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**Original Article****Colorectal Anastomotic Stenosis: Lesson Learned After 1643 Colorectal Resections for Deep Infiltrating Endometriosis**

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The authors declare that they have no conflicts of interest.

**Precis**

Risk factors, incidence, and treatment of anastomotic stenosis in women undergoing colorectal resection for severe endometriosis are discussed, and endoscopic dilatation is a valid option for this population.

**ABSTRACT**

**Study Objective:** To evaluate incidence, risk factors, and treatment of colorectal anastomotic stenosis in patients who underwent rectosigmoid resection for deep infiltrating endometriosis (DIE).

**Design:** A retrospective analysis of prospective database (Canadian Task Force classification III).

**Setting:** Public Medical Center

**Patients:** All women who underwent laparoscopic rectosigmoid resections for DIE between January 2002 and December 2016.

**Intervention:** All patients were evaluated clinically and endoscopically at 1 and 3 months after bowel resection. Stenosis was defined as the lack of passage through the anastomosis of a 12-mm proctoscope. Symptomatic stenosis was defined as the presence of endoscopically confirmed stricture accompanied by at least two of the following symptoms: constipation, need to push, tenesmus, ribbon stools. Only patients with symptomatic stenosis were studied. Demographics, surgical technique, and postoperative complications were prospectively recorded. Treatment and results of anastomotic symptomatic stricture were analyzed.

**Measurements and Main Results:** One thousand six hundred and forty-three patients underwent laparoscopic rectosigmoid resections. One hundred and four patients (6.3%) presented with symptomatic anastomotic stenosis. The mean age of patients was 27 years (range, 23–44). Interval between diagnosis and symptomatic stenosis was 57 days (range, 21–64 days). The only statistically significant predictors of anastomotic stenosis were the presence of ileostomy ( $p = .01$ ) and previous pelvic surgery ( $p = .002$ ). Treatment of choice was always conservative. Of 104 patients in analysis, 90 patients (86.5%) underwent three endoscopic dilatations. Reoperations were not necessary.

**Conclusion:** The anastomotic stricture is a recognized complication in patients following intestinal resection for DIE, and protective ileostomy represents the only modifiable factor related to anastomotic stenosis. Endoscopic dilatation is a valid option to treat this complication.

**Keywords:** Colorectal surgery; Endometriosis; Endoscopic dilatation; Laparoscopy

**Introduction**

Endometriosis is characterized by the presence of stromal and glandular tissue outside the uterine cavity. Deep infiltrating endometriosis (DIE) is defined as the presence of at least 5-mm thick infiltration of the peritoneum [1–3]. Incidence of intestinal localization ranges between 5.3% and 12% of all patients with endometriosis; the most commonly involved sites are the rectosigmoid junction and the rectum with an incidence of 70% to 90%, respectively; the ileocecal junction is rarely affected [4–6]. Many studies have been published regarding laparoscopic treatment of DIE, and major complications have been discussed as have the benefits and safety of laparoscopy [4,5,7]. Postoperative complications are functional, such as urinary and intestinal, and/or mechanical, such as anastomotic leakage and stenosis [8–12]. Anastomotic stricture is a well-known complication in colorectal surgery and is described in both malignant and benign disease [12–15]. Few studies published to date have analyzed the incidence of stenosis and treatment in patients undergoing laparoscopic rectosigmoidal resection with the double-stapling technique for endometriosis [16]. The objective of this paper is to evaluate incidence, risk factors, and treatment of colorectal anastomotic stenosis following laparoscopic bowel resection in women with DIE.

#### **Materials and Methods**

From January 2002 to December 2016, 1643 women diagnosed with DIE underwent laparoscopic intestinal resection at the Department of Gynaecology and Surgery of the Sacred Heart - Don Calabria Hospital of Negrar, Italy. The Institutional Review Board approved this study.

