Transvaginal ultrasonography with or without bowel preparation in the diagnosis of rectosigmoid endometriosis: prospective study

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Running Head: The diagnosis of rectosigmoid endometriosis

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Abstract

Objectives: The primary objective of the study was to compare the diagnostic accuracy of the transvaginal ultrasonography (TVS) with and without bowel preparation (BP) in assessing the presence of rectosigmoid endometriosis. The secondary objectives were to compare the diagnostic accuracy of the two techniques in estimating infiltration of the submucosa, length of the largest rectosigmoid nodules, distance of the nodules from the anal verge and presence of multifocal disease.

Methods: Patients with pain symptoms of more than 6 months duration and/or suspicion of endometriosis underwent TVS with and without BP within an interval of 1 week to 3 months. The exams were independently and blindly performed by two ultrasonographers. Ultrasonographic results were compared with surgical and histological findings.

Results: 262 patients were included in the study; 118 patients had rectosigmoid endometriosis at surgery. There was no significant difference in the accuracy of TVS with or without BP in diagnosing the presence of rectosigmoid endometriosis ($p = 0.453$). There was no significant difference in the accuracy of TVS with or without BP in diagnosing submucosal infiltration ($p = 0.238$) and multifocal disease ($p = 0.727$). There was no significant difference in the accuracy of TVS with or without BP in estimating the main diameter of the largest nodule ($p = 0.644$) and the distance between the more caudal rectosigmoid nodule and the anal verge ($p = 0.162$).

Conclusions: BP does not increase the diagnostic performance of TVS in detecting rectosigmoid endometriosis and in assessing the characteristics of these nodules.

Introduction

Rectosigmoid endometriosis is one of the most severe forms of deep endometriosis. It causes pain and several intestinal complains such as constipation, diarrhea, intestinal cramping, abdominal bloating, feeling of incomplete evacuation, passage of mucus and rectal bleeding during the menstrual period [1]. An accurate diagnosis of rectosigmoid endometriosis allows offering to the patient either a hormonal [2, 3] or surgical treatment [4]. Furthermore, among patients requiring surgery, the characteristics of the rectosigmoid endometriosis (such as size of the nodules and presence of multifocal disease) allows to preoperatively predict the type of surgical procedures (shaving, disk resection or segmental bowel resection).

Transvaginal ultrasonography (TVS) currently represents the first line investigation for the diagnosis of rectosigmoid endometriosis [5]. Previous studies showed that TVS is as accurate as rectal endoscopic sonography [6], magnetic resonance imaging (MRI) [7], multidetector computerized tomography enema (MDCT-e) [8] in the diagnosis of rectosigmoid endometriosis. Furthermore, TVS is very cheap compared with radiological imaging, it is well tolerated by the patients, non-invasive and it does not require anesthesia.

Some ultrasonographers use bowel preparation (BP) prior to non-enhanced TVS with the aim to increase the diagnostic performance of this exam in detecting rectosigmoid endometriosis [9-13]; however, most of the authors do not use BP [7, 14-21]. Recently a prospective study with small sample size (40 women) suggested that BP facilitates the diagnosis of rectosigmoid endometriosis [22]. However, the usefulness of BP in patients undergoing TVS for the diagnosis of rectosigmoid endometriosis remains to be established. Furthermore, there is no agreement of the type of BP used before TVS; it may consist of a simple rectal enema performed about one hour before TVS [9] or it may include some days of diet and the administration of oral laxatives on the eve of the exam [23] and thus it may be uncomfortable for the patients.

The objective of this prospective study is to assess if BP increases the diagnostic performance of TVS in the diagnosis of rectosigmoid endometriosis.

Materials and methods

Objectives of the study

The primary objective of the study was to assess the performance of the TVS with and without BP in diagnosing the presence of rectosigmoid endometriosis. The secondary objectives of the study were: to assess the accuracy of the two ultrasound techniques in diagnosing the presence of infiltration of the submucosal layer of the bowel wall; to compare the precision of the two techniques in estimating the length of the largest rectosigmoid nodules, the distance of the more caudal rectosigmoid nodules from the anal verge and the presence of multifocal disease.

The local Ethics Committee approved the study protocol (430REG2016). Patients participating in the study signed a written consent form.

Study population

This prospective study included all consecutive patients of reproductive age referred for the first time to our institution because of pain symptoms of more than 6 months duration and/or suspicion of endometriosis. The study was performed between October 2016 and April 2018. Criteria of exclusion from the study were: previous diagnosis of colorectal endometriosis, previous intestinal surgery (other than appendectomy), previous hysterectomy or bilateral ovariectomy, virgin patients or patients in whom TVS could not be performed.

Study design

Transvaginal ultrasonography without BP was performed at the time of the first consultation at our institution. Patients were requested to undergo a TVS with BP within an interval of 1 week to 3 months from the first consultation as routinely performed at our institution.

The following BP was used for the purpose of the study: a low residue diet administered on the three days before the exam, an oral laxative administered on the eve of the exam (sodium picosulfate 10.0 mg, light magnesium oxide 3.5 g, and anhydrous citric acid 10.97 g; CitraFleet, Casen Recordati SL, Zaragoza, Spain) and a rectal enema (120 ml of sodium diphosphate) administered within few hours before the exam.

The exams were performed by two gynecologists (C.S. and U.L.R.M) with extensive experience in the ultrasonographic diagnosis of endometriosis who were informed of the patients' clinical history and symptoms, but were blinded to the results of vaginal examination. The consultant informing the patient about the study and obtaining the written consent performed the first TVS without BP. The other consultant performed the second TVS with BP. The exams were performed independently and blindly by the two consultants. No distension of the rectum or vagina with contrast medium [23, 24] was used during the ultrasonographies. Only two-dimensional images were obtained during the

study (Figure 1 and Figure 2). Only patients who underwent laparoscopy within 6 months from the second ultrasonographic exam were included in the study.

