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Laparoscopic Resection and Anastomosis in Bowel Endometriosis: Single Stapler Surgical Technique

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ABSTRACT

Background and Objectives: Endometriosis affects 10% of reproductive-age women globally, with bowel endometriosis in 3.8%–37% of cases, primarily involving the rectum and sigmoid. Surgical excision is the gold-standard treatment for deep infiltrating endometriosis (DIE). Our objective was to evaluate the feasibility, safety, and efficacy of a single-stapler laparoscopic resection and anastomosis technique for bowel DIE.

Methods: This retrospective study analyzed 17 cases managed from January 2023 to June 2024. Clinical presentation, surgical outcomes, and follow-up data were reviewed. Symptom improvement and complications were assessed during a minimum 3-month postoperative period.

Results: Patients primarily presented with preoperative symptoms, including progressive dysmenorrhea, dyspareunia, and dyschezia. All anastomoses were tension-free with negative margins; no diversion stomas were needed. Postoperative recovery was smooth, with significant symptom relief and no complications.

Conclusion: The single-stapler technique for laparoscopic rectosigmoid resection is a safe, effective approach for bowel DIE, offering excellent outcomes with significant symptom relief and minimal severe complications.

Key Words: Bowel endometriosis, Deep infiltrating endometriosis, Resection and anastomosis, Single stapler surgical technique.

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INTRODUCTION

Endometriosis affects roughly 10% (190 million) of reproductive age women and girls globally (WHO 2023).[1] Pathogenesis is complex and likely multifactorial with environmental, genetic, epigenetic, immunologic, and other unknown factors contributing to development of disease. Endometriosis include superficial endometriosis, deeply infiltrating endometriosis (extension of disease >5 mm beneath the peritoneum), and endometrioma (ovarian cyst).[2] Bowel endometriosis is a subtype of deep infiltrating endometriosis (DIE) and is defined as the presence of endometriotic glands and stroma infiltrating at least the muscularis propria of the intestinal wall.[3] Endometriosis can be located in several locations along the intestines, including the rectum, rectosigmoid junction, colon, cecum, ileocecal junction, appendix, and small bowel. Bowel endometriosis has been reported to occur in 3.8–37% of patients with endometriosis and mainly rectum and sigmoid involved in up to 90% of all intestinal lesions.[4] Surgical excision is the mainstay of treatment for this form of endometriosis, as medical therapies may only provide temporary analgesic relief and are associated with higher recurrence and progression rates if used as the primary treatment.[5] The type of surgical resection used depends on the location of the lesion, depth and circumference of involvement, and number of nodules present.[6] Shaving involves removing the bowel lesion and associated fibrosis while keeping the bowel mucosa and a portion of the muscularis layer intact with subsequent reinforcement with interrupted sutures. Disc resection involves full-thickness removal of the diseased portion of the bowel wall, typically less than half of the maximum bowel circumference. Segmental resection involves complete removal of the segment of bowel involved with endometriosis with subsequent reanastomosis. Segmental resection usually is required if lesions are >3 cm in length or involve more than one-third of the bowel lumen. Multifocal lesions may also require segmental resection.[4]

The conventional laparoscopic segmental resection technique involves use of a linear stapler to excise the affected segment of bowel proximal and distal to the lesion before

performing an anastomosis using a circular stapler. Unfortunately, with more distal lesions, it can be difficult to place a linear stapler directly across the lumen of the bowel, resulting in an angular resection line or incomplete resection with a single staple load. Additionally, the overlap that occurs between the linear and circular staple lines creates a potential area of weakness that increases risk of postoperative bowel leak at the anastomosis site.[7] To alleviate these issues, we devised a single stapler technique using a circular endostapler. Hence this study aimed to outline a detailed step-by-step surgical technique and the preoperative and postoperative care, along with its short-term and long-term outcomes of laparoscopic single stapler surgical technique of rectosigmoid resection and anastomosis in bowel endometriosis.

