



# Correlation of Endoscopic Findings with Suspected Intestinal Endometriosis in the Distal Sigmoid and Rectum as Observed on Transrectal Ultrasonography

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## Abstract

**Introduction** Colonoscopy enables detailed endoscopic evaluation of the interior of the colon. Changes observed via colonoscopy may be subtle or pronounced and can sometimes mimic those of other diseases, such as deep intestinal endometriosis. The diagnosis of endometriosis in the distal sigmoid and rectum by colonoscopy has been described in previous case reports.

**Objective** We aimed to correlate the endoscopic changes found in the distal sigmoid and rectum with the presence of endometrial deposits confirmed by transrectal ultrasound (TRUS).

**Methods** We included 50 female patients referred to the endoscopy department at our institution for colonoscopy, rectosigmoidoscopy, or TRUS, who exhibited one or more symptoms associated with endometriosis.

**Results** The colonoscopic findings were normal in 36 patients but showed alterations in 14 patients. Among the latter, TRUS revealed involvement of the sigmoid and/or rectal wall in 11 patients.

**Conclusions** The endoscopic changes in the distal sigmoid or rectum described in this study were strongly associated with endometrial deposits confirmed using TRUS.

## Keywords

- ▶ endometriosis
- ▶ sigmoidoscopy
- ▶ colonoscopy
- ▶ sigmoid colon
- ▶ rectal diseases

## Introduction

The differential diagnoses of abdominal or chronic pelvic pain include diseases such as irritable bowel syndrome, inflammatory bowel disease, abdominal tumors, and intestinal endometriosis.<sup>1–3</sup> Currently, there is no endoscopic definition regarding intestinal involvement in endometriosis (EDT), which may lead to failure or delay in diagnosis.

Endometriosis is a benign gynecological disease, defined by the presence of tissue similar to that of the endometrium, glands, and/or stroma that is located outside the uterine cavity and responsive to hormonal stimuli.<sup>4–7</sup> When EDT infiltrates the wall of the rectum or colon, colonoscopy may exhibit deviations from normal findings. However, few studies to date have described these changes or an actual

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association with endometrial deposits located near or infiltrating the wall of the colon and rectum.<sup>3,4</sup>

The appearance and maintenance of endometrial deposits are dependent on hormonal stimulation. Therefore, the incidence of the disease is higher in reproductive-age women and does not commonly occur before menarche, or in postmenopausal women who are not exposed to estrogen replacement therapy. It is estimated that the incidence of EDT among reproductive-age women is between 5 and 15%.<sup>5,8,9</sup> The most common sites of deep intestinal EDT implantation are the ovaries, fundus of the Douglas' pouch, round ligament, uterosacral ligament, uterus, uterine tubes, sigmoid colon, and appendix<sup>4,6,10-12</sup>). In cases of EDT that affects the intestinal segments, the sites with the highest incidence rates are the rectum and the distal sigmoid, accounting for up to 95% of intestinal implants.<sup>3,13-15</sup>

Transrectal ultrasound (TRUS) examination is one of the most specific methods used for the diagnosis and evaluation of intestinal involvement of endometrial deposits. The use of rigid transducers similar to those used in transvaginal ultrasound or endoscopes with ultrasound transducers on their end enable examination of the entire rectum and sigmoid when studying the disease using the echo-logic classification, which allows the detailing of the degree of invasion of the rectal or colonic wall (T1 when there is no invasion, T2 for involvement of the serosa, T3 when the muscularis propria is involved, T4 for involvement of the submucosa, and T5 when the mucosa is involved).<sup>16</sup> Histological confirmation is possible via laparoscopy or echo-guided puncture (solely for endometrial deposits); therefore, the diagnosis can be made based on clinical and radiological examinations alone. These imaging studies are important for diagnosis, classification, and surgical planning, when necessary, and include the following: abdominal ultrasonography, transvaginal ultrasonography (TRUS), three-dimensional transvaginal ultrasonography, magnetic resonance imaging (MRI), double contrast barium enema, water enema computed tomography, colonoscopy, and virtual colonoscopy, although these all have specific indications and limitations.<sup>6,16-28</sup> Laparoscopy displays low detection accuracy in the case of endometrial deposits in the rectum or distal sigmoid. Transvaginal ultrasonography, transrectal endoscopy, and MRI are the most appropriate options, with similar results.<sup>13</sup>

