

# Preoperative assessment of intestinal endometriosis: a comparison of Transvaginal Sonography with Water-Contrast in the Rectum, Transrectal Sonography, and Barium Enema

Valentino Bergamini,<sup>1</sup> Fabio Ghezzi,<sup>2</sup> Stefano Scarperi,<sup>1</sup> Ricciarda Raffaelli,<sup>1</sup> Antonella Cromi,<sup>2</sup> Massimo Franchi<sup>1</sup>

<sup>1</sup>Department of Obstetrics and Gynecology, University of Verona, Policlinico “G.B. Rossi”, 37134 Verona, Italy

<sup>2</sup>Department of Obstetrics and Gynecology, University of Insubria, Varese, Italy

## Abstract

To evaluate the accuracy of Transrectal Sonography (TRS) and a new technique, Transvaginal Sonography with Water-Contrast in the Rectum (RWC-TVS), in the diagnosis of rectosigmoid endometriosis, and the accuracy of Barium Enema (BE) and RWC-TVS in the detection of intestinal stenosis due to endometriosis. In a prospective study, we compared the findings of TRS and RWC-TVS performed before surgery with the operative and pathologic findings in 61 consecutive patients who underwent laparoscopy or laparotomy for suspected rectosigmoid endometriosis. The accuracy of BE and RWC-TVS in the detection of intestinal stenosis was evaluated comparing the radiologic and ultrasonographic results with the macroscopic findings at surgery and pathology. RWC-TVS diagnosed rectosigmoid endometriosis with the same accuracy of TRS and was equally efficient as BE in the detection of a significant intestinal lumen stenosis. For the diagnosis of rectosigmoid endometriosis the sensitivity, specificity, positive and negative predictive values of TRS and RWC-TVS were 88.2% and 96%, 80%, and 90%, 95.7%, and 98%, and 57.1% and 81.8%, respectively. For the detection of intestinal stenosis the sensitivity, specificity, positive and negative predictive values of BE and RWC-TVS were 93.7% and 87.5%, 94.2% and 91.4%, 88.2% and 82.3%, and 97% and 94.1%, respectively. RWC-TVS is a new, simple technique for a single-step and accurate preoperative assessment of rectosigmoid endometriosis.

**Key words:** Rectosigmoid endometriosis—Transrectal Sonography—Barium Enema—Rectum—Intestinal stenosis

The intestinal tract represents the most common site of extra-genital endometriosis, with rectosigmoid disease accounting for 70% to 93% of extra-genital endometriotic implants [1–5]. Since the reactional fibrosis seen in endometriotic lesions invading the muscularis of the intestinal wall does not respond to medical therapy, surgery remains the cornerstone of treatment for patients with symptomatic bowel involvement [6, 7]. In less severe cases of rectosigmoid endometriosis, excision of the endometriotic nodule may be an adequate surgical approach, but extensive surgery entailing segmental bowel resection is required when advanced disease is complicated by lumen obstruction. A detailed preoperative assessment of deep infiltrating intestinal endometriosis is mandatory to determine the most effective surgical strategy. A well-defined lesion's topography and the knowledge of the extent of invasion of the intestinal wall are crucial for identifying patients who might require a segmental bowel resection, in order to provide appropriate counselling, and to plan a specific preoperative preparation. However, the diagnosis of rectosigmoid endometriosis is challenging. While it is clear that routine clinical examination is not sufficient alone, there is still debate on which imaging technique is the most appropriate tool for presurgical evaluation. As the infiltration of the intestinal wall by the endometriotic lesion rarely involves the mucosa, the conventional endoscopic and radiologic investigations are of little help

Correspondence to: Valentino Bergamini; email: valentino.bergamini@gmail.com

in the definition of rectosigmoid involvement. Recently, several investigators addressed the diagnostic accuracy of the transrectal approach, either by ultrasonography or rectal endoscopic ultrasonography, for posterior deep infiltrating endometriosis [8–10]. RWC-TVS was compared with TVS showing that adding water contrast in the rectum increases the accuracy in the diagnosis of rectal infiltration [11].

The aim of this study is to describe our experience with a new diagnostic imaging approach for the preoperative assessment of intestinal endometriosis including the identification of those cases that are candidates for segmental bowel resection. The diagnostic accuracy of this novel method was compared with that of conventional imaging techniques.