Ultrasonographies were performed by using a Voluson E6 or a Voluson S8 machine (GE Healthcare, Milwaukee, WI, USA). The exams were performed accordingly to a standardized protocol. The presence of rectosigmoid endometriosis was defined as endometriotic lesions reaching at least the intestinal muscularis propria [25] that are usually associated with smooth-muscle hyperplasia and fibrosis. The recto-sigmoid nodules usually appear as a thickening of the hypoechoic muscularis propria or as hypoechoic nodules, with or without hyperechoic foci with blurred margins [5]. The size of the intestinal nodule was defined as the mid-sagittal diameter. Since TVS allows visualizing the normal rectal wall layers [5], the infiltration of intestinal submucosa was estimated (Figure 3a and Figure 3b). The location of the intestinal nodules was classified accordingly to the definition of the International Deep Endometriosis Analysis (IDEA) group [5] as follows: lower anterior rectal nodules (located below the level of the insertion of the uterosacral ligaments on the cervix and thus retroperitoneal), upper anterior rectal nodules (located above the insertion of the uterosacral ligaments on the cervix and thus visible at laparoscopy), nodules of the rectosigmoid junction (located at the level of the uterine fundus) and anterior sigmoid nodules (located above the level of the uterine fundus). The distance between the lower margin of the more caudal nodule and the anal verge was estimated. The distance was evaluated by retracting the probe down to the perineal plane as previously performed by other authors [26]; straight or curved lines with calipers were used to trace the anterior rectosigmoid muscular layer until the anal verge. In case of lower and upper rectal nodule the distance was estimated using a single ultrasonographic image. In case of nodules not so low as to be included in a single screenshot (rectosigmoid and sigmoid

nodules), the estimation of the distance was performed by using a split-screen [26]. The presence of multifocal disease (defined as additional nodules that affected the rectosigmoid) was assessed. The findings of TVS with and without BP were compared with surgical and histological findings.

The demographic characteristics of the patients were recorded at the time of inclusion in the study. The ultrasonographers subjectively evaluated the quality of BP by using a 5-point Likert scale (from 1 "very poor BP" to 5 "excellent BP" with completely empty bowel).

Assessment of symptoms

Symptoms were systematically investigated at the time of the first consultation. The presence of pain symptoms (dysmenorrhea, deep dyspareunia, chronic pelvic pain, and dyschezia) was assessed; the intensity of these symptoms was rated on a 100 mm visual analogue scale (VAS). The presence of intestinal symptoms was investigated as previously described [27]; furthermore, intestinal symptoms were evaluated using the Gastrointestinal Quality of Life Index (GIQLI) [28].

Surgical procedures

The surgical procedures were performed by an experienced laparoscopic surgeon (S.F.); a colorectal surgeon (C.S.) participated to the procedures when bowel surgery was required. The surgeons were aware of the findings of the two ultrasonographic exams. Rectosigmoid endometriotic nodules were excised by one of the following techniques: shaving (nodule excision without opening the rectum), discoid resection (resection of the nodule with excision of the anterior rectal wall) or segmental resection. Shaving was performed in case of superficial involvement of the bowel by peeling the nodule off the bowel wall without breaching the intestinal lumen. Discoid resection was performed when, after initial shaving, the damage to the muscularis was judged to be

too deep and/or wide and the nodule was confined to the ventral surface of the bowel. Segmental resection was performed in case of large nodules (diameter > 2.5 cm) and multifocal disease.

During the preoperative clinic, about one month before surgery, the patients received detailed explanations on the three surgical techniques used to treat bowel endometriosis including the specific benefits and frequency of complications associated with each procedure. Patients were also informed of the potential role of hormonal treatment for bowel endometriosis [2,3] and of the risks and benefits of receiving no treatment. Following verbal discussion, a leaflet on the surgical treatment of bowel endometriosis was given to each patient. Based on the findings of the ultrasonographic exams, a specific surgical treatment for bowel endometriosis was planned (shaving, discoid resection or segmental resection). However, the patients were informed that an alternative surgical technique could be used based on intraoperative findings.

Surgery was performed by laparoscopy with the aim to excise all visible endometriotic lesions (except those on the diaphragm). After adhesiolysis, the rectosigmoid was systematically inspected to verify the presence and characteristics of the endometriotic lesions. After bowel preparation, the rectosigmoid was transected caudal (e 2.5 cm) to the endometriotic nodules using Endopath ETS-Flex stapler (Ethicon Endo-Surgery, Cincinnati, OH, USA). The cephalic portion of the rectosigmoid was extracted from the abdominal cavity and transected after inspection and palpation. The anastomosis was performed intra-abdominally using a Curved Intraluminal Stapler (ILS 29, Ethicon Endo-Surgery). During surgery the distance between the more distal rectosigmoid nodule from the anal verge was estimated by introducing a cannula in the bowel.

Histological assessment of bowel specimens

The rectosigmoid specimens were sent unfixed to the pathology laboratory and they were evaluated in a standardized fashion. Each sample was described macroscopically, measured and opened or filled with absorbent paper to ensure optimal fixation without altering the anatomical shape. Each specimen was immersed overnight in 10% buffered formalin and subsequently sampled. Areas suspected to be infiltrated by endometriosis were sampled with cuts parallel to the major axis of the bowel. The histological samples were oriented to show the full thickness of the visceral wall from the mucosa to the serosa. These samples were routinely processed, included in paraffin and cut by the microtome to obtain histological sections (3 μm thickness) that were stained with hematoxylin and eosin. The depth of infiltration of endometriosis was assessed on the basis of the most luminal anatomical structure involved and consequently reported as infiltration of the muscularis propria, the submucosa and the mucosa (Figure 4). The largest diameter of the nodules and the presence of multifocal disease (presence of one or more lesions that affected the sigmoid colon and that were associated with the colorectal primary lesion) were evaluated.