It is important to emphasize that TRUS is a minimally invasive and highly accurate modality; it is considered one of the best preoperative examinations to determine the degree of invasion of lesions in the intestinal wall, especially in the rectum and distal sigmoid, thereby providing important information for surgical planning.<sup>18,22,29,30</sup> Therefore, this study aimed to correlate the endoscopic changes found in the distal sigmoid and rectum with the presence of endometrial deposits confirmed via TRUS.

## Methods

This was a prospective cross-sectional study approved by the Research Ethics Committee CAAE: 32790414.3.0000.5461. The study population included female patients between 18

and 55 years of age who were referred to the endoscopy department of our institution for colonoscopy, rectosigmoidoscopy, or TRUS, who presented with one or more of the following symptoms associated with EDT: abdominal pain, pain during defecation, rectal bleeding, dyspareunia, and infertility. All participants provided written informed consent.

This is a pioneering study comparing endoscopic and sonographic findings in patients with EDT that affects the rectosigmoid. No consistent data for sample size calculation were found in the literature and, therefore, a pilot study with 50 individuals was conducted to determine the required number of patients.

The exclusion criteria were as follows: patients with active, or a history of, cancer; inadequate preparation of the rectum and/or distal sigmoid (Boston scale equal to 0 or 1 in the rectum or distal sigmoid); refusal to participate; relative or absolute contraindications to colonoscopy or TRUS; and relative or absolute contraindications to sedation or anesthesia. Participants agreed to undergo laparoscopy or laparotomy with surgical intervention in the rectum and/or distal sigmoid and/or gynecological interventions (except for cesarean section and/or resection of ovarian cysts).

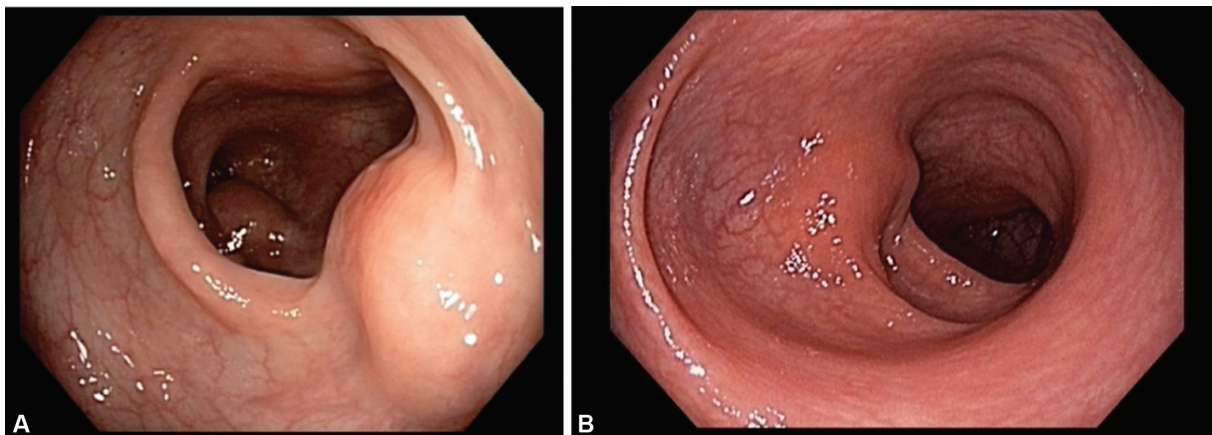
The following variables were evaluated in this study:

Clinical variables: 1) Pain upon direct pressure on the vaginal fornix during sexual intercourse (deep dyspareunia) and/or vaginal examination; 2) chronic pelvic pain (constant infraumbilical pain for more than 30 days and/or pain associated with menstruation for more than 3 cycles); and 3) intestinal bleeding with red blood and without hemodynamic repercussion in the previous 7 years.