## Patients and methods

The present series consists of 61 consecutive patients, scheduled for surgery due to signs and symptoms of severe posterior deep infiltrating endometriosis, that were referred from January 2008 to February 2009 to the Department of Obstetrics and Gynecology at University Hospitals of Verona and Varese. Both hospitals are referral centers for endometriosis treatment. All the patients reported dyspareunia and/or catamenial rectal pain. On admission, routine preoperative work-up for suspected bowel endometriosis in our departments included: (i) Transrectal Sonography (TRS) and (ii) Barium Enema (BE). During the study period, women who gave their written informed consent underwent an additional diagnostic procedure consisting of a Transvaginal Sonography with Water-Contrast in the Rectum (RWC-TVS). Individual operators performing sonography and BE were blinded with respect to the other diagnostic findings.

TRS was performed using an Acuson Sequoia 512 scanner with a biplane, two-dimensional axial and sagittal convex probe of 6.5 MHz. A gel-filled rubber sheath was placed over the tip of the transducer. The probe was inserted into the rectum and advanced until a midline image of the cervix was visualized in a longitudinal view. The uterine cervix, parametria, uterosacral ligaments, and vaginal and rectal walls up to the rectosigmoid junction were evaluated by moving the transducer along its longitudinal axis and rotating it 130° to 140° along the main axis in both axial and longitudinal planes. All the scans were performed by the same operator (gynecologist) who has extensive experience in the ultrasonographic diagnosis of endometriosis, and the images of the endometriotic lesions obtained with both techniques were recorded. Barium Enema was undertaken according to the standard guidelines [13]. On the basis of preliminary experience at our institutions and the consequent protocol for treatment of intestinal endometriosis, a stenosis was considered significant when involving

≥50% of the lumen at BE. In candidates for segmental resection, the availability of the colorectal surgeon was ascertained, and appropriate patient's counselling and intestinal preparation were provided with full disclosure of possible complications related to bowel surgery.

The new combined recto-vaginal ultrasonographic method was carried out after a rectal enema and without need of general anesthesia. After a sagittal scan of the uterine cervix was obtained with the transvaginal approach and the sonographer focused on the relations with the adjacent rectal walls, a flexible 25 Charrière diameter catheter (PharmaPlast® Redditch, Worcs, UK) with a rubber balloon placed over the tip was simultaneously inserted into the rectal lumen up to a 20 cm distance from the anus. Saline solution was then instilled inside the balloon under ultrasonographic control. The amount of water needed to contrast the rectosigmoid lumen ranged from 100 to 300 mL, depending on the wall distensibility. By means of this adjustable water-contrast, high-definition images of the rectal wall and its layers were obtained and a dynamic evaluation of the endometriotic lesion was possible (Figs. 1 and 2).

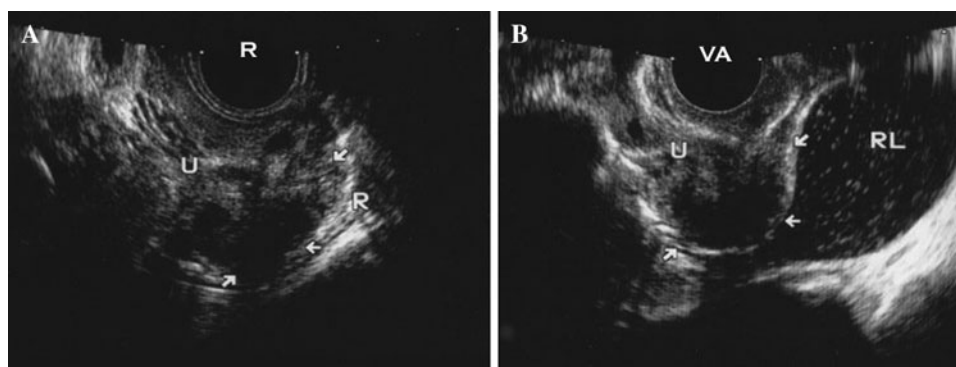
Subsequently, all women underwent surgical treatment and laparoscopy was attempted as first-line surgical approach except in those patients suspected of having a frozen pelvis. Segmental resection of the involved intestinal tract was scheduled based on the abovementioned radiographic criteria. In all the cases where surgical exploration excluded the necessity of intestinal resection, complete excision of the superficial rectosigmoid or rectovaginal nodule was attempted. After surgery, findings at preoperative investigations were compared with surgical and histological results. We calculated the sensitivity, specificity, positive and negative predictive values of TRS and RWC-TVS in the diagnosis of rectosigmoid endometriosis, and of BE and RWC-TVS in the prediction of intestinal stenosis.

Independence among the two methods was assessed using the  $\chi^2$  test. Statistical significance was set at  $p < 0.05$ .