METHODOLOGY

This was a single-center retrospective observational study. Records of cases were assessed from January 2023 to June 2024 and all cases of bowel endometriosis managed with laparoscopic rectosigmoid resection and anastomosis by single stapler surgical technique with a follow-up of at least 3 months were included in the study. Data were gathered from patient case files, surgical recordings, and follow-up documentation. A comprehensive record of each patient's baseline characteristics, clinicopathological information, and details pertinent to the surgical procedure were analyzed. Any complications associated with the surgery, including perioperative, short-term, and long-term issues, were meticulously documented. As per the institute protocol, follow-up appointments are scheduled at 3 month and 6 months postsurgery, and additional follow-up at 12 months, either through outpatient visits or telephone consultations. Each follow-up included a pertinent symptomatic questionnaire, clinical evaluations, and imaging as needed, with a preference for pelvic ultrasound or transvaginal ultrasound. The visual analog score (VAS) was employed to assess pain and evaluate improvements in symptoms before and after surgery. Continuous variables were presented as mean ± standard deviation (SD) and categorical variables were presented as proportions. Wilcoxon signed rank test was the statistical method used for comparison of pain scores.

The step-by-step surgical technique and the preoperative and postoperative care institutional protocol is as follows:

Preoperative Preparation

The preoperative evaluation for the patient included detailed history taking, clinical examination and hematological work-up. All patients underwent baseline ultrasonography with magnetic resonance imaging (MRI) of the abdomen and pelvis and a detailed MR colonography. Written informed consent was obtained from the patient after thoroughly discussing the surgical procedure and potential complications. Patients were prepared using a monobasic sodium phosphate solution for bowel preparation, and supportive intravenous hydration administered the day before the procedure with patients advised to stay nil by mouth, 6 hours prior to surgery.

Surgical Technique

Under general anesthesia, the patient is positioned in a modified Lloyd Davis position at a precise 30° angle, ensuring optimal access for the surgical team. Sequential compression devices are diligently applied to the lower limbs as venous thromboembolism prophylaxis throughout the procedure. A Foley catheter is inserted into the urinary bladder, and all patients are equipped with an orogastric tube to facilitate intraoperative care. The right arm is carefully abducted, while the left arm is securely tucked alongside the chest. The patient is then tilted toward the left side to provide the best surgical view. The operating surgeon is positioned on the left side, with the first assistant managing the camera at the head of the table. The second assistant, located on the right side, plays a crucial role in tissue manipulation, grasping, and retraction, while the third assistant focuses on vaginal manipulation—ensuring all aspects of the procedure are covered.

In this innovative technique, 4 trocars are utilized: a primary trocar (10 mm) positioned 1 cm above the umbilicus for the camera and 3 accessory trocars (5 mm) inserted under camera vision, 2 on left side and 1 on right of the abdomen. The surgical team insufflates the abdomen with carbon dioxide gas, maintaining a steady pressure of 12 mmHg throughout the operation. All cases were performed using 30° IMAGE1 S Rubina (Karl Storz, Germany) platform, by the same expert surgical team.

Adhesiolysis

Adhesiolysis is performed to inspect and assess the extent of endometriosis, with the goal of restoring normal anatomical structures. After the adhesiolysis of bowel or peritoneal adhesions, a thorough exploration of the peritoneal cavity is conducted. This involves examining for any signs or features indicative of endometriosis, particularly on the pelvic peritoneum, sigmoid colon, rectum, uterosacral

ligament, bilateral ovaries, and throughout the peritoneal cavity.

Retroperitoneal Dissection with the Creation of Bilateral Pararectal and Paravesical Spaces

The formation of the bilateral para-vesical and lateral para-rectal spaces, often referred to as Latzko spaces, is a critical precursor for intricate pelvic surgeries. Developing these avascular areas not only aids in the lateral displacement of the ureters but also enhances the identification of the inferior hypogastric nerve (IHN). This knowledge is instrumental in performing nerve-sparing procedures, ultimately leading to better surgical outcomes and improved patient recovery.

Ureterolysis and Ureteric Tunnel Dissection

The procedure begins by carefully identifying the ureter within the medial fold of the broad ligament, followed by a meticulous separation from its medial peritoneal attachment. This dissection is extended in a craniocaudal direction until reaching the uterosacral ligament. This process is then mirrored on the opposite side. In cases involving a parametrial nodule, the same-side ureteric tunnel dissection is executed, extending all the way to the ureter's entry point into the bladder wall. It is crucial to prioritize nerve preservation during this step, particularly for the branches of the IHN that supply the respective side.