Statistical analysis

Although the most popular practice is to perform TVS without BP [7, 14, 16, 17, 19-21, 29], it could be theoretically advocated that the use of BP may improve the accuracy of the technique; therefore, we decided to use a non-inferiority study design. We based our sample size calculation on the accuracy calculated from a recently published meta-analysis [30] including only the studies investigating the role non enhanced TVS with BP (98.9%) [9, 10]. We expected that the accuracy was identical between TVS with and without BP. We calculated that 262 patients (undergoing TVS with BP, TVS without BP and laparoscopy) were required to provide 95% power to show the non-inferiority of TVS without BP, with a non-inferiority margin of 3%.

Accuracy, sensitivity, specificity, positive predictive value and negative predictive value were calculated for TVS with and without BP. The diagnostic value of each test was also assessed using positive likelihood ratio and negative likelihood ratio. Efficacy parameters were calculated with 95% confidence intervals (CIs). The McNemar's test with the Yates continuity correction was used to compare the accuracy of TVS with and without BP in the diagnosis of rectosigmoid endometriosis. The mean differences of the measurements of nodule size and distance from the anal verge were estimated by subtracting the measurements performed by TVS with and without BP from the measurements obtained on histopathology (for nodule size) and during surgery (for distance from the anal verge) and. Data were presented as mean and standard deviation (SD); limits of agreement (LOA) were calculated as mean difference ± 2 SD of the difference. The normal distribution of continuous data was assessed by the Kolmogorov-Smirnov normality test. The Student's t test was used to compare normally distributed continuous variables while the Mann-Whitney U-test was used to compare abnormally distributed data. Categorical variables were assessed by the chi squared test and the Fisher's exact test, as appropriate. The SPSS software version 20.0 (SPSS Science, Chicago, IL, USA) was used for statistical analysis. $p < 0.05$ was considered statistically significant.

Results

Characteristics of the study population

Out of 297 patients invited to participate to the study, 24 (8.1%) refused. 9 patients did not undergo surgery and 2 patients were lost at follow-up. Therefore, 262 patients were included in the study (Figure 5); the characteristics of the study population are shown in Table 1. 118 patients (45.0%) had rectosigmoid endometriosis at surgery. 136 (51.9%) patients had endometriosis without rectosigmoid involvement. The other patients did not have laparoscopic diagnosis of endometriosis

(pelvic adhesions were observed in three patients, pelvic congestion syndrome in one patient and four patients did not have laparoscopic evidence of pelvic pathologies).

The mean (± SD) time lapse between the two exams was 4.9 ± 2.7 weeks; the mean (± SD) time lapse between TVS with BP and surgery was 16.2 ± 4.9 weeks. Among patients with rectosigmoid endometriosis, 63 underwent bowel resection, 36 discoid resection and 19 shaving. The largest nodule was located on the sigmoid in 28 patients, on the rectosigmoid in 26 patients, on the upper rectum in 33 patients and on the lower rectum in 31 patients. In patients treated by bowel resection, the mean (± SD) length of the resected bowel specimens was 11.6 ± 2.3 cm.

Diagnostic performance of TVS with and without BP in diagnosing rectosigmoid endometriosis

TVS with and without BP was successfully performed in all the patients; no patient required interrupting the exams because of pain. Table 2 shows the sensitivity, specificity, positive predictive value, negative predictive value, positive likelihood ratio and negative likelihood ratio of TVS with and without BP in diagnosing the presence of rectosigmoid endometriosis. The McNemar's test showed that there was no significant difference in the accuracy of TVS with or without BP in diagnosing the presence of rectosigmoid endometriosis ($p = 0.453$; Table 3).

Diagnostic performance of TVS with and without BP in assessing secondary outcomes

At histology, out of 118 patients with rectosigmoid endometriosis, 37 patients (31.4%) had infiltration of the intestinal submucosa. In 103 patients the presence of rectosigmoid nodules was correctly diagnosed by TVS with and without BP; the McNemar's test showed that there was no significant difference in the accuracy of TVS with or without BP in diagnosing submucosal infiltration in patients with ultrasonographically diagnosed rectosigmoid endometriosis ($p = 0.238$; Table 4 and Table 5).

At histology, out of 118 patients with rectosigmoid endometriosis, 23 patients (19.5%) had multifocal disease. The McNemar's test showed that there was no significant difference in the accuracy of TVS with or without BP in diagnosing multifocal disease in patients with ultrasonographically diagnosed rectosigmoid endometriosis (p = 0.727; Table 6 and Table 7).

The mean (± 2 SD) main diameter of the largest nodule at histology was 27.2 ± 6.9 mm. The mean difference between the size of the largest nodule estimated by TSV and histopathology was 1.7 ± 1.1 mm (95% C.I., 1.5 to 2.0 mm; LOA, -0.5 to 4.0) for TVS without BP and 1.7 ± 1.3 (95% C.I., 1.5 to 2.0 mm; LOA, -0.8 to 4.3) for TVS with BP (p = 0.644).

At surgery, the mean (± 2 SD) distance between the more distal rectosigmoid nodule and the anal verge was 15.0 ± 5.3 mm. The mean difference in the distance between the more distal nodule and the anal verge estimated by TSV was 2.8 ± 1.7 mm (95% C.I., 2.5 to 3.1 mm; LOA, -0.6 to 6.2) for TVS without BP and 2.6 ± 2.0 (95% C.I., 2.2 to 3.0 mm; LOA, -1.4 to 6.6) for TVS with BP (p = 0.162).

The quality of BP was subjectively judged to be excellent or good in 97.7% (256/262) of the patients (mean ± SD quality of BP on a 5-point Likert scale, 4.6 ± 0.5).

Discussion

This prospective study shows that BP does not increase the diagnostic performance of TVS in detecting rectosigmoid endometriosis and in assessing the characteristics of these nodules (infiltration of the submucosal layer, presence of mutifocal disease, main diameter of the largest nodule, and distance between the more caudal nodule and the anal verge).

