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Endoscopic Ultrasound and Intestinal Endometriosis

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Abstract

Endometriosis is a benign gynecological disease characterized by histological confirmation of the presence of ectopic endometrial glands and/or endometrial stroma. The main clinical gynecologic manifestations include chronic pelvic pain, back pain, menstrual disorders, and infertility. Over 60% of women with endometriosis have chronic intestinal symptoms. Intestinal involvement occurs in up to 12% of patients. Intestinal deep infiltrating endometriosis is defined as the lesion infiltrating at least the muscular layer of the bowel wall. Gynecological pelvic exam is not sufficient for the diagnosis of the location of deeply infiltrating endometriosis. Imaging methods can suggest the diagnosis of endometriosis and help to map the disease. Transrectal ultrasound (TRUS) has been used for more than a decade for the diagnosis and staging of deep endometriosis, providing relevant data for surgical treatment. It is useful to determine the depth of infiltration and the distance from the anal junction. The recent trend is to prefer nodule excision, when feasible, rather than radical digestive resection; therefore, it is important to take into consideration the staging of rectal and sigmoid infiltrating endometriosis in the preoperative clinical evaluation.

Keywords: Endometriosis, endosonography, rectal neoplasm, digestive system surgical procedures, gastrointestinal stromal tumors

1. Introduction

Endometriosis is a benign gynecological disease characterized by histological confirmation of the presence of ectopic endometrial glands and/or endometrial stroma [1].

The disease affects 10% of reproductive-age women, and intestinal involvement occurs in up to 12% of patients. It is a costly chronic disease causing pelvic pain and subfertility [2]. Up to 95%

of intestinal endometriosis is found in the rectum and sigmoid colon. In addition, in 39% of the cases, it may be present in more than one intestinal segment. In 20% of the cases, it can be found isolated [1].

1.1. Pathogenesis

There are three theories that explain the appearance of endometriosis. They are coelomic metaplasia, lymphatic or hematogenous dissemination, and retrograde menstruation, which is the most widespread theory. According to the theory of retrograde menstruation, that is, a physiological event in up to 90% of women, viable endometrial cells of the uterine cavity migrated to the tubes, implanting themselves and developing in several ectopic sites [3].

The rectosigmoid colon acts as an anatomic shelter, housing endometrial cells and preventing them from being cleared by the usual menstrual clearing process within the peritoneal cavity. Endometrial implants trigger an inflammatory response, and eventually, a fibrotic nodule is buried under the peritoneum [4].

1.2. Classification

Intestinal deep infiltrating endometriosis is defined as the lesion infiltrating at least the muscular layer of the bowel wall. The mucosa is infiltrated in less than 5% of intestinal lesions [1, 5].

Outside intestinal wall, deep endometriosis is defined as a solid endometriotic mass situated more than 5mm deep into the peritoneum. According to some experts, endometriotic foci located on the bowel serosa that do not meet these criteria are defined as peritoneal endometriosis rather than bowel endometriosis [4].

In normal female pelvic anatomy, the anterior rectum is apposed to the posterior vagina; this is referred to as the rectovaginal septum. Superior to the rectovaginal septum, the vagina and rectum separate and create a peritoneum-lined space called the posterior pouch of Douglas. The anatomic boundaries of pouch of Douglas are as follows: inferiorly, the rectovaginal septum; laterally, the uterosacral ligaments; anteriorly and superiorly, the posterior vagina, cervix, and uterus; posteriorly, the rectum [4].

The layers of stratification of the intestinal wall and some anatomical pelvic limits are of extreme importance for staging and therapeutic definition of intestinal endometriosis [3].

Based on histological and topographic criteria, Rossini, Ribeiro, and Aoki developed the echologic classification to map pelvic lesions based on endoscopic findings [6].

The authors divide the penetration or the absence of intestinal endometriosis in five stages (T1–T5) (**Figure 1**) and five different topographies to define the site of lesions (L1–L5) (**Figure 2**). To delimit the parietal penetration, the authors used sonographic stratification layers of the normal intestinal wall, described by Uncle Tytgat in 1986. In order to designate the anatomical position of the lesion, the authors used the ratio of local involvement with the uterus, the posterior vaginal fornix, and rectovaginal septum. To indicate that the evaluation is being conducted in a sonographic study of suspected endometriosis lesions, the letters