Release of IHN

In all cases, medial pararectal space, also known as the Okabayashi space, was created to accurately identify the IHN. This nerve was carefully detached from its medial peritoneal attachment and preserved right up to the hypogastric plexus at the uterosacral ligament. In instances where we encountered any nerve entrapment, we conducted adhesiolysis and nerve release, along with the excision of any nodules. This approach not only prioritizes nerve preservation but also fosters better recovery and long-term patient outcomes.

Use of Lateral Window Technique and Rectovaginal Space Dissection

During the procedure, both sides of the mesorectum's lateral wall are carefully exposed. Following this, the dissection moves toward the center using cold scissors, allowing for access to the rectovaginal space. The dissection of any rectovaginal nodules is then performed, ensuring precision and effectiveness.

Rectal Separation by Retrorectal Space Dissection

Assistant at vaginal end helps to delineate lateral border of rectum using a rectal probe so that dissection is meticulously carried out in the retrorectal space. To enhance safety, blunt dissection or dissection using cold scissors is the preferred while working near the rectum.

Rectosigmoid Colon Resection and Specimen Retrieval

Upon confirming the indication for rectosigmoid resection including, presence of multifocal or multicentric intestinal lesions, or a large nodule exceeding 3 cm or a stricture or more than one-third circumference of bowel wall involvement; the rectosigmoid colon is resected on both ends beyond the disease-free margin using ultrasonic energy (**Figure 1**). An endobag facilitates insertion of anvil for the circular bowel endostapler and is used to retrieve the bowel specimen (**Figures 2** and **3**). The endobag is placed through vault following hysterectomy, and through posterior colpotomy incision in cases managed conservatively. Subsequently, posterior colpotomy incision is closed in fertility-conserving surgeries and the vault is sutured in other cases before proceeding for rectal anastomosis.

Anvil Fixation and Anastomosis of Rectosigmoid Colon

A purse-string suture is placed circumferentially around the cut end of the proximal and distal bowel with 2-0 non-absorbable polypropylene monofilament. The anvil is then placed over the proximal bowel and fixed in place

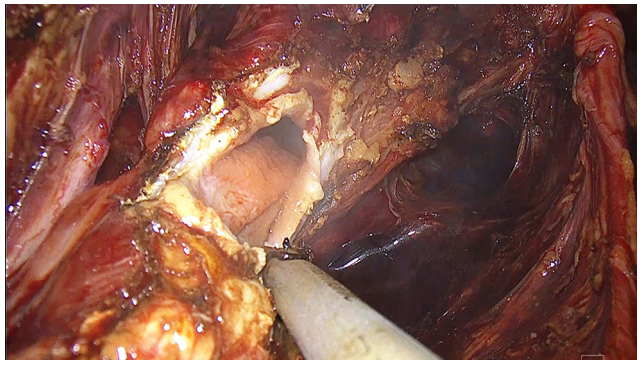

Figure 1. Resection of the proximal rectum with a disease-free margin.

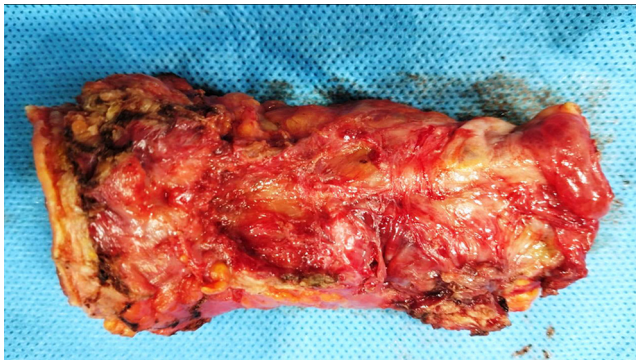

Figure 2. Resected rectal segment specimen (8 cm in length).

by tightening this suture (**Figure 4**). The circular stapler (29–31 mm) housing is inserted rectally and tightened (**Figure 5**). The distal portion of the rectum, along with the stapler housing, is aligned with the anvil secured to the proximal cut end of the rectum (**Figure 6**). Ensuring proper alignment of the bowel axis along the anastomosis and a tension-free anastomosis with adequate bowel mobilization, the circular stapler is activated and then disengaged using the rotary railroad technique, taking care to avoid any disruption at the anastomotic site. A thorough examination of the excised donut tissue from the anastomosis site confirms the integrity of the anastomosis. The rectal anastomosis is completed by applying intermittent reinforcing sutures along the stapler line to reduce tissue tension. A subsequent air leak test is conducted under endoscopic evaluation with a rigid proctoscope, while the bowel is occluded proximal to the anastomosis site. Additionally, a drain is placed in the pelvic cavity to manage any postoperative abdominal drainage.