Preoperatively, all patients were studied with transvaginal ultrasound and a barium enema following symptom onset, and every patient underwent a multidisciplinary evaluation. Surgery was conducted by the same team. All patients had Stage IV endometriosis according to the American Society of Reproductive Medicine [17]. Preoperatively, any colorectal stenosis from nodules of endometriosis encompassing over 50% of the bowel wall on barium enema was considered significant. The level of colorectal anastomosis was arbitrarily defined, according to the distance from the dentate line measured with a rectoscope, as medium and high ( $\geq 5$  cm) or low ( $< 5$  cm) [16,18]. In all cases a colorectal anastomosis was performed with the double-stapling technique, providing the transection of the colon or the rectum with a linear stapler and then an end-to-end mechanical anastomosis using a circular stapler between the rectal stump and the oral colonic

stump. A coloproctological outpatient follow-up assessing analysis of any symptoms, a rectal examination, and a rigid proctoscopy was planned at 1 and 3 months from discharge. Anastomotic stenosis was defined as the lack of passage through the anastomosis of a 12-mm proctoscope [19]. Symptomatic stenosis was defined as the presence of endoscopically confirmed stricture accompanied by at least 2 of the following symptoms: constipation, need to push, tenesmus, ribbon stools. Patients with presentation of stenosis at clinical examination and onset of specific related symptoms were sent for endoscopic dilatation. Before closure of a temporary ileostomy, a barium enema was administered to check for colonic anastomotic stenosis. If significant stenosis was found, endoscopic dilatation was completed. The proposed treatment was outpatient endoscopic dilation with metal bougie dilators of increasing diameters (Savary-Gilliard; Cook Medical, Winston-Salem, NC; 10-mm, 21-mm, 24-mm) [20]. Only patients that underwent treatment for symptomatic stenosis were considered for the current analysis. Patients were followed with clinical evaluation and proctoscopy at 6 and 12 months after dilatation. Success was defined as the resolution of symptoms at 12 months after the procedure. Demographics, surgical technique, and postoperative complications were prospectively recorded. This database for patients with symptomatic stenosis identified study participants for analysis. Treatment and results of anastomotic symptomatic stricture were analyzed. The considered variables were assessed by one-way analysis of variance (ANOVA) between groups if a Gaussian distribution was confirmed by the Kolmogorov-Smirnov test or via Mann-Whitney test. Differences among subgroups were evaluated with Tukey-Kramer multiple comparisons test. A multivariate analysis was also performed. Data were analyzed using GraphPad InStat (version 3.00, GraphPad Software Inc., San Diego, CA, USA) and significance was set at a p value of .05.

## Results

One thousand six hundred and forty-three patients underwent laparoscopic rectosigmoid resections. Of these, 197 patients (12%) underwent temporary ileostomy creation. Of the entire group, 104 patients (6.3%) presented with symptomatic anastomotic stenosis (Fig. 1). The 33 patients with stoma and endoscopically confirmed stenosis were also presumed to be symptomatic

(endoscopy was performed after a positive barium enema for anastomotic stenosis). All patients with symptoms and/or stenosis underwent complete outpatient follow-up.

The mean interval between diagnosis and symptomatic stenosis was 57 days (range, 21–64 days). The median age of patients was 27 years (range, 23–44), and median BMI of 24.5 (range, 23–26). Comorbidity such as diabetes, hypertension, clotting problems, obesity were not reported in the study. The only statistically significant predictors of anastomotic stenosis were the presence of ileostomy ( $p = .01$ ) and previous pelvic surgery ( $p = .002$ ) (Table 1). Eighty-two percent of patients with stenosis underwent previous pelvic surgery ( $p = .002$ ). In 32 patients (30.7%), the vagina was opened during surgery to remove endometriosis nodules, and 8 hysterectomies (7.7%) were performed. In 13 (13%) patients, a low anastomosis was performed, a medium-high anastomosis was completed in 91 (87%) patients. Thirty-three patients had a temporary ileostomy (32%). A 29-mm circular stapler was used in 79 women, and in 25 patients the 31-mm stapler was used. Median operative time was 315 minutes (range, 150–520 minutes), and postoperative blood transfusion was required in 12 patients. Two cases of anastomotic dehiscence were treated laparoscopically and the patients were administered an ileostomy. Treatment of anastomotic stricture was conservative and treated with endoscopic dilation. After stricture treatment was complete, there was no recurrent stenosis at 12-month follow-up. Ninety cases required three sessions of pneumatic dilation, and in 13 patients more than three sessions were needed to achieve successful dilatation. No reoperations were necessary, and there were no complications in patients who underwent pneumatic dilation.