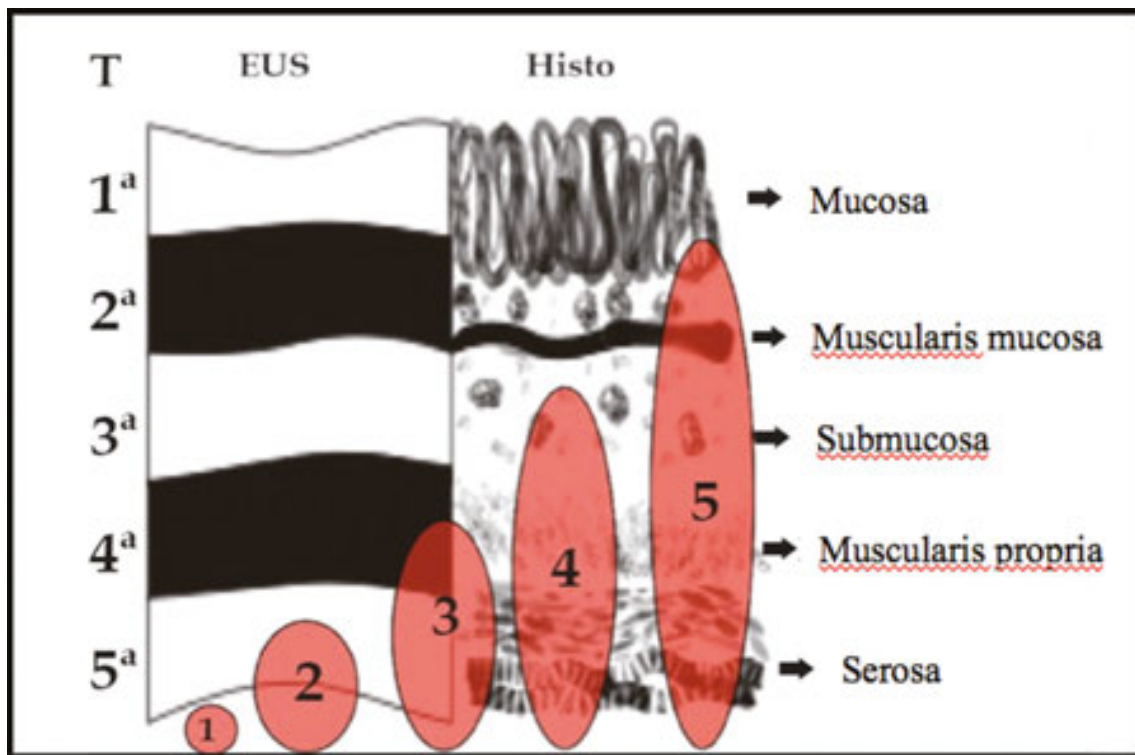


Figure 1. Depth of endometriosis invasion in intestinal wall according to the echo-logic classification. The acronym EUS indicates a schematic representation of the five layers of the intestinal wall, identified during endoscopic ultrasound. The acronym HISTO is a histological correlation of the layers of the wall, evidenced in EUS. "1" = extra-intestinal endometriosis; "2" = endometriosis into the serosa; "3" = endometriosis into the muscularis propria; "4" = endometriosis into the submucosa; and "5" = endometriosis into the mucosa.

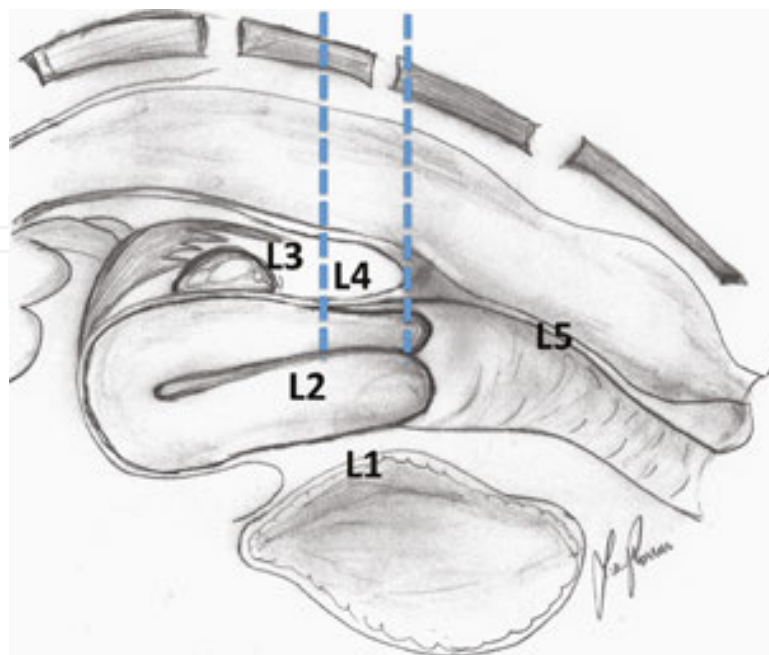


Figure 2. Schematic representation—location of endometriotic nodes in the pelvis according to echo-logic classification. "1" = pre-cervical endometriosis; "2" = paracervical endometriosis (right or left); "3" = node retrocervical endometriosis; "4" = endometriosis of rectovaginal nodules in reflection; and "5" = rectovaginal septum.

“ue,” lowercase, precede each penetration stage. Then, the letter “T,” uppercase preceding the number, indicates the degree of penetration, or not, of the intestinal wall, and lastly, the letter “L,” uppercase, precedes the number to indicate the position of the lesion in the pelvis [3, 6].

Deep lesions tend to have a nodular pattern with a “C” shape (**Figure 3**); however, there are infiltrative lesions that take a pattern of longitudinal growth, and others have a mixed pattern. In peritoneal cavity, intestinal lesions may adhere to other organs and structures leading to the formation of blocks usually involving the uterus and/or the ovaries [3].

1.3. Clinical manifestations

The main clinical gynecologic manifestations include chronic pelvic pain, back pain, menstrual disorders, and infertility. Over 60% of women with endometriosis have chronic intestinal symptoms. Diarrhea, constipation, tenesmus, nausea, vomiting, fever, anorexia, weight loss, and hematochezia may be present at different intensities. Even without parietal invasion, an endometriotic lesion adjacent to any intestinal segment may cause digestive symptoms. Some women may also be asymptomatic [1, 4].