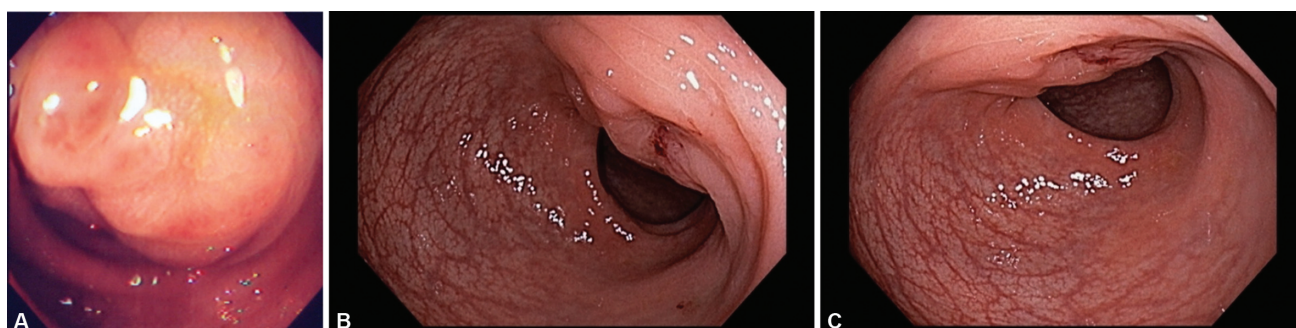
Endoscopic variables: 1). Fold thickening (with preserved circular anatomy of the organ and one or more haustrations with visually altered thickness) (→ **Fig. 1**); 2) bulging without nodules (with visually altered circular anatomy of the organ and semicircular bulging without notches or other bulges above it (→ **Figs. 2A B**); 3) bulging with lobulation (visually altered circular anatomy of the organ, noting bulging shaped like an irregular semicircle, with notches or other bulges) (→ **Fig. 3A, B, C**); 4). alteration of the mucosa (enanthea,



