphincter muscles. Thus, critical information for choosing the therapeutic approach is obtained. The diagnostic accuracy provided by 3D-AUS is of fundamental importance for patients with endometriosis, especially for young women who are seeking fertility, because this modality prevents countless surgeries.

MRI is the most complete test for the staging of deep pelvic lesions; however, this method is less effective for the diagnosis of posterior pelvic endometriosis, because it do not accurately assesses the infiltration of the rectal wall layers.<sup>18,20</sup> Magnetic resonance imaging has a sensitivity, specificity and accuracy for the diagnosis of colorectal endometriosis of 88–90.9% 77.8–97.8% and 94.9%, respectively, demonstrated by several authors.<sup>32</sup> But MRI is a method that is only available in large



**Fig. 1 – Injuries analyzed by 3D-AUS (axial cuts). (A) Lesion involving perirectal tissue and (B) a lesion involving the rectal muscle layer.**

cities and, in addition, is an expensive examination. Services that do not have MRI may have computed tomography; however, this modality proves to be more difficult in distinguishing and delimiting pelvic organs and injuries. As a rule, MRI provides less important information in comparison to those obtained with a transvaginal ultrasound performed by an experienced professional.<sup>33,34</sup>

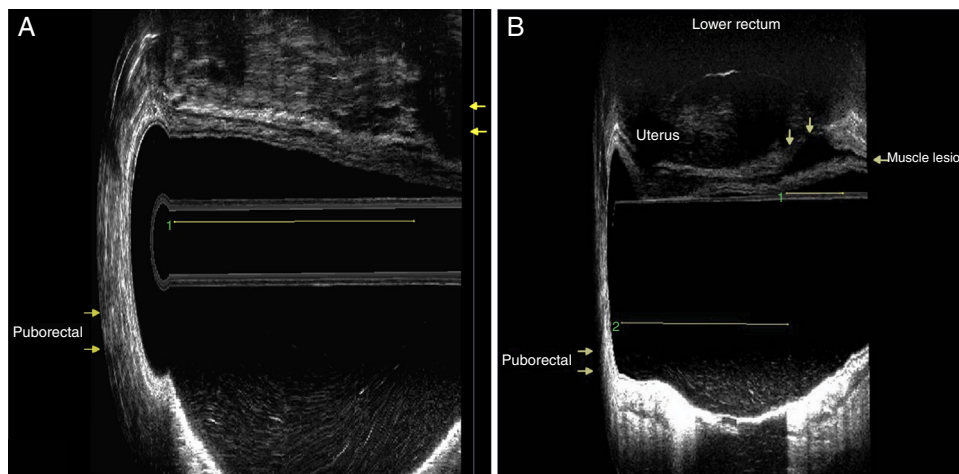
The development of imaging methods provided important qualitative and quantitative contributions to the diagnosis and thus to define the most appropriate therapeutic approach. Thus, there is a tendency in favor of the incorporation of these tests in the preoperative routine.

The staging of the lesions with 3D-AUS preoperatively favors the orientation with respect to the surgical procedure to be adopted in each case. Thus, one can predict the need, or not, of an approach and/or intestinal resection, as well as the possibility of a protective ostomy. With 3D-AUS, the surgeon will obtain important information, such as the distance from the endometriotic lesion to the anal sphincter, and whether in this lesion there is perirectal fat or rectum invasion. In the other hand, this modality can define if the invasion affects muscle

and/or, submucosal layer, or rectal mucosa. Thus, it may be suggested that in cases of foci greater than 2 cm in length or occurring in more than one third of rectal circumference, it would be less likely a local economic resection.

Among patients diagnosed with endometriosis, the correlation of the pathology report with 3D-AUS findings occurred in 72.5% of 40 patients undergoing surgery for removal of lesions suggestive of endometriosis and detected by this examination.

Microscopically, endometriosis is defined by the presence of typical endometrial glands and stroma, deposition of hemosiderin, erythrocytes, and macrophages, and fibrous tissue containing inflammatory cells. The fact of not having a correlation in all cases may be related to a previous medical treatment, or by being older lesions, with scars and peritoneal retraction. The anatomopathological correlation is generally observed in active lesions.<sup>35</sup> Pathological examination of the lesions should be used as an auxiliary method of diagnosis, by not being positive in all cases. The main limitation of our study arises from the need for training pathologists, in order to review the surgical pieces of endometriosis for the



**Fig. 2 – Injuries analyzed by 3D-AUS (sagittal section). (A) The distance from the focus to sphincter apparatus and (B) determination of longitudinal size of the endometriotic focus.**

definitive diagnosis. Another limiting factor is the fact that ours is a referral service and that, moreover, many of the patients had already undergone medical treatment and/or surgery. Thus, the resulting injuries lost their glandular histological characteristic.

## Conclusion

Thus, we can conclude that the use of three-dimensional anorectal ultrasonography in patients with deep pelvic infiltrating endometriosis aid in the diagnosis of rectal lesions, when compared with the pathological findings of surgical specimens.

## Conflicts of interest

The authors declare no conflicts of interest.

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