1.4. Clinical evaluation

The complexity of the disease is determined by the variety of clinical presentations: the multifocality, the involvement of non-gynecological sites, and the difficulty in the diagnosis of

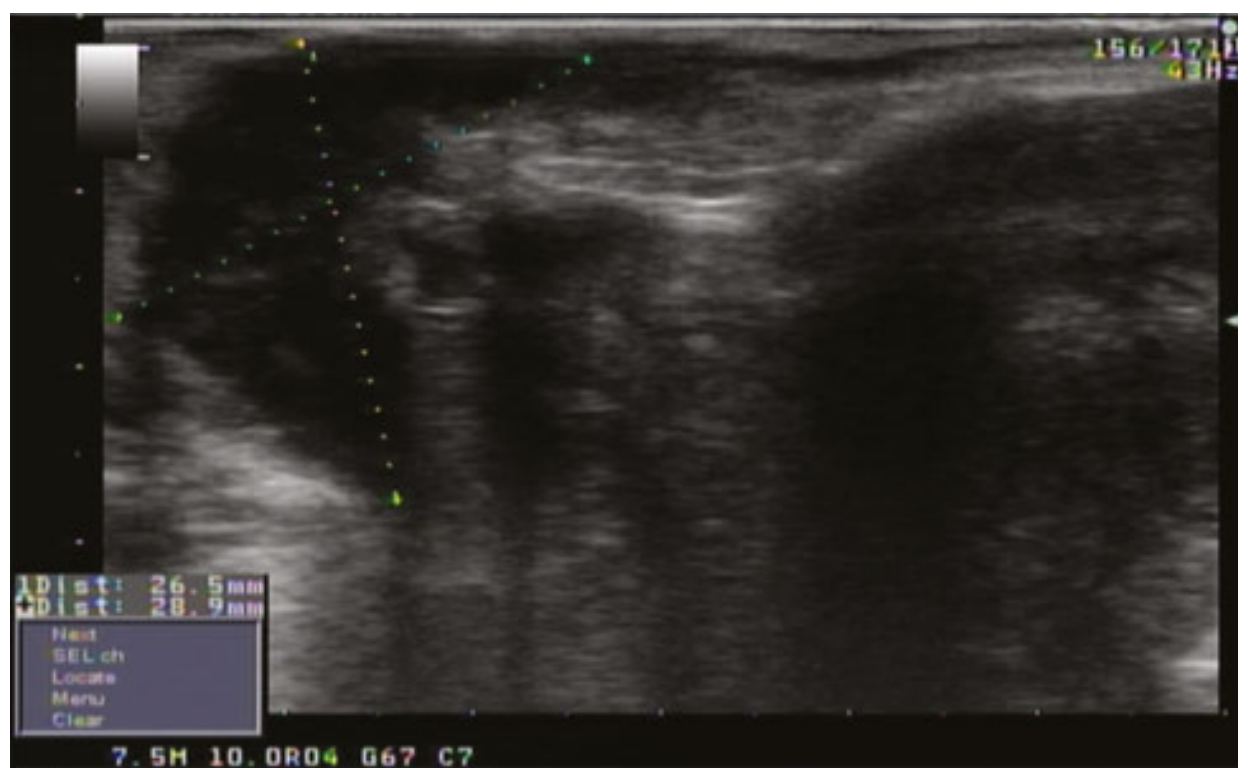


Figure 3. Endometriotic lesion, hypoechoic and heterogeneous, infiltrating the intestinal wall (ueT4L3).

the disease by preoperative imaging examinations and in the definition of the proper surgical treatment [5].

Clinical evaluation is performed as part of the overall assessment of a patient who presents with pelvic pain and/or infertility.

2. Imaging diagnosis and treatment

Gynecological pelvic exam is considered important for evaluating the extent of pelvic lesions. Through vaginal and rectal touch examination, thickening or nodularity in the pouch of Douglas, uterosacral ligaments, and/or the rectovaginal septum are the most significant data. However, the absence of positive signs does not rule out the disease [1].

Although considered important, gynecological pelvic exam is not sufficient for the diagnosis of the location of deeply infiltrating endometriosis [5]. Imaging methods can suggest the diagnosis of endometriosis and help to map the disease [1, 7].

Some imaging methods can provide answers to these questions:

1. Is there an infiltration compromising the intestinal wall?
2. What is the location of the endometriosis lesion?
3. What is the depth, the extension, and the fraction of the circumference of the intestinal wall invaded?
4. Is there invasion of adjacent organs or structures and adhesions in the cavity?
5. What is the distance between the lesion and the peritoneal reflection?
6. What is the distance between the lesion and the anal sphincter?
7. Is the rectovaginal septum compromised?
8. Is the disease multifocal?
9. Is there another type of intestinal lesion mimicking intestinal endometriosis?
10. Is histologic differential diagnosis necessary?

A study showed that TVUS had better sensitivity, specificity, and accuracy in deep retrocervical and rectosigmoid endometriosis when compared with MRI and gynecological examination [8].

Another study compared diagnostic accuracy of physical examination, transvaginal ultrasound (TVUS), transrectal ultrasound (TRUS), and MRI in the evaluation of deep infiltrating endometriosis. The study concluded that MRI gives similar results to TVUS and TRUS for the diagnosis of intestinal endometriosis but has higher sensitivity and likelihood ratios of uterosacral ligament and vaginal involvement [9]. However, some studies showed that TRUS

and TVUS were superior to MRI for detecting lesions in rectosigmoid. The TVUS should be used as the first-line imaging study [10, 11].

MRI is very useful in the complete evaluation of the pelvis (pelvic floor, bladder, ureter, and muscles). It is the best option for the evaluation of ovarian endometriosis, and it has good accuracy in the diagnosis of deep implants of the intestinal wall or rectovaginal septum [1, 12].