Some strengths characterize the current study: the prospective design, the large sample size and the fact the two TVSs were performed by blinded ultrasonographers. Another strength of this study consists in the fact that all the patients underwent TVS with BP using a standardized protocol to clean the bowel and an optimal bowel cleansing was obtained. This protocol included a low residue diet on the three days before the exam, an oral laxative and a rectal enema administered within few hours before the exam. Although this protocol may appear more extensive that what is commonly used in clinical practice, it was chosen to perform TVS in ideal conditions of bowel cleansing. In line with this, BP was judged to be excellent or good by the ultrasonographers in 97.7% of the patients. However, this optimal BP did not increase the diagnostic performance of TVS.

Some authors suggested that improvement in the diagnostic accuracy of TVS might be obtained using a series of modified sonographic techniques based on the introduction of saline solution or gel in the vagina and/or rectum. These techniques, named “enhanced” or “modified” TVS, may be useful when the findings of TVS are inconclusive or when the sonographers have limited experience in the diagnosis of deep infiltrating endometriosis. In fact, the distention of the rectum may enhance the visualization of rectosigmoid endometriosis [23, 24, 31]. The current study investigated

the impact of BP only on non-enhanced TVS. It is possible that BP has a different role when TVS is performed by distending the rectosigmoid with saline solution or gel.

This study was performed in a referral center for the treatment of endometriosis and the high prevalence of rectosigmoid endometriosis in the study population (45.0%) represents a bias of the study. Therefore, the results of this study cannot be extrapolated to the general population of women with clinical suspicion of deep endometriosis. Another limitation of this study consists in the fact that TVSs were performed by expert ultrasonographers; thus, we cannot exclude that BP affects the diagnostic performance of TVS performed by less experienced ultrasonographers. Another potential limitation of this study consists in the fact that the surgeons were aware of the findings of preoperative TVS. However, it seems unlikely that this may have influenced the surgical evaluation of endometriosis. Finally, in this study did not investigate whether BP influences the detection of deep infiltrating endometriosis affecting the anterior compartment, the uterosacral ligaments, the vagina and the rectovaginal septum. Lastly, the patients included in this study underwent surgery because of persistence of pain symptoms and intestinal complaints despite a wide use of hormonal therapies (Table 1). However, there is growing evidence that deep endometriosis [32] and also colorectal endometriosis [2, 3, 33] can be managed by administering hormonal therapies; therefore, the results of this study cannot be extrapolated to the whole population of patients who do not require surgical treatment of endometriosis.

In the current study TVS was used to estimate the distance between the lower margin of the more caudal nodule and the anal verge. The consensus by the International Deep Endometriosis Analysis (IDEA) group [5], reviews by experts [12,34], and clinical studies [26,35] supported the use of TVS in measuring this distance. However, while this measurement can be easily performed in case of rectal

nodules, but it may be less precise when the endometriotic nodules are located on the rectosigmoid junction or on the sigmoid. Other imaging techniques have been proposed to increase the precision of this measurement including rectal endoscopic sonography [36], computed tomographic colonography [35], computed tomography enema [36]. However, in clinical practice, it is relevant to detect lower lesions because their surgical treatment is associated with a higher risk of complications.

The findings of this study have clinical implications. Patients with suspicion of colorectal endometriosis who have the first consultation in a referral center may immediately undergo TVS without the need to postpone the exam because of BP. Furthermore, the patients can avoid the discomfort caused by BP. For example, sodium picosulfate/magnesium may be associated with a dehydrating effect that is demonstrated by a reduction in body weight and an increase in hemoglobin levels; thus some patients may experience postural hypotension [37]. In addition, BP (such as sodium picosulfate/magnesium) increases the frequency and the force of intestinal peristalsis which causes abdominal cramps and pain, nausea, and disturbances of daily activities [37]. Theoretically, the increased intestinal peristalsis may also impair the visualization of intestinal and pelvic endometriosis at the time of TVS. Finally, the cost of BP can be saved.

In conclusion, this study shows that BP does not improve the performance of non-enhanced TVS in diagnosing rectosigmoid endometriosis. Further studies should evaluate whether BP should be used when rectosigmoid distention with water and/or gel is used during TVS.

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Legend to Figures

Figure 1. Endometriotic nodule infiltrating the rectal wall (asterisk) diagnosed without BP (Figure 1a) and with BP (Figure 1b).

Figure 2. Endometriotic nodule infiltrating the rectal wall (asterisk) diagnosed without BP (Figure 2a) and with BP (Figure 2b).

Figure 3a. TVS without BP showing a hypoechoic nodule infiltrating the muscularis propria of the rectum (asterisk). The submucosa is not infiltrated (white arrowheads).

Figure 3b. TVS without BP showing a hypoechoic nodule (asterisk) infiltrating both the muscularis propria and the submucosa of the rectum (black arrowheads).

Figure 4. Histological sections stained with hematoxylin and eosin showing the depth of infiltration of endometriosis in the rectosigmoid wall.

Figure 4A. Endometriosis infiltrates the large bowel mucosa partially replacing the epithelial lining (arrowheads; original magnification 40X).

Figure 4B. Endometriosis infiltrates the large bowel submucosa (arrowheads); the mucosa (asterisk) is not infiltrated (original magnification 40X).

Figure 4C. Endometriosis (E) infiltrates the large bowel muscularis propria; a disarray of the muscle bundles can be observed. The submucosa (asterisk) and the mucosa (arrows) are not infiltrated (original magnification 20X).

Figure 5. Flow diagram showing recruitment and progress of participants through the study.