## **Discussion**

### ***Current Topics***

Colorectal anastomotic stricture occurs in 3% to 30% of all patients undergoing colorectal resection [13–15,19,21]. Inflammation is well described as a risk factor for disease-related stenosis [12–14,19,21–23].

Postoperative anastomotic leakage, radiotherapy, pelvic sepsis, diverting stoma, stapled anastomosis and incomplete mobilization of the splenic flexure have been reported as surgical-related predisposing factors, although not always confirmed [12,14,19,24,25]. The anastomotic

stricture was not considered a complication in the major series of bowel resection for endometriosis; however, we believe that this complication probably occurred but was not reported [5,18,26,27].

### **Main findings**

In the current study, stenosis occurred less often than in other series of colorectal resection for benign conditions [13,22,23]. The Negrar method of excision of severe endometriosis involves a segmental colorectal resection of the bowel affected by the endometriosis without the ligation of the inferior mesenteric artery at its origin. This segmental colorectal resection for DIE is accomplished without the mobilization of the splenic flexure because it is generally not necessary to obtain a valid colorectal anastomosis [28,29]. This technique does not appear to reduce the incidence of anastomotic stricture in diverticular disease, as reported by Ambrosetti et al [13]. In the current series, younger age, preservation of left colic artery, and absence of underlying or systemic inflammation could explain the low incidence of stenosis. The current series seems to confirm the statistically significant association between anastomotic stenosis and stoma creation ( $p = .01$ ).

### **Weakness**

There is a potential bias of having considered as symptomatic all patients with an ostomy and anastomotic stenosis, but owing to the minimally invasive nature of the treatment, we considered this clinically safe. Temporary ileostomy could be indicated for anastomosis that is unstable for various technical aspects including positive pneumatic test, pelvic adhesions owing to previous surgery, ultralow anastomosis, suture of the vagina, or double bowel resection. In the current series, temporary ileostomy was performed in 45% of patients for double bowel resection, in 30% for ultralow anastomosis generally associated with suturing of the vagina, in 20% of patients for ureteral reimplantation, and in 5% for other reasons. These patients are at high risk for developing fistulae that remain subclinical owing to diversion. Structural sequelae of the anastomotic leakage include sinus formation and anastomotic stricture [21]. Bowel diversion is traditionally considered a protective factor of clinical significant leakage [11]. On the other hand, a deeper understanding of the entire host-microbe interaction throughout the course of surgery and

healing is essential to elucidate the pathobiology of both anastomotic leak and stricture. In this context, the microbiota flora alteration induced by diversion could be the triggering factor of stricture [30].

Panis et al recently reviewed twenty-years' experience regarding the treatment of anastomotic stenosis suggesting a reasonable algorithm for a step-up treatment of the anastomotic stricture starting from dilatation to discussion about definitive stoma [19]. Conservative treatment of anastomotic stricture should be considered in patients with short and early discovered stenosis, especially in benign disease [19,31]. The endoscopic dilation remains the first option in the treatment of symptomatic stenosis; however, other techniques have been reported because conservative procedures are associated with a high recurrence rate requiring repeat dilatations in 6% to 20% of patients [19,31]. These data are not confirmed in the current study.

We chose the initial 3-month follow-up because asymptomatic colorectal stenosis is infrequently identified after this period from surgery and the focus of the study was symptomatic colorectal stenosis. Three months' follow-up may be considered a bias because it is short for asymptomatic colorectal anastomotic stenosis after rectosigmoid resections for endometriosis.

### **Strengths**

The strengths of the current conservative treatment are impacted by several factors: nature of disease (not inflammatory), lack of associated therapy (no radiotherapy or biologic drugs), patient characteristics (young age), and strict follow-up (early stenosis diagnosis). Endoscopic dilatation was well tolerated by patients and can be reused, making this technique cost-effective [19]. It is often necessary to repeat pneumatic dilatations; the number of sessions vary between one and three in the literature [19,31]. In the current series, none of the patients who underwent pneumatic dilatation suffered from complications after treatment and none needed treatment after 6- and 12-month follow-up after endoscopic dilatation. Biraima et al noted that in 17 years of treatment of anastomotic stricture, the number of dilatations required were predictive of recurrence of anastomotic stenosis [31]. In the current series only 7.9% of patients with symptomatic anastomotic stricture required more than 3 dilatations.