Colonoscopy is often performed in many patients with endometriosis, especially in patients with intestinal symptoms such as rectal bleeding. However, only 50% of deep intestinal lesions have specific signs of endometriosis such as subepithelial lesions, which promote deformation and reduction in the lumen (**Figure 4**). Frequently, there is a paucity of mucosal involvement. A prospective study showed colonoscopic findings suggestive of intestinal endometriosis in 4% of cases. Colonoscopy failed to diagnose intestinal endometriosis in 92% of patients who underwent surgery. So, this invasive procedure should not be routinely performed in the diagnosis of intestinal endometriosis [13]. On the other hand, it should be routinely used to exclude other intestinal diseases of the rectum, colon, and terminal ileum that can mimic intestinal symptoms of endometriosis (present in around 60% of patients with deep endometriosis).

When histological confirmation of intestinal endometriosis is necessary, TRUS-FNA is considered a safe procedure. In 2010, Rossini performed TRUS-FNA in 85 patients with suspected endometriotic lesions and characterized the histological findings of endometriosis in 97% of the patients [14]. Puncture was restricted only to lesions that compromise at least the muscular layer of the intestinal wall (ueT3) [3]. The hypothetical risk of seeding endometriotic cells was avoided because TRUS-FNA was performed without the penetration of the peritoneal cavity, and no other organs were transfixed. Histological diagnosis using TVUS-FNA still presents limitations, that is, the risk of peritoneal and/or vaginal implants in the path of the needle.

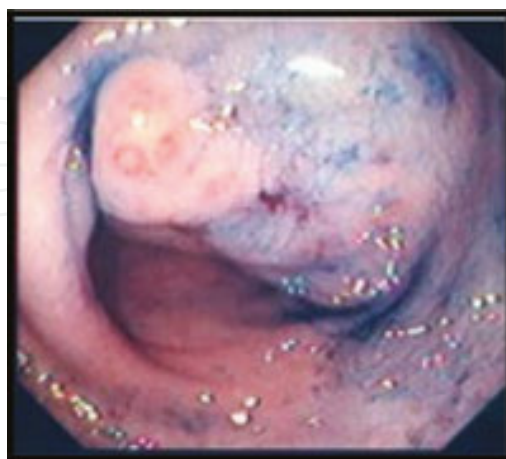


Figure 4. Colonoscopy image—endometriotic lesion infiltrating the intestinal wall.

2.1. Transrectal ultrasound

The TRUS has been used for more than a decade for the diagnosis and staging of deep endometriosis, providing relevant data for surgical treatment. It is useful to determine the depth of infiltration and the distance from the anal junction. Evaluation of intestinal endometriosis can be performed by using rigid linear probes (**Figure 5**), linear probes, or radial echoendoscopes.



Figure 5. Rigid probe (Hitachi EUP U533).

The rigid probe facilitates the evaluation of lesions located in the rectosigmoid and rectovaginal septum [3]. Using rigid probes, the patient should be positioned in the left lateral decubitus with flexion of the thighs and legs. First, a deep rectal touch examination should be performed to check for anorectal stenosis and/or nodules in the regions of the anus, rectum, rectovaginal septum, pouch of Douglas, cervix, and paracervical regions. Subsequently, the rigid probe should be introduced through the anus and immediately pointed to the back of the patient. The probe should then be softly slid over the sacrum for up to approximately 7–10 cm in the rectal lumen. At this point, a balloon coupled over the probe is filled with water (at least 40 mL). The probe is then pushed up gently with short up and down movements until the distal sigmoid colon. In this position, the right and left iliac vessels and sometimes the bifurcation of abdominal aorta and the right kidney can be observed. Evaluation of the intestinal wall and surrounding tissues, including pelvic organs and iliac vessels, is performed using movements of introduction, traction, and rotation of the probe on its longitudinal axis (clockwise and counterclockwise), as well as by compression or decompression of the transducer against the wall [3].

The presence of hypoechogenic, irregular, homogeneous, or heterogeneous lesions, around or infiltrating pelvic structures, or the intestinal wall are considered suspect of endometriosis (Figures 6–8).