Tables

Table 1. Demographic characteristics of the study population

	Patients with rectosigmoid endometriosis (n = 118)	**Patients without rectosigmoid endometriosis** (n = 144)	**p**
Age (years; mean ± SD)	33.0 ± 4.9	32.1 ± 4.3	0.300
Body mass index (kg/m^2; mean ± SD)	23.4 ± 2.2	23.8 ± 2.1	0.264
Previous live births (n, %)	18 (15.3%)	26 (18.1%)	0.662
Hormonal therapies at the time of the study (n, %)	86 (72.9%)	95 (70.0%)	0.285
Combined contraceptives			
- sequential oral contraceptive	18 (15.2%)	26 (18.0%)	0.546
- continuous oral contraceptive pill	21 (17.8%)	15 (10.4%)	0.084
- extended regimen oral contraceptive	6 (5.0%)	5 (3.5%)	0.517
- vaginal ring	9 (7.6%)	16 (11.1%)	0.340
- transdermal patch	2 (1.7%)	6 (4.2%)	0.247
Progestins			
- desogestrel	5 (4.2%)	6 (4.2%)	0.977
- dienogest	10 (8.5%)	8 (5.6%)	0.353
- norethindrone acetate	9 (7.6%)	9 (6.3%)	0.661
- etonogestrel subdermal implant	1 (0.8%)	3 (2.1%)	0.417
- levonorgestrel releasing intrauterine device	3 (2.5%)	1 (0.7%)	0.225
Gonadotropin releasing hormone analogues	2 (1.7%)	0 (0.0%)	0.117
Previous surgery for endometriosis (n, %)	32 (27.1%)	35 (24.3%)	0.706
Pain symptoms			
Prevalence of dysmenorrhea (n, %) *	75 (92,6%)	106(93,0%)	0.833
Intensity of dysmenorrhea (mean ± SD) *	66,8 ±9.9	67,1 ± 8.5	0.810
Prevalence of deep dyspareunia (n, %)	88 (74.6%)	104 (72.2%)	0.668
Intensity of deep dyspareunia (mean ± SD)	61.1 ± 11.5	59.8 ± 11.4	0.438
Prevalence of non-menstrual pelvic pain (n, %)	92 (77.9%)	110 (76.4%)	0.762

Intensity of non-menstrual pelvic pain (mean ± SD)	55.8 ± 8.2	57.3 ± 8.1	0.205
Prevalence of digestive complaints			
Dyschezia (n, %)	67 (56.8%)	70 (48.6%)	0.188
Constipation (n, %)	43 (36.4%)	34 (23.6%)	0.023
Diarrhoea (n,%)	33 (27.9%)	32 (22.2%)	0.248
Intestinal cramping (n, %)	68 (57.6%)	77 (53.5%)	0.501
Abdominal bloating (n, %)	74 (62.7%)	83 (57.6%)	0.404
Feeling of incomplete evacuation (n, %)	42 (35.6%)	20 (13.9%)	0.000
Passage of mucus (n, %)	38 (32.2%)	23 (16.0%)	0.002
Rectal bleeding (n, %)	17 (14.4%)	6 (4.2%)	0.004
GIQLI score (mean ± SD)	76.7 ± 8.6	79.0 ±9.1	0.038

* calculated in menstruating women
GIQLI: Gastro Intestinal Quality of Life Index
SD: standard deviation

Table 2. Diagnostic performance of TVS with and without BP in diagnosing the presence of rectosigmoid endometriosis

	TVS without BP	TVS with BP
Accuracy *	92.3% (88.5%-95.3%)	93.5% (89.8%-96.2%)
Sensitivity *	88.1% (80.9%-93.4%)	90.7% (83.9%-95.3%)
Specificity *	95.8% (91.2%-98.5%)	95.8% (91.2%-98.5%)
Positive predictive value *	94.6% (88.8%-97.4%)	94.7% (89.1%-97.5%)
Negative predictive value *	90.8% (85.8%-94.2%)	92.6% (87.7%-95.7%)
Positive likelihood ratio °	21.15 (9.64 – 46.43)	21.76 (9.92 - 47.73)
Negative likelihood ratio °	0.12 (0.08 – 0.20)	0.10 (0.06 – 0.17)

* Values presented as percentage and 95% confidence interval
° Values presented as ratio and 95% confidence interval

Table 3. Accuracy of TVS with and without BP in diagnosing the presence of rectosigmoid endometriosis

	TVS without BP	TVS with BP
True positive	104	107
False positive	6	6
True negative	138	138
False negative	14	11
Total	262	262

Table 4. Diagnostic performance of TVS with and without BP in diagnosing submucosal infiltration in patients with ultrasonographically diagnosed rectosigmoid endometriosis

	TVS without BP	TVS with BP
Accuracy *	84.6% (76.2%-90.9%)	88.8% (81.2%-94.1%)
Sensitivity *	60.6% (42.1%-77.1%)	71.4% (53.7%-85.4%)
Specificity *	95.8% (88.1%-99.1%)	97.2% (90.3%-99.7%)
Positive predictive value *	87.0% (68.1%-95.4%)	92.6% (75.8%-98.0%)
Negative predictive value *	84.0% (77.4%-88.9%)	87.5% (80.5%-92.2%)
Positive likelihood ratio °	14.34 (4.58-44.90)	25.71 (6.45-102.47)
Negative likelihood ratio °	0.41 (0.27-0.63)	0.29 (0.17-0.50)

The presence of rectosigmoid endometriosis was correctly diagnosed by TVS without BP in 104 patients and by TVS with BP in 107 patients.