**Fig. 1** Fold thickening.



**Fig. 2** (A) Bulging without nodules. (B) Bulging without nodules.

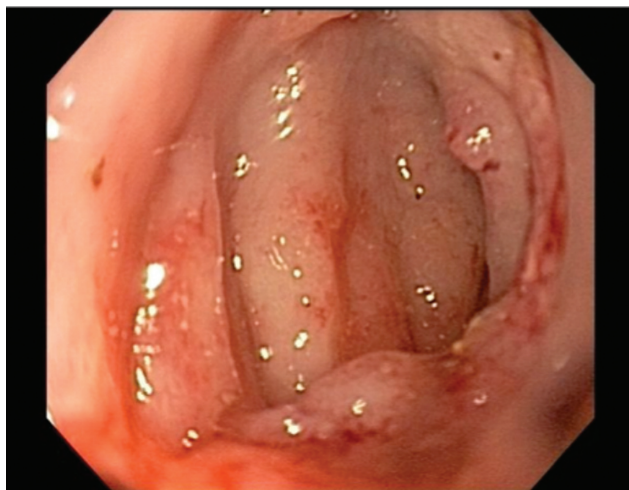


**Fig. 3** (A) Bulging with nodules. (B) Bulging with nodules. (C) Bulging with nodules.

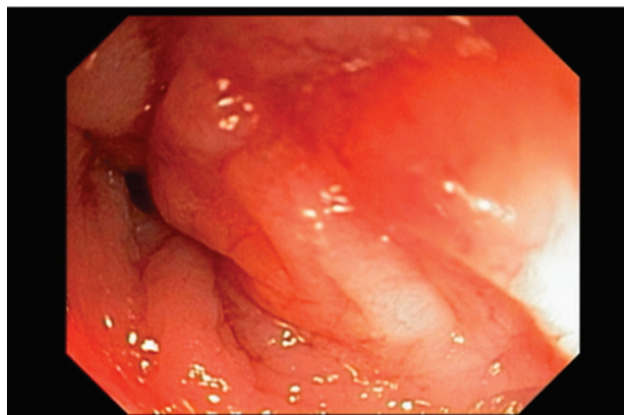
edema, unusual coloration, and/or increased vascularization) (→ **Fig. 4**); and 5) obstruction of the rectum and/or distal sigmoid (probe unable to pass through the rectum or distal sigmoid) (→ **Fig. 5**).

The patients referred to the department for TRUS or rectosigmoidoscopy underwent distal sigmoid colon and rectum preparation with two applications of 130 mL of a solution containing sodium phosphate monobasic (160 mg/mL) + sodium phosphate dibasic (60 mg/mL) via the rectum; the first application was performed the night preceding

the exam, and the second application was performed 1 hour before the exam. For patients referred for colonoscopy, the preparation of the entire colon and rectum included a low-residue liquid diet and two bisacodyl tablets (5 mg) the day before the examination. On the day of the procedure, the preparation was completed with the ingestion of a mannitol solution (500 mL of 20% mannitol with 500 mL of water, orange juice, isotonic, or similar beverage) and, if necessary, rectal lavage with 500 to 1,000 mL of 0.9% saline solution, repeating the procedure until two clear liquid rectal discharges occurred. The patients who fulfilled the inclusion criteria were provided with a questionnaire and invited to



**Fig. 4** Changes in the mucosa.



**Fig. 5** Obstruction.



participate in the study. Those who agreed to participate signed the consent form and had their concerns, if any, addressed.

The endoscopic examinations of the distal sigmoid and rectum were all performed by the same endoscopist, who had performed over 2,000 colonoscopies. After the endoscopic examination, ultrasound examination was conducted by the hospital's physician, who had performed over 3,000 TRUS procedures and who was blinded to the endoscopic findings of the already-sedated patients.

The procedures were performed using Olympus, Fujinon and/or Hitachi-Aloka devices (Olympus Corporation, Tokyo, Japan; Fujifilm, Tokyo, Japan; Hitachi Aloka Medical Ltd, Tokyo, Japan).

After data collection, the clinical and endoscopic variables were stratified, and sensitivity and specificity were calculated. The positive predictive value (PPV), negative predictive value (NPV), and accuracy were also calculated with a confidence interval (CI) of 95%.

## Results

The present study targeted 53 patients enrolled between August 4, 2014, and September 4, 2015. Of the 53 patients, 3 were excluded: 2 did not consent to participate and 1 had incomplete colon preparation. Therefore, 50 patients (age: 21–51 [mean:  $35.8 \pm 7.2$ ] years) were included in the analysis.

The most frequently reported symptoms were chronic pelvic pain ( $n=29$ ; 58.0%) and abdominal pain ( $n=27$ ; 54.0%).

Thirty-six patients (72.0%) exhibited normal colonoscopic findings; the other 14 (28%) were stratified based on our endoscopic variables as follows: 5 patients (10%) with fold thickening, 5 (10%) with bulging without nodules, 3 (6%) with bulging with nodules, and 1 (2%) with changes in the mucosa.

According to the TRUS findings, 33 (66.0%) patients had suspected endometriosis, but only 14 (28%) had endometriotic lesions in contact with the rectum or sigmoid, in the following proportion: rectum (6 patients, 12%) and sigmoid (8 patients, 16%) (►Table 1).

►Table 2 shows the demographic and clinical characteristics of the 14 patients with intestinal endometriosis: age, symptoms, endoscopic findings, history of pelvic surgery, presence of free fluid in the cavity, location of the foci of intestinal endometriosis, and the degree of infiltration in the wall of the sigmoid colon or rectum.