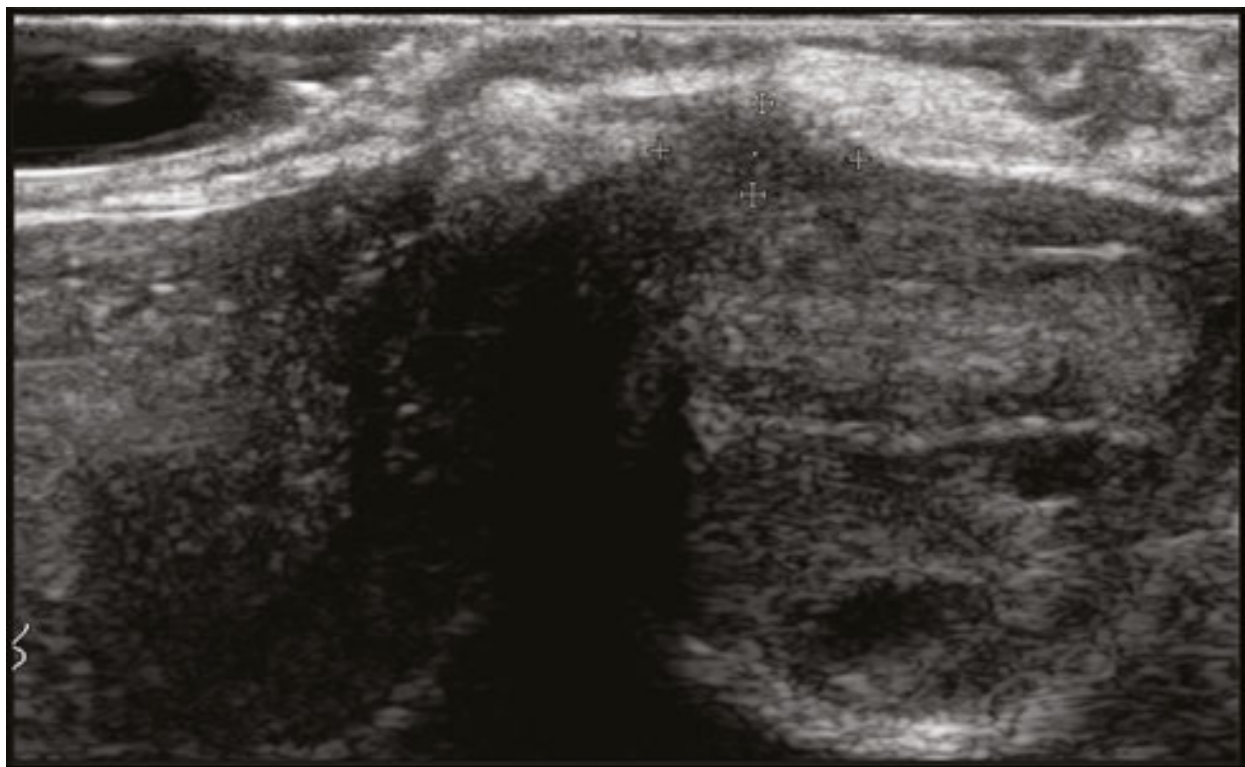


Figure 6. Extra-intestinal endometriotic lesion (ueT1L2 R).

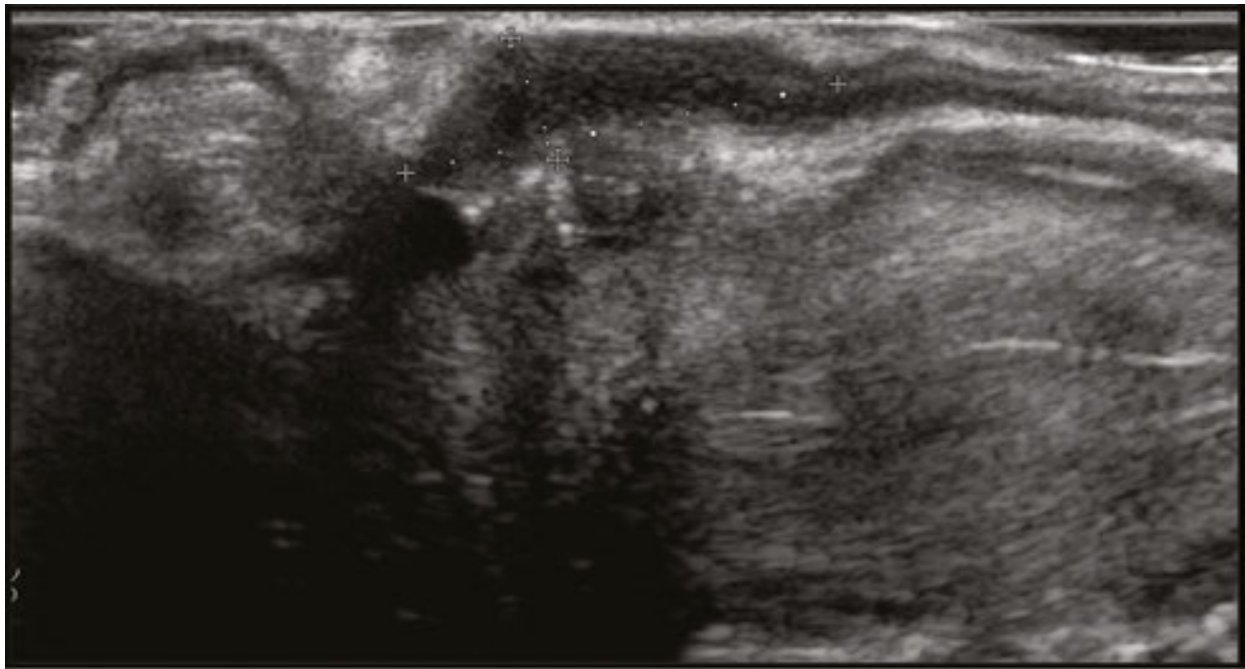


Figure 7. Hypoechoic and heterogeneous lesion, infiltrating the intestinal wall (ueT3L3).