## Results

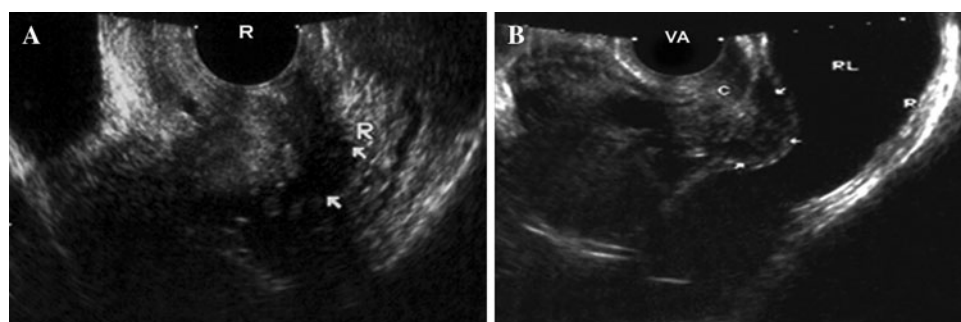
Among 61 patients (mean age 33.1; range 28–37) 11 were nulliparous and 19 had a history of gynecologic surgery for endometriosis. Four women presented a history of intermittent bowel obstruction.

Laparoscopy was the initial approach in all women except for four cases. Sixteen patients underwent colorectal resection that was completely performed via laparoscopy in 12 cases. Intraoperative examination showed no endometriosis in three patients, noninfiltrating lesions (superficial peritoneal and/or ovarian sites) in seven patients, while in 51 cases the combined surgical and histologic findings confirmed a rectosigmoid localization of the disease.



**Fig. 1.** **A** Transrectal ultrasonographic view of a rectosigmoid endometriotic lesion. **B** Transvaginal longitudinal scan of the same patient with water-contrast in the rectum, showing

a significant stenosis of the rectosigmoid lumen (*arrows point to the lesion*; VA, vagina; R, rectum; RL, rectal lumen; U, uterus).



**Fig. 2.** **A** Transrectal sonography showing an endometriotic lesion involving the rectal wall. **B** Same patient as in **A** with water-contrast in the rectum, showing a stenosis of the rectosigmoid lumen.

**Table 1.** Accuracy of TRS and RWC-TVS in the diagnosis of endometriosis of the rectosigmoid tract

	Sensitivity	Specificity	PPV	NPV
TRS	88.2% (45/51)	80% (8/10)	95.7% (45/47)	57.1% (8/14)
RWC-TVS	96% (49/51)	90% (9/10)	98% (49/50)	81.8% (9/11)

PPV, Positive predictive value; NPV, negative predictive value

In the latter group, 16 cases had an endometriotic plaque causing a  $\geq 50\%$  intestinal lumen stenosis confirmed at histopathology. The remaining 35 patients had a rectosigmoid localization with no evidence of significant lumen stricture.

The sonographer correctly identified the intestinal lesion in 45 out of 51 patients evaluated by TRS, while RWC-TVS was successful in all patients but two. With regards to the ultrasonographic appearance of the lesion, in 26 out of 51 patients both techniques demonstrated a hypoechoic, plaque-like endometriotic lesion whose size ranged from  $1.9 \times 0.5$  cm to  $5 \times 2.2$  cm (width  $\times$  depth). In the remaining cases, a low-echoic nodule without significant stricture of the intestinal lumen was detected.

Out of 16 cases that required intestinal segmental resection due to a stenosis confirmed at histopathology, a  $\geq 50\%$  lumen restriction had been preoperatively detected by BE in 15 women, compared to 14 patients identified by RWC-TVS. These imaging techniques gave a positive

finding not subsequently confirmed by the surgeon in two and three patients, respectively.

Tables 1 and 2 summarize the accuracy of TRS and RWC-TVS in the diagnosis of endometriosis of the rectosigmoid tract, and of BE and RWC-TVS in the detection of a significant intestinal stenosis. TRS and RWC-TVS showed the same accuracy in the diagnosis of rectosigmoid endometriosis ( $p = \text{NS}$ ). On the other hand, BE and RWC-TVS were equally successful in detecting a significant stenosis of the rectosigmoid lumen ( $p = \text{NS}$ ).