* Values presented as percentage and 95% confidence interval
° Values presented as ratio and 95% confidence interval

Table 5. Accuracy of TVS with and without BP in diagnosing submucosal infiltration in patients with ultrasonographically diagnosed rectosigmoid endometriosis

	TVS without BP	TVS with BP
True positive	20	25
False positive	3	2
True negative	68	70
False negative	13	10
Total	104	107

Table 6. Diagnostic performance of TVS with and without BP in multifocal disease in patients with ultrasonographically diagnosed rectosigmoid endometriosis

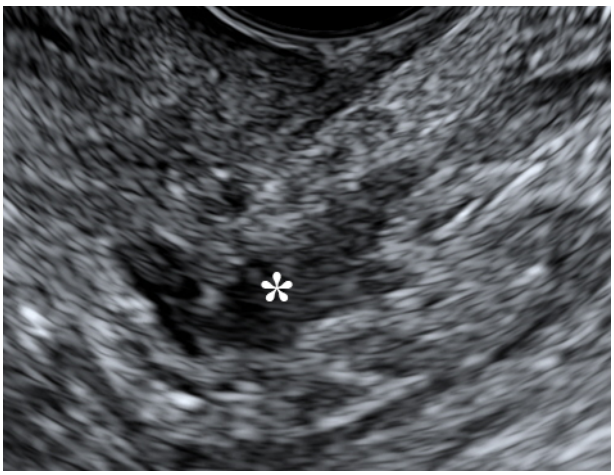
	TVS without BP	TVS with BP
Accuracy *	95.2% (89.1%-98.4%)	97.2% (92.0%-99.4%)
Sensitivity *	81.0% (58.1%-94.6%)	85.7% (63.7%-97.0%)
Specificity *	98.8% (93.5%-100.0%)	100.0% (95.8%-100.0%)
Positive predictive value *	94.4% (70.6%-99.2%)	100.0%
Negative predictive value *	95.4% (89.5%-98.0%)	96.63 (91.0%-98.8%)
Positive likelihood ratio °	67.19 (9.47-476.61)	- §
Negative likelihood ratio °	0.19 (0.08-0.47)	0.14 (0.05-0.41)

The presence of rectosigmoid endometriosis was correctly diagnosed by TVS without BP in 104 patients and by TVS with BP in 107 patients.

* Values presented as percentage and 95% confidence interval
° Values presented as ratio and 95% confidence interval
§ positive likelihood ratio could not be calculated because of the absence of false positive

Table 7. Accuracy of TVS with and without BP in diagnosing multifocal disease in patients with ultrasonographically diagnosed rectosigmoid endometriosis

	TVS without BP	TVS with BP
True positive	17	18
False positive	1	0
True negative	82	86
False negative	4	3
Total	104	107



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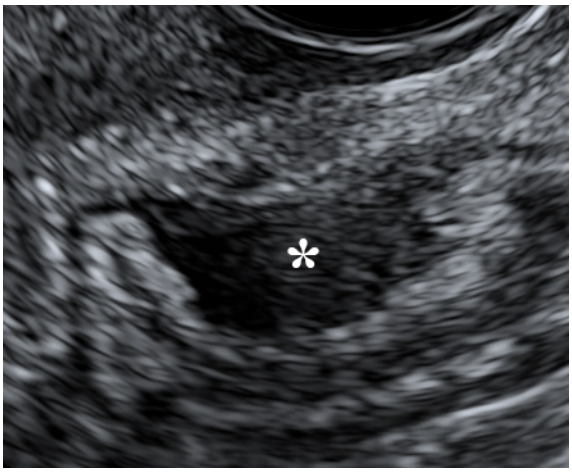

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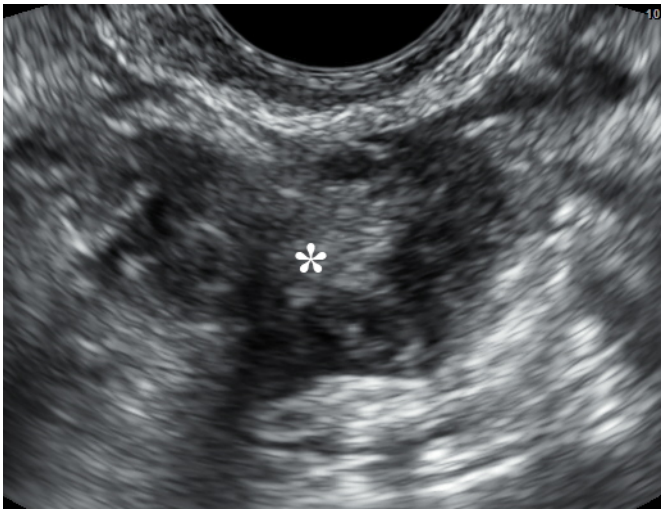

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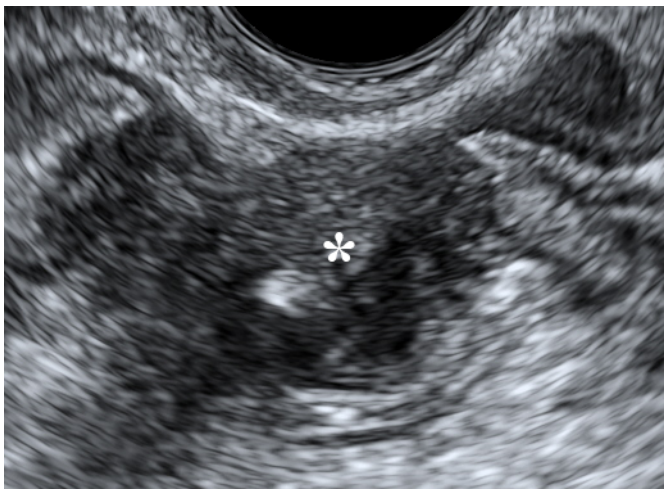

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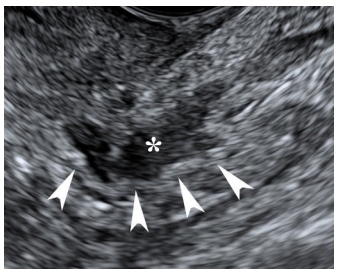