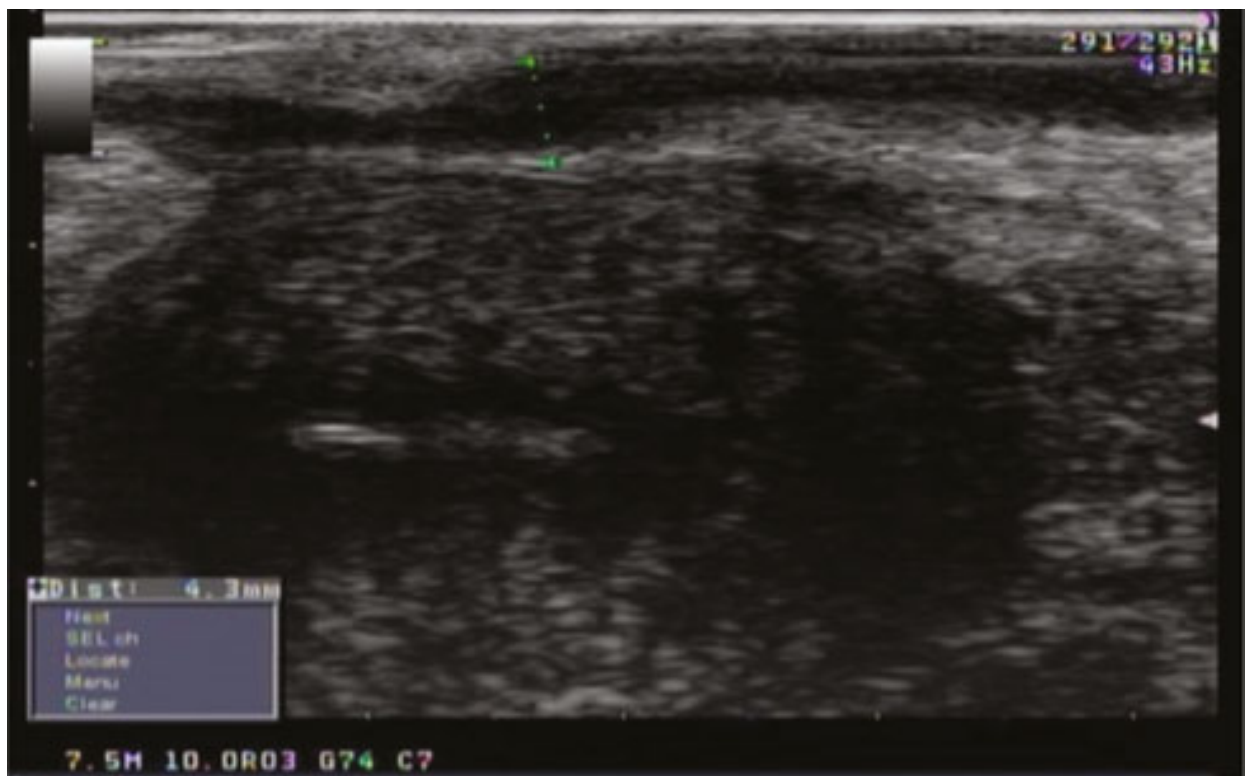


Figure 8. Endometriotic lesion (ueT3L3).

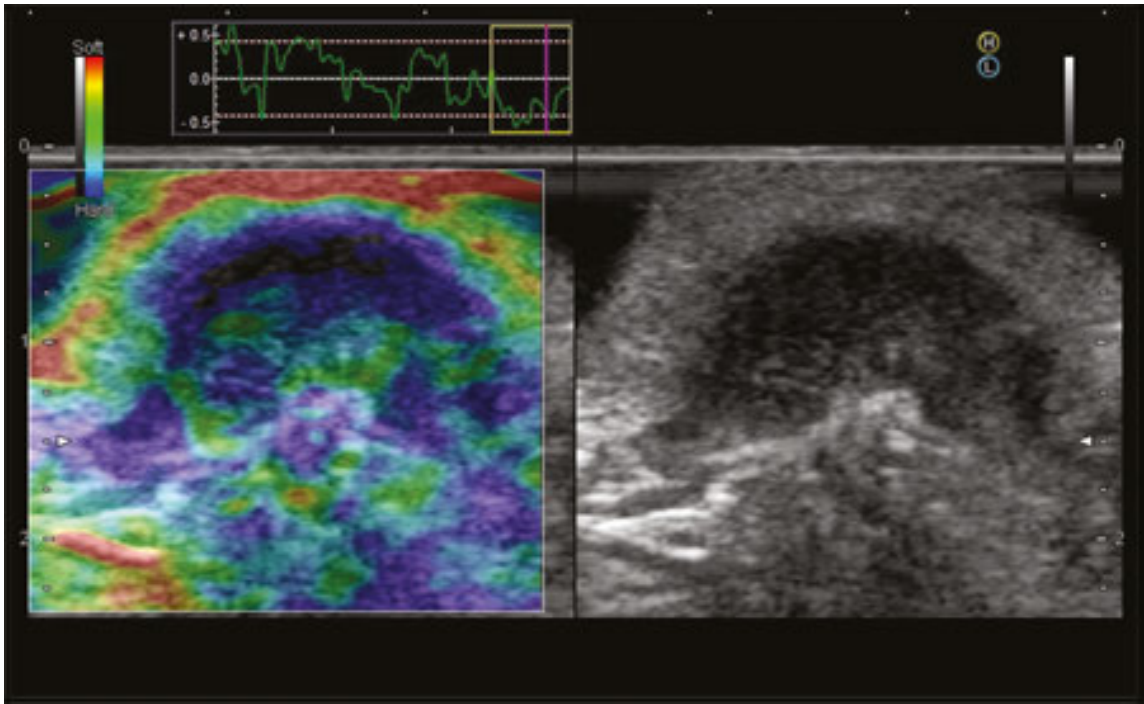


Figure 9. TRUS—Endometriotic lesion (ueT3L4) using transrectal ultrasound and elastography.