### **Conclusion**



Colorectal anastomotic strictures in patients undergoing bowel resection for DIE is a recognized complication and its nature is difficult to understand. Even with short-term follow-up, it is important to maintain the requirements of the follow-up schedule together with careful clinical examination to avoid recurrence and further invasive procedures. Treatment with endoscopic dilatation is a valid treatment option and should be considered a first approach.

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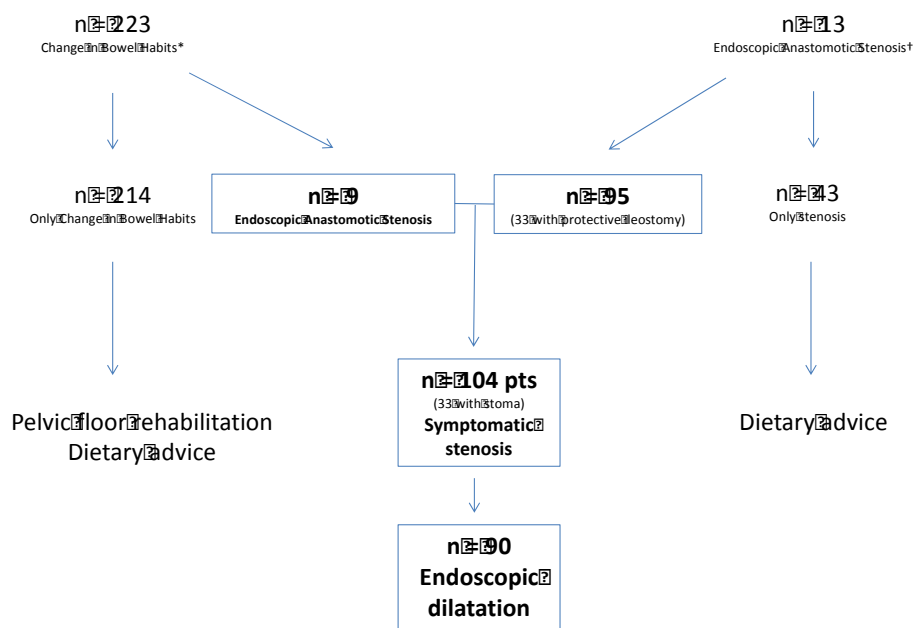
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Fig. 1 Outpatient follow-up flow chart of 1643 patients who underwent colorectal resection for deep infiltrating endometriosis. Of 223 patients with change in bowel habits, 9 patients had stenosis confirmed by proctoscopy. Of 138 patients with endoscopic stenosis, 95 patients presented with symptoms and were evaluated; 33 of these presented for temporary ileostomy and were included with caution. \*Constipation, ribbon stools, need to push, tenesmus; †Lack of passage of 12-mm proctoscopy through the anastomosis.



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Table 1

Risk factors of colorectal anastomotic stenosis in patients with anastomotic symptomatic stenosis who underwent rectosigmoid resection for deep infiltrating endometriosis

	Patients with anastomotic stricture	p value
Median age, years (range)	27 (23–44)	p = .11
Body mass index, kg/m <sup>2</sup> (range)	24.5 (23–26)	p = .24
Preoperative intestinal lumen stenosis > 50% (<del>or > 50%</del>), n (%)	23 (22%)	p = .66
Presence of ileostomy, n (%)	33 (32%)	p = .01
Previous pelvic surgery, n (%)	85 (82%)	p = .002
Opening of the vagina	32 (30.7%)	p = .13
Hysterectomy (concomitant), n (%)	8 (7.7%)	p = .56
29-mm circular stapler, n (%)	79 (75.9%)	p = .78
31-mm circular stapler, n (%)	25 (24%)	p = .66
Medium and high anastomoses, n (%)	90 (87%)	p = .24
Low anastomosis, n (%)	13 (13%)	p = .89
Blood transfusion, n (%)	12 (11.5%)	p = .25
Anastomotic leak, n (%)	2 (1.9%)	p = .39

Comment [AS1]: Please clarify

Comment [AS2]: >50%, we modified the table.