## Discussion

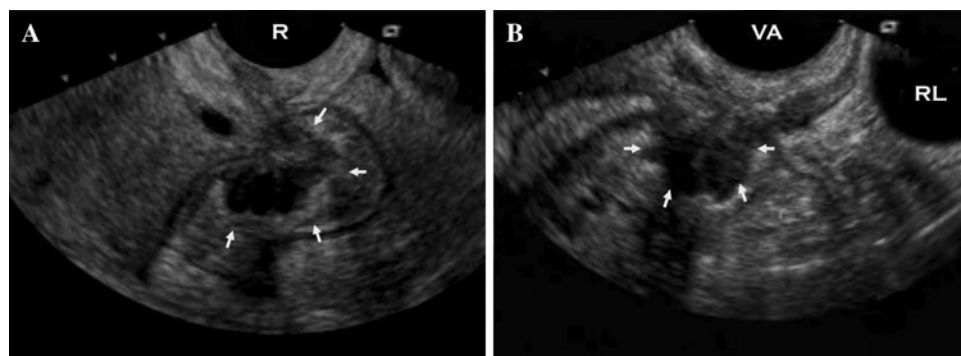
In our series of patients RWC-TVS was found to be as accurate as TRS and BE in the preoperative assessment of intestinal endometriosis.

Previous studies have shown the usefulness of the transrectal approach in the imaging evaluation of rectovaginal and rectosigmoid endometriosis, either by

**Table 2.** Accuracy of BE and RWC-TVS in the detection of intestinal lumen stenosis

	Sensitivity	Specificity	PPV	NPV
BE	93.7% (15/16)	94.2% (33/35)	88.2% (15/17)	97% (33/34)
RWC-TVS	87.5% (14/16)	91.4% (32/35)	82.3% (14/17)	94.1% (32/34)

PPV, Positive predictive value; NPV, negative predictive value



**Fig. 3.** **A** Transrectal ultrasonography showing the 'C'-shape of the rectosigmoid wall infiltrated by the endometriotic plaque. **B** Same patient with water-contrast in the rectum. Closed stenosis due to the endometriotic lesion stops the way of the balloon.

ultrasonography or rectal endoscopic sonography [8–10]. However, these techniques, although providing characteristic images of posterior pelvic endometriosis, do not give a complete preoperative information regarding the presence and degree of intestinal lumen stenosis and therefore the need for segmental bowel resection.

RWC-TVS seems to offer potential advantages over those imaging techniques previously proposed to preoperatively assess deep infiltrating endometriosis. First, with this novel approach an acoustic window between the probe and the adjacent anatomical structures is created by the instillation of water in the rectal lumen, thus allowing a more precise visualization of the intestinal wall layers, and their pathological distortion. Second, the technique we describe provides information on the distensibility of the intestinal walls after instilling water in the rectum. Moreover, the possibility for the thin, flexible catheter to overcome the rectosigmoid stenosis allows an accurate assessment of the extension and distance from the anus of the endometriotic stricture, and the proportion of the lumen narrowing. Only when a sigmoid stenosis is suspected at an upper level, meaning beyond the fundus uteri, a BE is necessary to complete the preoperative work-up.

Third, unlike rectal endoscopic sonography, the technique we describe allows a longitudinal scanning view which is more familiar to the gynecologist and enables the operator to clearly visualize the extent of the infiltration of the intestinal walls and its consequences on the lumen patency. On the other hand, by TVS or TRS one can only indirectly suppose the degree of the intestinal involvement by means of the characteristic "C" sign due to the thickening of the muscularis propria and the fibrotic convergence of the serosa that are found in the surgical specimen [12] (Fig. 3). Finally, an exhaustive

preoperative information is thus available in a short time and with a minimal discomfort for the patient, compared to other examinations requiring a more voluminous and rigid transrectal probe, intestinal preparation, and the need for complementary techniques besides the first-line procedure.

This single imaging investigation resumes the advantages of both transvaginal and transrectal ultrasonography, as well as rectal endoscopic sonography, reliably depicting the anatomy of the restosigmoid junction altered by deeply infiltrating endometriosis. Moreover, a concomitant exploration of the whole pelvis is possible by the transvaginal approach of the same procedure, thus allowing the identification of co-existing disease in the anterior pelvis. In our series, RWC-TVS best assessed in a single procedure the presence of a deep endometriotic lesion and the need for segmental bowel resection.

In conclusion, TRS has been previously proposed to identify a rectosigmoid involvement and therefore select those patients who are candidates for a deeper radiological and endoscopic diagnostic investigation, in order to rule out an intestinal stenosis to treat by resection [8]. However, by means of a single, noninvasive, dynamic procedure we were able to preoperatively achieve a better diagnostic definition of the lesion allowing an adequate surgical treatment of rectosigmoid endometriosis and co-existing pelvic localizations. Our low-tech and low-cost method makes it possible to avoid BE in most cases, unless an upper level stenosis is suspected.

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