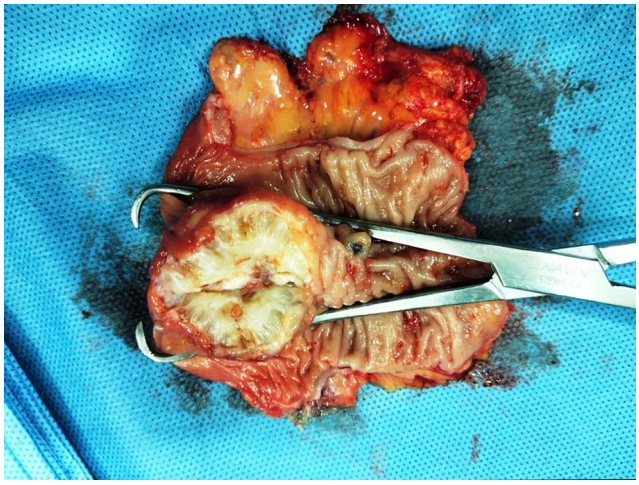

Figure 3. Cut section of the specimen showing rectal endometriotic nodule infiltrating mucosa.

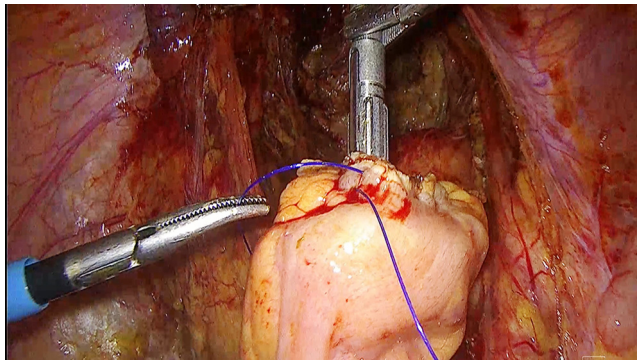

Figure 4. Fixation of the anvil in the proximal segment using 2-0 nonabsorbable polypropylene monofilament suture.

Postoperative Regime

The patient is maintained on a nil by mouth status for 24 hours, after which a liquid diet is gradually introduced. Early mobilization is encouraged to mitigate the risk of deep vein thrombosis, and subcutaneous injections of low molecular weight heparin are administered as a precautionary measure. Daily monitoring of vital signs and serum electrolytes is conducted, with necessary supplements provided in the event of any abnormalities. If the patient tolerates liquids well, a low-fiber diet is initiated on postoperative day 2. This is followed by the introduction of a semisolid diet on day 3 and a full oral diet on day 4. The abdominal drain is removed once the patient has successfully passed stool. Typically, patients are discharged on postoperative days 4 or 5.

Follow-Up Protocol

All patients were scheduled for follow-up appointments at 1 month, 3 months, and subsequently every 6 months postsurgery, either through outpatient visits or telephone

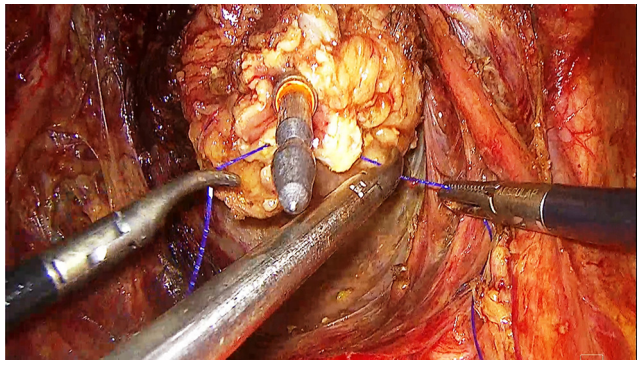

Figure 5. Circular stapler housing fixed at the distal rectal anastomotic site.