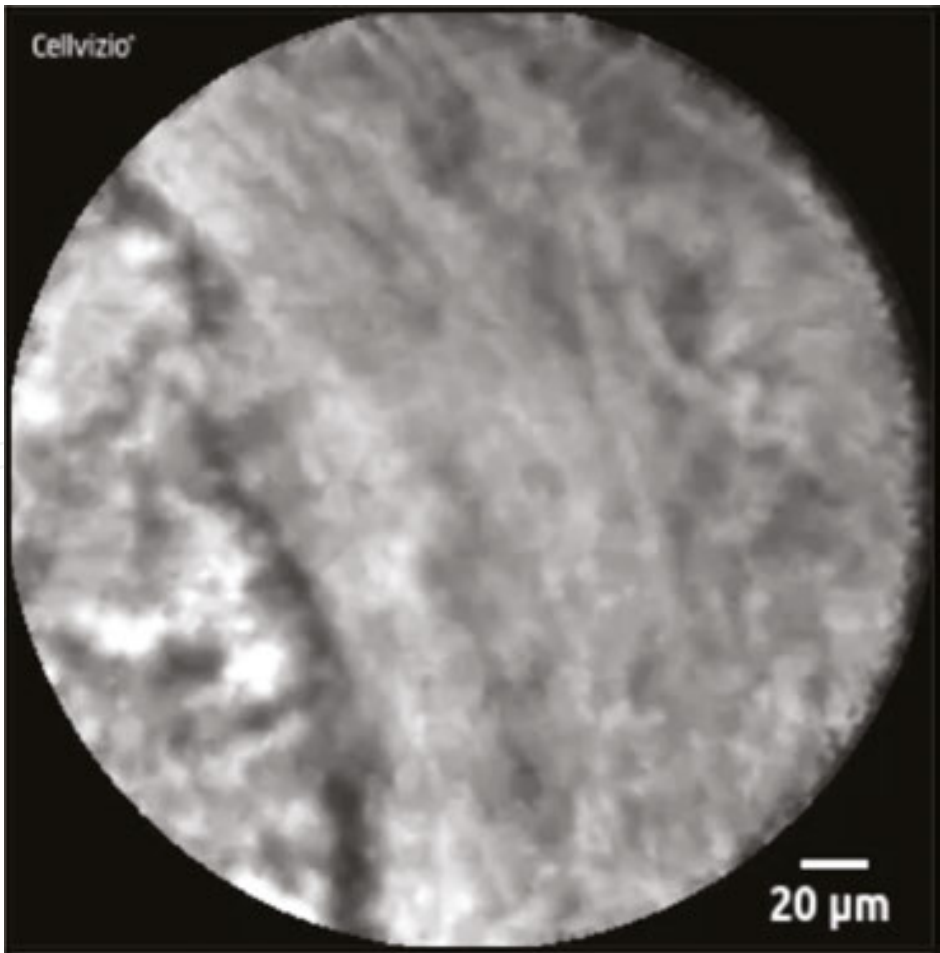


Figure 10. Confocal—endometrial stroma (grayish spots in the middle of fibrosis).

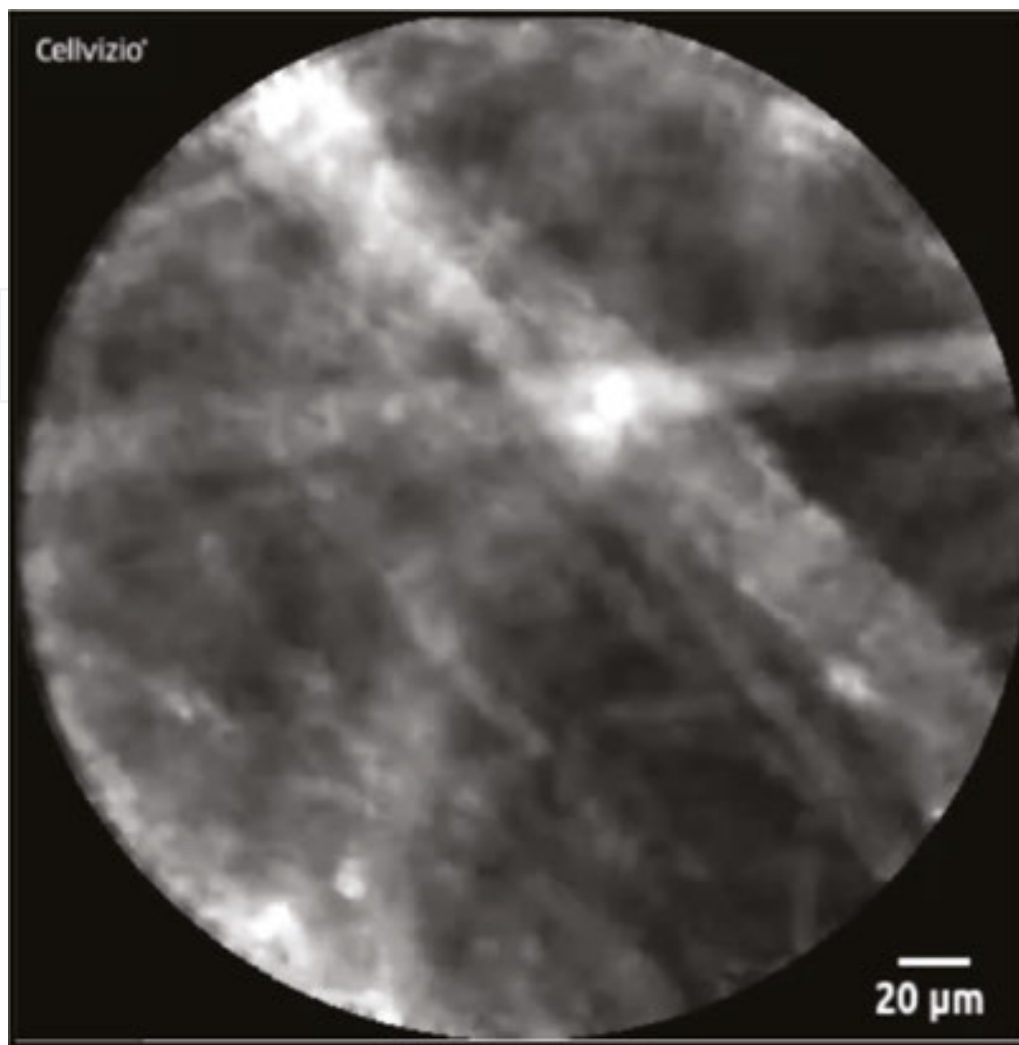


Figure 11. Confocal—fibrous (elongated grayish fibers).