In 9 of the 14 patients, it was possible to evaluate the circumferential involvement of the colon or rectum, distributed as follows: 1/8 of the circumference (1 patient), 1/4 (2 patients), 1/3 (4 patients), and 1/2 (2 patients).

The correlation of the endoscopic findings with the presence of endometriosis, regardless of location, provided the following results (►Table 3): prevalence of 66.0% (95%CI: 51.0–78.8%), sensitivity of 36.4% (95%CI: 20.4–54.9%), specificity of 88.2% (95%CI: 63.6–98.5%), PPV of 85.7% (95%CI: 57.2–98.2%), NPV of 41.7% (95%CI: 25.5–59.2%), accuracy of

**Table 1** Location and infiltration of endometriosis foci diagnosed by transrectal ultrasound: Correlation between the endoscopic findings

	n	%
<b>Main focus of endometriosis</b>		
Rectum	6	18.2
Sigmoid	8	24.2
Other location	19	57.5
<b>Infiltration</b>		
Serosa	1	3.0
Muscularis propria	6	18.2
Submucosa	7	21.2
Without infiltration	19	57.6

54.0% (95%CI: 39.3–68.2%), positive likelihood ratio of 3.1 (95%CI: 0.8–12.3), negative likelihood ratio of 0.7 (95%CI: 0.5–1.0), and area under the receiver operating characteristic (ROC) curve of 0.623 (95%CI: 0.508–0.738).

The results shown in ►Table 4 were obtained by crossing the endoscopy data with the presence of endometriosis in the rectum or distal sigmoid and were as follows: prevalence of 28.0% (95%CI: 16.2–42.5%), sensitivity of 78.6% (95%CI: 49.2–95.3%), specificity of 91.7% (95%CI: 77.5–98.3%), PPV of 78.6% (95%CI: 49.2–95.3%), NPV of 91.7% (95%CI: 77.5–98.3%), accuracy of 88.0% (95%CI: 75.7–95.5%), positive likelihood ratio of 9.43 (95%CI: 3.0–28.8), negative likelihood ratio of 0.2 (95%CI: 0.1–0.6), and area under the ROC curve of 0.851 (95%CI: 0.733–0.942).

The presence of an endometriosis lesion and the degree of infiltration in the sigmoid or rectum in patients who displayed alterations during the endoscopic evaluation are described in ►Table 5. It is important to note that the endoscopic changes and the ultrasound findings were located at the same distance from the anal verge. In addition, the endoscopic images (►Figs. 1, 2, 3 and 4) that yielded 91.7% (95%CI: 77.5–98.2%) specificity for intestinal endometriosis in the rectum or sigmoid.

The endoscopic and ultrasonographic alterations were marked using the distance between the anal verge and the endometrial deposit, confirming that the endoscopic alterations found were the same as those present in the ultrasound.

## Discussion

Efforts regarding early diagnosis of EDT are valuable because of its importance in reproductive-aged women, the difficulty of its diagnosis, the cost associated with the diagnosis and/or treatment, and particularly the decline in the quality of life of affected patients. Therefore, this study demonstrates the importance of thorough evaluation of the distal sigmoid and rectum in women of childbearing age who present with symptoms associated with deep EDT and are referred

**Table 2** Demographic and clinical characteristics of the 14 patients with intestinal endometriosis included in the study: Correlation between the endoscopic findings and intestinal endometriosis in the distal sigmoid and rectum, as confirmed via transrectal ultrasound in São Paulo in 2014 to 2015 ( $n = 50$ )