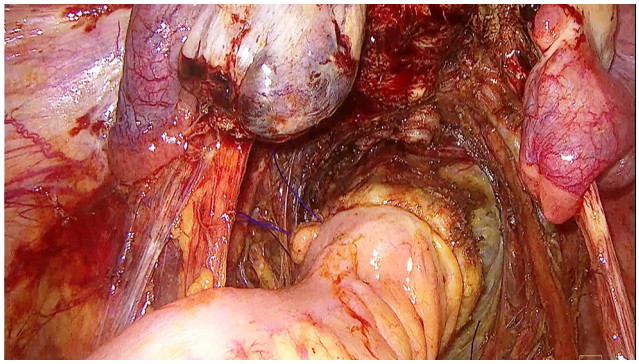

Figure 6. Proper alignment of the bowel axis along the anastomosis ensured.

consultations. Each follow-up included a comprehensive clinical evaluation and imaging studies (either ultrasound or MRI) as necessary. Pain assessment was conducted using a VAS. Patients were specifically queried regarding the enhancement of preoperative symptoms, the emergence of any new symptoms related to bowel, bladder, or IHN entrapment, and changes in their VAS score following surgery. Additionally, the recurrence of any symptoms associated with endometriosis (DIE) and long-term functional outcomes were documented. Fertility outcomes were assessed in patients who had a minimum follow-up of 12 months.

RESULTS

In our study, the most frequently reported symptoms were progressive dysmenorrhea (n = 17/17), menorrhagia (10/17), and dyspareunia (9/17). Notably, dyschezia, observed in 8 out of 17 participants (47%), was identified as a specific symptom associated with bowel endometriosis. Chronic constipation (n = 7/17, 41%) and hematochezia (n = 5/17, 29%) were other symptoms associated with bowel endometriosis. A preoperative colonoscopy was performed in all patients with hematochezia and noted to

Table 1.
Demographic Characteristic and Symptomatology in Patient of Bowel Endometriosis

	Fertility Conserving Surgery Group (n = 8) n (%)	Nonfertility Conserving Surgery Group (n= 9) n (%)	Total (n= 17) n (%)
Demograghic			
Age (in years; mean ± SD)	31.3 ± 5.97	39.5 ± 8.83	35.7 ± 8.50
Body mass index (kg/m^2; mean ± SD)	23.6 ± 6.61	26 ± 3.85	24.9 ± 5.31
Symptoms			
Nonspecific			
Chronic pelvic pain	5 (62.50)	3 (33.34)	8 (47.05)
Progressive dysmennohea	8 (100)	9 (100)	17 (100)
Menorrhagia	4 (50)	6 (66.67)	10 (58.82)
Dyspareunia	4 (50)	5 (55.56)	9 (52.94)
Bowel specific			
Chronic Constipation	3 (37.50)	4 (44.45)	7 (41.17)
Dyschezia	4 (50)	4 (44.45)	8 (47.05)
Hematochezia	1 (12.50)	4 (44.45)	5 (29.41)
Bladder specific			
Dysuria	0	0	0
Hematuria	0	0	0
Inferior hypogastric nerve entrapment			
Vaginal dryness	1 (12.50)	3 (33.34)	4 (23.52)
Perineal pain	2 (25)	2 (22.23)	4 (23.52)
Gluteal pain	5 (62.50)	4 (44.45)	9 (52.94)

Table 2.
Surgical Procedures Performed in the Study

	Fertility Conserving Surgery Group (n = 8) n (%)	Nonfertility Conserving Surgery Group (n = 9) n (%)	Total (n = 17) n (%)
Operative procedures			
Laparoscopic adhesiolysis	8 (100)	9 (100)	17 (100)
IHN release	8 (100)	9 (100)	17 (100)
Diseased pelvic peritonectomy	8 (100)	9 (100)	17 (100)
Recto-vaginal nodule excision	8 (100)	5 (55.56)	13 (76.47)
Oophorectomy	0	9 (100) U/L-2 B/L-7	9 (52.94)
Cystectomy	5 (62.50) U/L-1 B/L- 4	0	5 (29.41)
Ureterolysis	8 (100)	9 (100)	17 (100)
Uretero-ureterostomy	1 (12.50)	0	1 (5.88)
Double-J Stenting	1 (12.50)	0	1 (5.88)
Adenomyomectomy	6 (75)	0	6 (35.29)
Hysterectomy	0	9 (100)	9 (52.94)
Parametrial nodule excision	2 (25) U/L-1 B/L-1	3 (33.34) U/L-1 B/L-2	5 (29.41)
Vaginal nodule excision	1 (12.50)	0	1 (5.88)
Operative parameter			
Operation time (minutes) mean (range)	169 (90–210)	210 (180–270)	191 (90–270)
Blood loss (ml) mean (range)	80 (60–180)	90 (50–200)	85 (50–200)

U/L, unilateral; B/L, bilateral.

be normal. No bladder endometriosis specific symptoms such as dysuria and hematuria and IHN entrapment symptomology such as vaginal dryness (n = 4/17, 23.5%), perineal pain (n = 4/17, 23.5%), and gluteal pain (n = 9/17, 52.9%) were observed (**Table 1**).