Studies focusing on elastography (**Figure 9**) and confocal laser endomicroscopy (**Figures 10–12**) have been used to improve the accuracy of TRUS for the diagnosis of deep pelvic endometriosis with rectal involvement.

2.2. Treatment

Clinical treatment, exclusive for deep pelvic endometriosis, is still controversial. Medical therapy treats all sites of disease simultaneously, but systemic adverse effects may occur and also recurrence of symptoms when the use of medication is discontinued [4].

Surgical treatment may be the best option in some cases, because it promotes complete excision of the endometriosis lesions [4]. The recent trend is to prefer nodule excision, when feasible, rather than radical digestive resection; therefore, it is important to take into consideration the staging of rectal and sigmoid infiltrating endometriosis in the preoperative clinical evaluation [15]. At the presence of lesions in the intestinal or urinary organs, a gastrointestinal or urologic surgeon is respectively recommended [1].

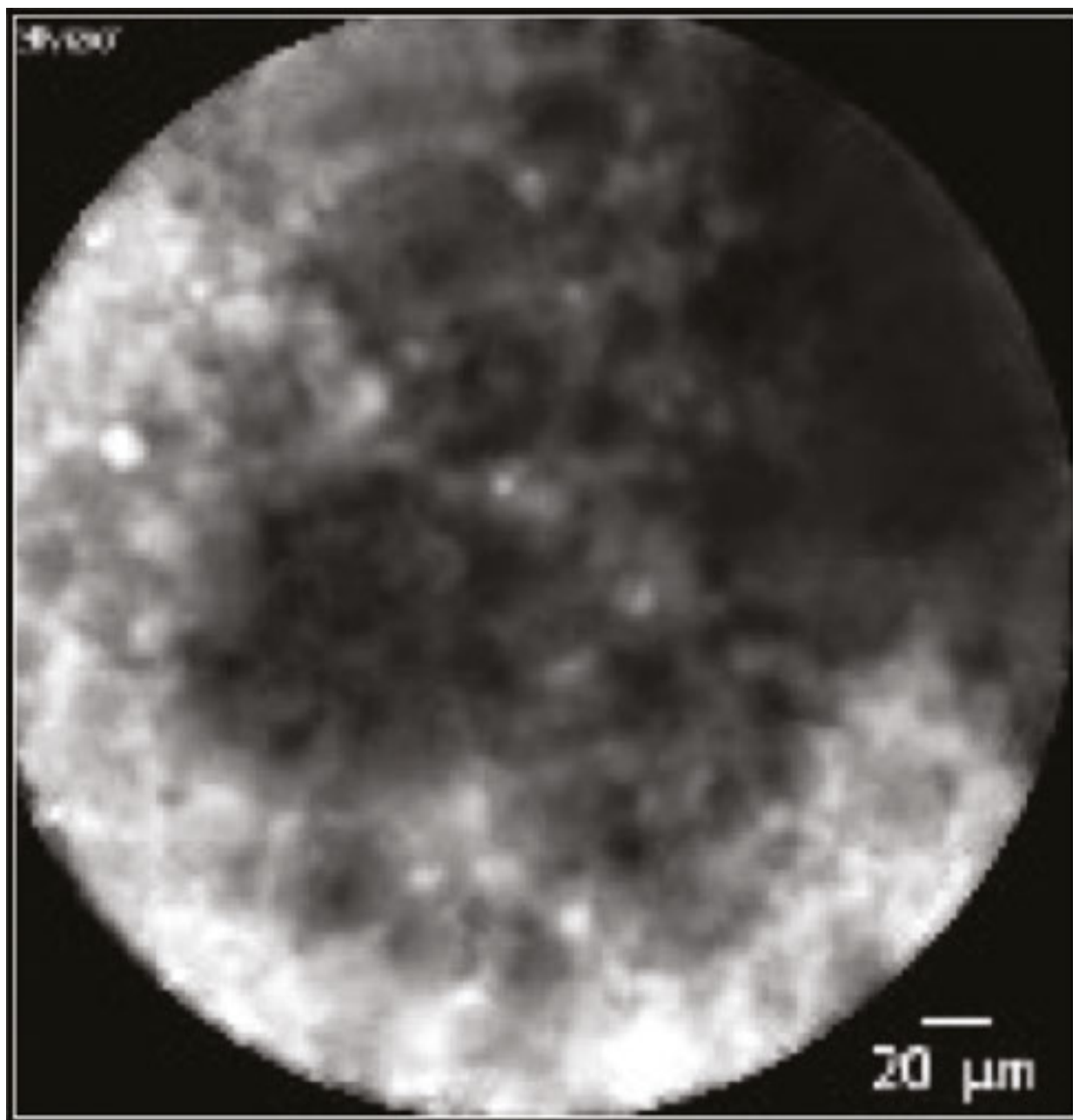


Figure 12. Endometrial glands (dark clouds).

3. Final considerations

Endometriosis is a costly chronic disease causing pelvic pain and infertility and may hence impair quality of life. All women presenting with these symptoms should be evaluated for endometriosis. TRUS is not considered the first-line option to evaluate intestinal endometriosis, but it is essential to determine the depth of infiltration and the distance from the anal junction. This information is useful to assess the extent of rectal surgery [4].

The treatment of deep pelvic endometriosis with intestinal involvement should be individualized and performed by a multidisciplinary team including gynecologists, psychologists, and surgeons with training and experience in advanced techniques of laparoscopic surgery.

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