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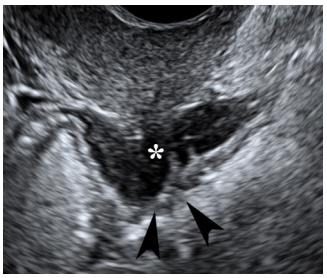

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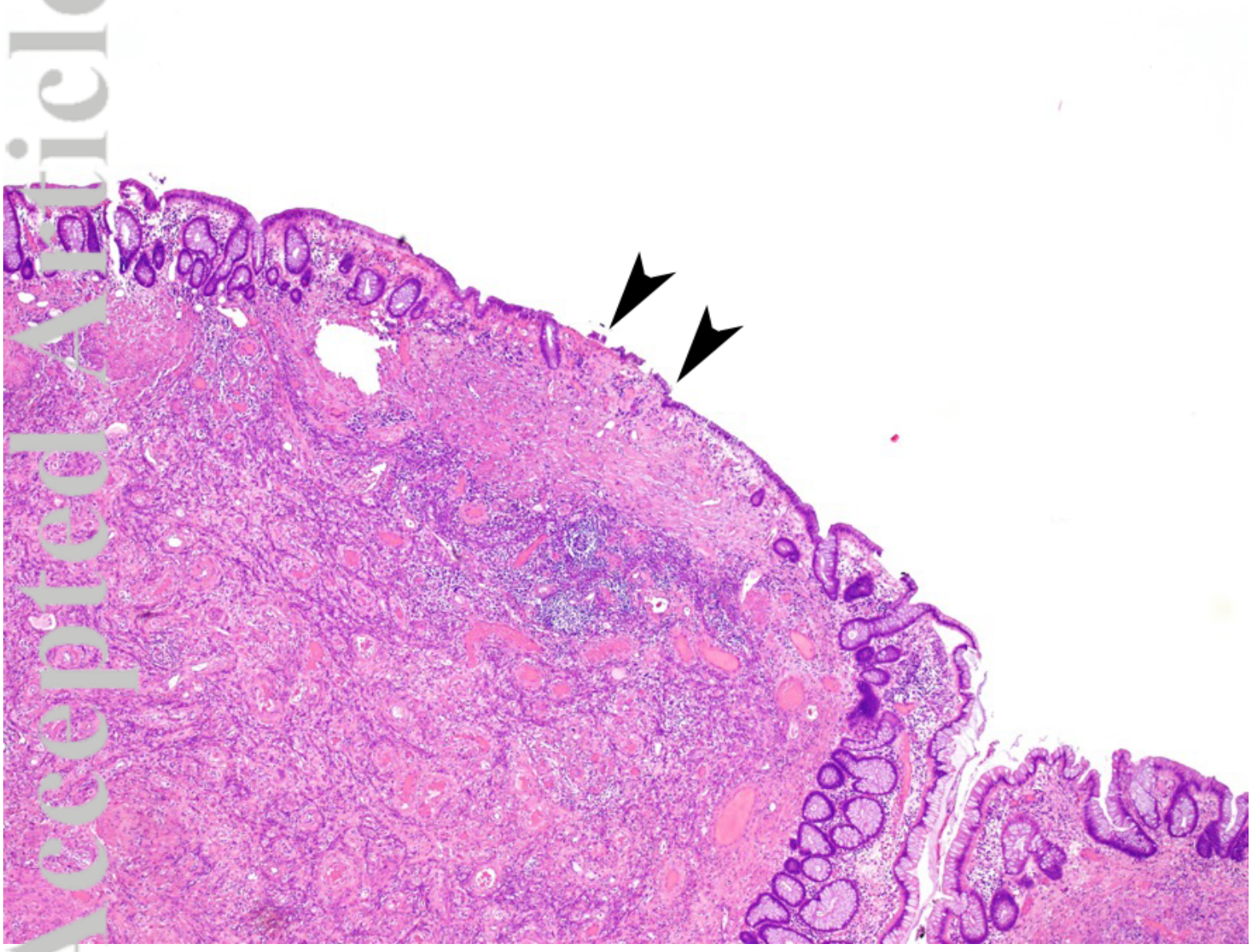