Nr. of patient	Age	Symptoms	Pelvic surgery	Colonoscopy	Free fluid	Location of endometriosis	Infiltration
5	47	Abdominal + pelvic pain		Bulging with nodules	No	Sigmoid	Submucosa
11	46	Abdominal + pelvic pain		Fold thickening	Yes	Sigmoid	Muscularis propria
13	34	Infertility and abdominal + pelvic + fundus of the pouch pain		Bulging	Yes	Sigmoid	Muscularis propria
14	36	Infertility and pelvic pain		Bulging with nodules	No	Sigmoid	Submucosa
18	26	Pelvic pain		Normal	No	Rectum	Serosa
19	29	Pelvic + fundus of the pouch pain	Cesarean section	Bulging	No	Rectum	Muscularis propria
26	34	Abdominal pain		Bulging with nodules	Yes	Sigmoid	Mucosa
28	44	fertility and abdominal + fundus of the pouch pain		Bulging with nodules	Yes	Rectum	Muscularis propria
30	40	Pelvic + abdominal pain		Changes in the mucosa	No	Rectum	Submucosa
34	38	Pelvic + abdominal + fundus of the pouch pain and intestinal bleeding	Cesarean section	Bulging	Yes	Sigmoide	Submucosa
35	37	Pelvic pain		Bulging	Yes	Sigmoid	Muscularis propria
42	33	Infertility and abdominal pain		Normal	No	Sigmoid	Submucosa
47	32	Abdominal pain		Thickening	No	Rectum	Submucosa
50	40	Pelvic + abdominal pain	Cesarean section	Normal	No	rectum	Muscularis propria

for colonoscopy, with emphasis on specific endoscopic alterations that may be associated with endometrial deposits, to enable an early diagnosis.

The characteristics of the population in this study were similar to those described in previous literature. The patients were aged 21 to 51 (mean  $35.8 \pm 7.2$ ) years, which is in line

**Table 3** Results of endoscopy and transrectal ultrasound: Correlation between the endoscopic findings and intestinal endometriosis in the distal sigmoid and rectum, as confirmed via transrectal ultrasound in São Paulo in 2014 to 2015 ( $n = 50$ )

Endoscopy	Transrectal ultrasound – endometriosis		Total n (%)
	No	Yes	
	n (%)	n (%)	n (%)
Normal	15 (30)	21 (42)	36 (72)
Altered	2 (4)	12 (24)	14 (28)
Total	17 (34)	33 (66)	50 (100)

with the age associated with a higher incidence of EDT.<sup>5-7</sup> The most common symptoms observed in the study were similar to those of other studies,<sup>4,7,8</sup> with chronic pelvic (58%) and abdominal (54%) pains being the most frequent.

**Table 4** Results of endoscopy and transrectal ultrasound of the patients with intestinal endometriosis: Correlation between the endoscopic findings and intestinal endometriosis in the distal sigmoid and rectum, as confirmed via transrectal ultrasound in São Paulo in 2014 to 2015 ( $n = 50$ )

Endoscopy	Transrectal ultrasound – intestinal endometriosis		Total n (%)
	No	Yes	
	n (%)	n (%)	n (%)
Normal	33 (66)	3 (6)	36 (72)
Altered	3 (6)	11 (22)	14 (28)
Total	36 (72)	14 (28)	50 (100)

The endoscopy results revealed that 36 (72.0%) patients had normal findings, and the other 14 (28%) were stratified according to the endoscopic variables. It was, therefore, observed that mucosal involvement in endometriosis was a rare event, as described in the literature.

The results of TRUS showed a prevalence of endometriosis of 66% (33 patients) in the study population, likely due to the fact that the sample comprised those with a previous diagnosis of or symptoms strongly suggestive of EDT.

The patients were stratified into two groups. One group comprised patients with EDT but with the focus distant from the rectum or sigmoid: the other group comprised patients with EDT adhered to or in contact with the rectum or distal sigmoid. We diagnosed 14 patients with EDT adhered to or in contact with the rectum or sigmoid, resulting in an incidence rate of intestinal EDT of 28% (–Table 4), a fact, again, explained by the characteristics of the study population.