The study presents detailed information on the surgical interventions conducted, as outlined in **Table 2**. The most frequently observed site of bowel endometriosis (DIE) was the midrectum (10/17). Additionally, 6 patients had lesions located at the recto-sigmoid junction (6/17) (segment between the distal 8 cm of the sigmoid colon and the proximal 5 cm of the rectum). One patient had a lesion in the low rectum (1/17) (within 8 cm from the anal verge), for whom an ultralow resection and anastomosis were performed. Notably, no patients required a diversion stoma during the primary surgical procedure. The maximum infiltration depth observed in this study was limited to the mucosal layer (**Table 3**). Furthermore, all anastomotic site donut were found to be negative for bowel endometriosis.

The bladder catheter was retained in place for a duration of 1 day for each patient. Following its removal, all patients successfully regained their normal bladder voiding function without the need for recatheterization or extended catheterization. The intraperitoneal drain was maintained for a median period of 3 days (3–5 days) until spontaneous passage of stool.

None of the cases required conversion to laparotomy, and no intraoperative complications were observed. Four patients underwent blood transfusions, while 3 experienced postoperative fever on days 3, 5, and 7, respectively. Blood cultures identified methicillin resistant staphylococcus aureus (MRSA) and *Escherichia coli* infections in 2 patients, and urine culture revealed *E. coli* in 1 patient. Furthermore, 3 patients reported increased stool frequency, and 1 patient experienced constipation. There were no instances of re-exploration or major postoperative complications (**Table 4**).

Nine patients (52.95%) have completed a follow-up for 12 months, while other patients are still undergoing follow

Table 3.
Histopathological Findings

	Fertility Conserving Surgery Group (n = 8)	Nonfertility Conserving Surgery Group (n = 9)	Total (n = 17)
Histopathology			
Length of bowel specimen (in cm); mean (range)	8.06 (4–13)	10 (7–13)	8.97 (4–13)
Number of endometriotic nodules; mean (range)	3 (2–6)	1.88 (1–3)	2.47 (1–6)
Occult nodule n (%)	1 (12.5)	0	1 (5.88)
Size of nodule (in cm); mean (range)	3.35 (2–5.5)	3.44 (2–5.5)	3.40 (2–5.5)
Margin (in cm); mean (range)	1.78 (0.8–3.0)	2.27 (1.0–4.0)	2.04 (0.8–4.0)
Maximum bowel infiltration	Up to mucosa	Up to mucosa	
Donut tissue examination	Margins free	Margins free	
Recto-vaginal nodule size (in cm); mean (range)	4.7 (2.5– 6.5)	4.9 (3–7.5)	4.84 (2.50–7.50)
Uterus-adenomyosis n (%)	4 (50)	6 (66.67)	10 (58.82)
Largest diameter of adenomyoma (in cm); mean (range)	3 × 2.50 × 1.50	3.5 × 2.60 × 1.60	3.27 × 2.56 × 1.58
Ovarian endometrioma n (%)	6 (75) U/L-1 B/L-5	3 (33.34) All 3 B/L	9 (52.94)
Diseased pelvic peritoneum n (%)	8 (100)	7 (77.78)	15 (88.23)
Leiomyomas n (%)	3 (37.50)	3 (33.34)	6 (35.29)
Parametrial nodule n (%)	3 (37.50)	3 (33.34)	6 (35.29)

IHN, Inferior hypogastric nerve; U/L, unilateral; B/L, bilateral.

up of which 3 patients (17.65%) have been followed up for 6 months, and 5 patients (29.40%) had follow-up for 3 months. None of the patients were lost to follow-up during the study duration. None of these patients had any postoperative complication such as fecal incontinence, fecal urgency, complaints of severe constipation. Recurrence of endometriosis was not observed in any case during the last follow-up visit with pelvic ultrasound/transvaginal ultrasound. A total of 3 patients (37.5%) conceived postsurgery, 1 (12.5%) had spontaneous conception 1 year after surgery, and the rest (25%) conceived after surgery with the help of assisted reproductive technique (**Table 5**). VAS scores related to chronic pelvic pain, dysmenorrhea, dyspareunia, dyschezia, gluteal pain, and perineal pain show significant improvement 3 months after surgery (**Table 6**).