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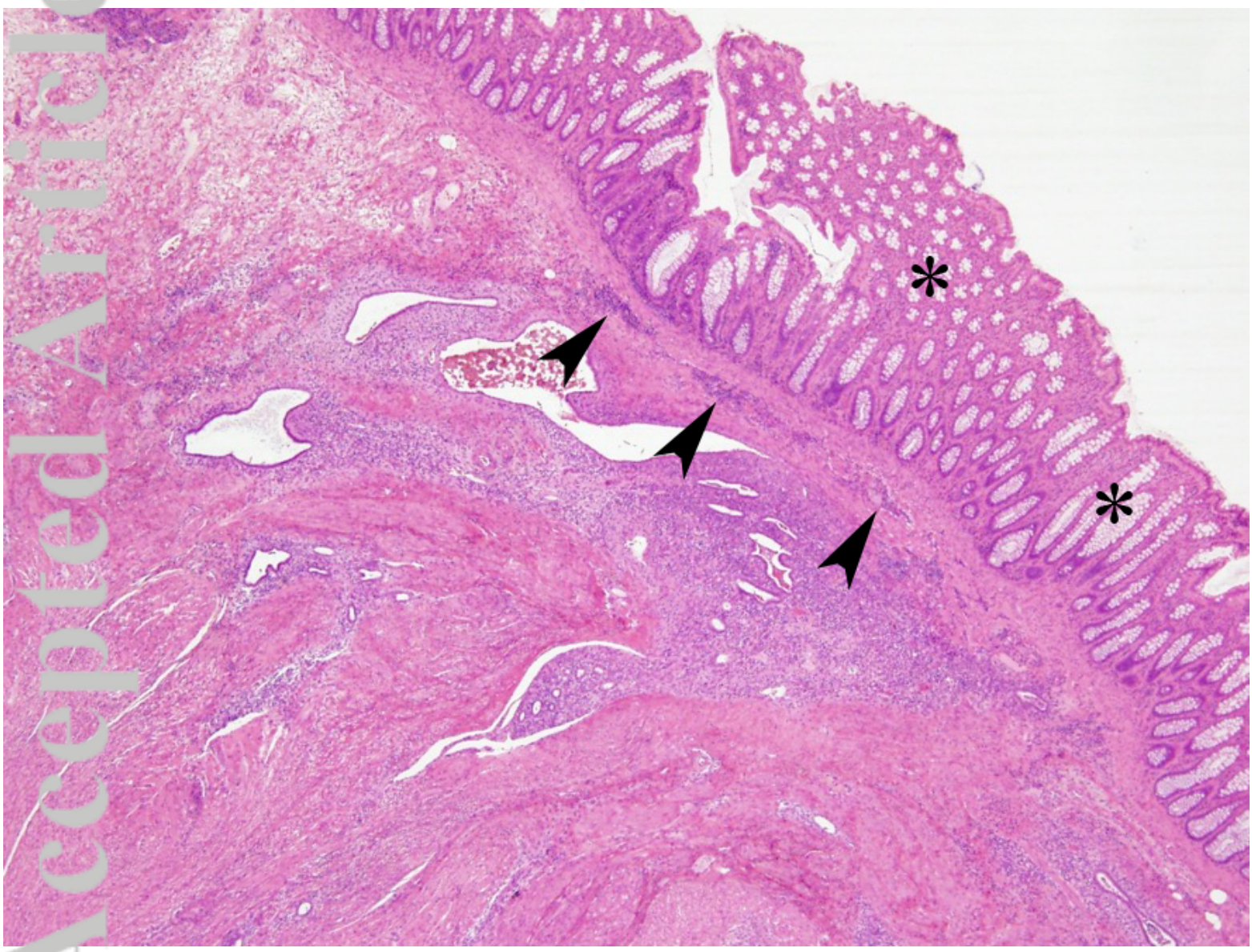

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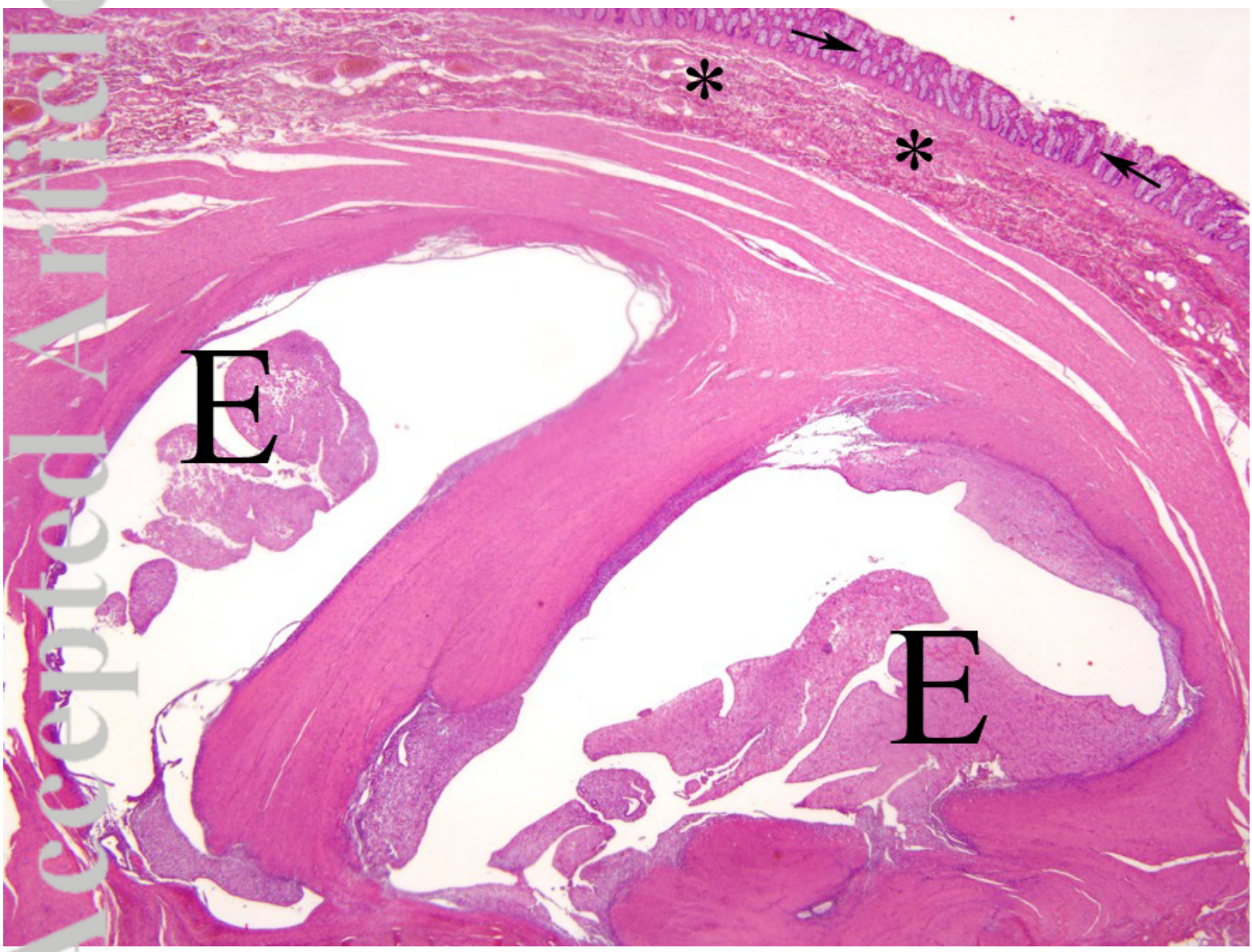

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