–Table 5 describes the characteristics of the patients with endometriotic lesions in the rectum or sigmoid and shows that all presented with chronic abdominal and/or pelvic pain

**Table 5** Patients with endoscopic changes and correlation with transrectal ultrasound : Correlation between endoscopic findings and intestinal endometriosis in the distal sigmoid and rectum, as confirmed via transrectal ultrasound in São Paulo in 2014 to 2015 ( $n = 50$ )

Nr. of patient	Age	Endoscopic change	Result TRUS/ infiltration
5	47	Bulging with nodules	Submucosa
11	46	Fold thickening	Muscularis propria
13	34	Bulging without nodules	Muscularis propria
14	36	Bulging with nodules	Submuocsa
19	29	Bulging without nodules	Muscularis propria
25	39	Fold thickening	Without infiltration/ without endometriosis
26	34	Bulging with nodules	Mucosa
28	44	Bulging without nodules	Muscularis propria
30	40	Changes in the mucosa	Submucosa
33	51	Fold thickening	Without infiltration/ with endometriosis
34	38	Bulging without nodules	Submucosa
35	37	Bulging without nodules	Muscularis propria
43	29	Fold thickening	Without infiltration/ without endometriosis
47	32	Fold thickening	Submucosa

as symptoms, suggesting that intestinal foci are, in fact, associated with a higher incidence of pain in these patients.

The observed endoscopic changes were fold thickening, bulging, bulging with nodules, and mucosal changes. No patient presented with obstruction of the sigmoid or rectum. Infiltration of the serosa, muscularis propria, submucosa, and mucosa was observed, but it was not possible to establish a relationship between the degree of infiltration and endoscopic findings due to the low sample size representing each variable.

The analysis of the data regarding the presence of EDT and its location showed a low sensitivity of endoscopy for the diagnosis of EDT in the pelvic cavity (only 36.4%), which suggests that endoscopic examination is not indicated for the diagnosis of pelvic EDT. However, the data on specificity (88.2%) and PPV (85.7%) demonstrate that endoscopy does present some association with EDT in this location.

The analysis of the relation between the presence of intestinal EDT and the changes evaluated in this study (endoscopic variables) yielded better results: a sensitivity of 78.6%, specificity of 91.7%, PPV of 78.6%, and NPV of 91.7%. These confirm that in the present study, the changes detected in the endoscopic assessment were strongly associated with intestinal EDT in the rectum and distal sigmoid.

Among patients with endoscopic alterations, three exhibited false positive results for deep EDT and all three displayed fold thickening on endoscopy. When this variable was analyzed individually, five cases were detected, two with endometriosis in the rectum or sigmoid and three false positives. This suggests that if the variable *fold thickening* is excluded from the analysis, a table with more specific endoscopic variables is obtained, albeit with a lower sensitivity for EDT in those segments. The small sample size associated with each variable means that the CIs associated with the sensitivity, specificity, and accuracy values specific to each endoscopic variable were too wide-ranging.

The study possessed some limitations, the most important being the small number of existing studies on the subject, which prevented us from performing a statistical calculation to determine the minimum number of patients, thereby prompting us to conduct an initial study with 50 patients. The fact that data collection was performed at an endoscopy department that specializes in colonoscopy and TRUS, with a significant number of patients referred to the department already having a diagnosis of deep EDT, was critical for the results obtained. It is important to note that all of the tests were performed by the same two endoscopists with experience in cases of deep EDT, a fact that possibly affected the final result.

## Conclusion

Endoscopic changes detected in the distal sigmoid colon and rectum were correlated with the presence of EDT in these segments, as confirmed using TRUS.

Considering the results and limitations of the study, it can be suggested that colonoscopies performed in patients, with pelvic and/or chronic abdominal pain should include

a thorough examination of the rectum and distal sigmoid, focusing on the alterations described in the present study. If some of these changes are detected, an examination for the confirmation of intestinal EDT should be requested.

Future studies focusing on these endoscopic changes in different populations and involving larger sample sizes are required to confirm these results. However, the information reported herein is relevant and should be disseminated among colonoscopists both in training and in practice.

#### Conflict of Interests

The authors have no conflict of interests to declare.

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