DISCUSSION

Bowel endometriosis introduces a challenge for gynecologists, requiring a deeper level of surgical skill set related to this condition. Medical management options for this condition remain uncertain.[3] The technique of Segmental bowel resection used for decades by surgeons to treat rectal pathologies is used for treating bowel endometriosis.[3] The first Laparoscopic segmental resection and anastomosis for endometriosis was first described in the 1990s by Redwine and Sharpe.[8] Since then, various techniques for resection and anastomosis have been described in the literature, each with its own advantages and limitations.

This study is a single-center retrospective observational analysis of bowel endometriosis treated with laparoscopic resection and anastomosis using a single-stapler surgical technique. Preoperative bowel prep is crucial in cases of bowel endometriosis. Enhanced recovery after surgery (ERAS) guidelines for colorectal procedures recommend avoiding mechanical bowel preparation in colon surgeries; however, it can be considered for rectal surgeries.[9–11] If bowel preparation is planned, adding preoperative oral antibiotics along with systemic antibiotics has been shown to reduce intra-abdominal infections, anastomotic leaks, and wound infections compared to bowel preparation alone.[12,13] In the present study, only mechanical bowel preparation was used, and none of the cases had an anastomotic site leak. However, the omission of antibiotics, as recommended by ERAS guidelines, is a limitation of our study and highlights an area for potential improvement in

Table 4.
Operative Complication

Intraoperative	Total (n = 17) n (%)
Conversion to laparotomy	0
Injury to bladder bowel, ureter, or major vessel	0
Postoperative	
General	
Blood transfusion	4 (23.52)
Postoperative fever (>38° on 2 or more occasions)	3 (17.64)
Urinary tract related	
Bladder dysfunction (urinary retention with prolonged catheterization)	0
Bowel related	
Paralytic ileus	0
Increased frequency of stool	3 (17.64)
Constipation	1 (5.88)
Rectal bleeding	0
Anastomotic leak	0
Stricture	0
Bowel obstruction	0
Miscellaneous	
Ureterovaginal/vesicovaginal fistula	0
Rectovaginal fistula	0

future protocols. Our study used meticulous patient selection supported by preoperative MRI colonography, which provided detailed insights into bowel endometriosis. This imaging modality accurately identified the number and depth of lesions, as well as the presence of bowel strictures or stenosis. These findings were instrumental in facilitating comprehensive preoperative counselling for patients and enabling surgeons to plan and select the most appropriate bowel surgical technique for each case.

In our previous technique for bowel resection and anastomosis, we used a linear stapler to resect the distal bowel end and a single circular stapler for the intracorporeal anastomosis. However, in the present study, use of linear stapler was omitted. This approach eliminates the need for multiple stapler's lines, reduces the risk of compression on the iliac vessels or ureters which occurs during application of staplers, no risk of stapled corner (dog-ear) formation and is easily replicable and leads to better postoperative and long-term functional outcomes for patients. In a study conducted by Hanacek et al, multiple stapler lines and end-to-end anastomosis have been identified as risk factors for postoperative anastomotic leakage.[7] Another study by Brunner et al revealed that double-stapler technique anastomoses have a lower bursting pressure than single-stapler technique anastomoses.[14] Our previous research on colorectal resection using multiple staplers showed 1 case of anastomotic leakage.[15] In our present technique, we use a single circular stapler and avoid the formation of dog ears at the distal end, which helps reduce the risk of anastomotic leaks. Additionally, the procedure costs are lower due to the decrease in the number of staplers used.

Minimizing fecal spillage during bowel resection and anastomosis is crucial for reducing intra-abdominal contamination and postoperative complications. In our study, we utilized mechanical bowel preparation—which, when combined with oral antibiotics, effectively lowers bacterial load and infection risk—but did not routinely employ additional intraoperative measures such as controlled distal clamping or isolation with laparoscopic specimen

Table 5.
Follow-Up Outcomes

Follow-Up	3 Months	6 Months	12 Months	Total
Symptomatology				
Chronic pelvic pain	0	0	0	0
Dysmenorrhea	0	0	0	0
Dyspareunia	0	0	0	0
Dyschezia	0	1	1	2
Gluteal and perineal pain	0	0	0	0
Vaginal dryness	0	0	0	0
Postoperative complication				
Constipation	1	1	1	3
Fecal incontinence	0	0	0	0
Fecal urgency	0	0	0	0
Recurrence				
Ovarian endometrioma	0	0	0	0
Pregnancy outcome				
Spontaneous conception	0	0	1	1
Assisted reproductive technology	0	0	2	2

Table 6.
Pre- and Postoperative Pain Assessment

Visual Analog Score (0–10)	No. of Patients (n)	Preoperative (Median)	Postoperative (Median)	*P* Value
Chronic pelvic pain	8	6	1	.0047[W*]
Dysmenorrhea	17	9	2	.0002[W*]
Dyspareunia	11	8	2	.0030[W*]
Dyschezia	8	8	3	.0067[W*]
Gluteal and perineal pain	13	6	1	.0014[W*]

bags. Controlled distal clamping secures the bowel distal to the resection site, thereby helping to prevent leakage, while laparoscopic specimen bags create a controlled environment that further minimizes contamination. In cases of minimal spillage, prompt irrigation and suction further reduce bacterial contamination within the peritoneal cavity.[16,17] Although these techniques were not consistently applied in our current protocol, we recognize their importance in optimizing surgical outcomes and will incorporate these principles in future research to enhance patient safety.

We acknowledge the ongoing debate regarding the routine use of prophylactic drains in elective rectal surgery. While a recent meta-analysis by Menahem et al suggest no significant impact on anastomotic leak rates,[18] we routinely place drains to minimize extraperitoneal fluid collections, potentially reducing the risk of contamination. Additionally, in cases of anastomotic failure, drains may aid in early detection, allowing for timely intervention and management.[19,20] Our approach aligns with the rationale that, despite conflicting evidence, selective drain placement remains a useful adjunct in postoperative care.

Our study's findings align with the reported complication rates of 3.4% for laparoscopic surgery in severe endometriosis, rising to 10–22% with bowel resection, as described by Nicolaus et al.[21] This highlights the surgical complexity of DIE and the critical need for precise operative planning, enhanced perioperative management, and vigilant postoperative monitoring to optimize patient outcomes. Three patients experienced increased stool frequency in the immediate postoperative period, with 1 undergoing ultralow resection and anastomosis and 2 undergoing low resection and anastomosis. However, none of these patients reported fecal incontinence or urgency at 3, 6, or 12 months postoperatively. This transient increase in bowel frequency is likely due to short-lived neorectal irritability, a well-recognized postoperative adaptation that typically resolves over time.[22] Furthermore, operating time and blood loss during surgery, as recorded in our study were also comparable to other studies in the literature.[23]

We utilized a hand-sewn purse-string suture at the proximal end of the colon to secure the anvil for fixation of circular stapler. Hence it is vital for the surgeon to be skilled in the technique of intracorporeal purse string suturing.[15] Although challenging, the technique is replicable by trained endoscopic surgeons and its use may be limited for laparoscopic surgeons with limited proficiency in laparoscopic suturing and ergonomic challenges.

Complications like recto-vaginal fistula, rectal bleeding, anastomotic leaks, strictures, bowel obstructions, and recurrence was absent in the study. Notably, there were no significant long-term bowel-related issues reported, such as severe constipation, fecal incontinence, or fecal urgency, following the segmental resection of bowel endometriosis. Our study also demonstrates 37.5% (3/8) positive pregnancy outcomes and improvement in VAS score.

To our knowledge this is the first study with the use of this novel single circular stapler use for bowel endometriosis. The limitation of our study lies in its relatively small sample size and the retrospective design. The technique although replicable requires proficiency in endo-suturing. Larger prospective studies may be planned to further validate this procedure.

CONCLUSION

The single-stapler laparoscopic technique for rectosigmoid resection in bowel endometriosis is a feasible, safe, and effective approach. It minimizes risks associated with conventional methods, such as anastomotic leaks, and promotes faster recovery. Long-term follow-up confirms symptom relief and functional outcomes, supporting its integration into surgical practice for DIE management.

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