



Surgical Outcomes After Colorectal Surgery for Intestinal Deep Endometriosis: A Retrospective Cohort Study

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ABSTRACT

Aim: Deep endometriosis (DE) is defined as infiltrating lesions greater than 5 mm in depth and is one of the more severe forms of endometriosis. The surgical management of DE infiltrating the bowel is complex and controversial. The primary aim of this study was to determine post-operative complications and outcomes in patients undergoing surgical treatment for bowel endometriosis.

Method: A retrospective study was conducted of all patients who underwent surgical treatment for bowel endometriosis between 2012 and 2020 at two centers. All demographic data and peri-operative data, including symptoms, imaging, type of operation, length of stay, complications, and length of follow-up were analyzed.

Results: A total of 167 patients underwent combined gynecological and colorectal surgery for intestinal DE. Complete data was available for 108 patients, who were included in the final analyses. Pelvic pain was the most common symptom, with 82/108 (75.9%) patients reporting it as the main symptom. Pre-operative dedicated ultrasound detected a rectal endometrial nodule in 101/108 (93.5%) patients. All operations were performed laparoscopically; 27/108 (25%) patients underwent a rectal shave, 15/108 (13.9%) patients underwent a disc resection, and 66/108 (61.1%) patients underwent segmental resection for bowel endometriosis. One anastomotic leak was identified in our cohort. Sonographic recurrence of endometriosis was identified in 22.5% of the patients after a median follow-up of 12 months. All of the patients with recurrence were treated with medical management only.

Conclusion: Laparoscopic surgery for endometriosis was performed with an acceptable rate of complications and recurrence in this cohort.

Keywords: Laparoscopic, endometriosis, segmental resection, colorectal, complications

Introduction

Deep endometriosis (DE) affecting the bowel wall is defined as lesions infiltrating 5 mm under the peritoneum. Bowel endometriosis is estimated to affect between 5-12% of

all endometriosis patients, with 70-93% of these located preferentially in the rectum and recto-sigmoid junction.^{1,2} The most common symptoms in patients with DE include pain, dysmenorrhea, dyspareunia, dyschezia, and occasionally per rectal bleeding.³

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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.^{4,5} There are several surgical options for the treatment of bowel endometriosis, including disc and segmental resection. Complications associated with segmental resection have previously been documented.⁶ These complications are more prevalent in cases of lower rectal operations compared to sigmoid resection. Various strategies have been defined to minimize complication rates after bowel surgery.⁷

The main aim of this study was to review the surgical treatment of bowel endometriosis by focusing on complications and recurrence.

Materials and Methods

This retrospective study included all patients who underwent surgical treatment for bowel endometriosis between 2012 and 2020 at two centers. All of the patients were operated on by the same gynecological surgeon-sonologist (GC) and colorectal surgeon (WB). This multi-disciplinary approach is in accordance with both the World Endometriosis Society and the National Institute for Health and Care Excellence guidelines.^{8,9} All demographic and peri-operative data, including age, symptoms at presentation, pre-operative imaging results, type of operation, postoperative complications, and follow-up data were analyzed.

All of the patients underwent a specialist DE transvaginal ultrasound scan (TVS) in accordance with the International DE Analysis consensus statement¹⁰ to assess the size and location of DE lesions, including the status of the pouch of Douglas (PoD), and the presence/absence of endometriomas. All TVSs were performed by GC or an experienced member of their team (Figures 1, 2). Symptomatic women with a TVS diagnosis of rectosigmoid DE were then referred to WB for a colorectal consultation to review considerations for performing joint gynecological/colorectal laparoscopic surgery. The surgical approaches were discussed between the patients and WB including the risks involved. All of the patients underwent bowel preparation pre-operatively using Prepkat-C® (Fresenius Kabi, Bad Homburg, Germany).

Surgical technique

All of the patients underwent laparoscopic excision of all macroscopically visible endometriosis. Bowel endometriosis was treated with either a laparoscopic shave, disc excision, or segmental resection. If the lesion was suitable for dissection off the bowel wall, it was shaved using laparoscopic scissors, diathermy, or a laparoscopic linear stapler to excise it from the anterior bowel wall. The disc excision procedure was performed as described by Woods et al.¹¹

All segmental resections were carried out laparoscopically. Our technique for segmental resection involves preserving the inferior mesenteric artery (IMA). Once the rectum has been dissected off the posterior vagina and the PoD is cleared, the proximal and distal extents of bowel endometriosis are marked. The lateral peritoneal attachments of the sigmoid colon to the pelvic wall are mobilized to straighten the rectum and colon. The mesentery is fenestrated close to the bowel wall at the proximal extent of the resection margin. The mesentery is then divided using a Harmonic® scalpel (Ethicon Endo-Surgery, Cincinnati Ohio, USA). The proximal and distal extents of resection margins are resected using an Echelon Flex™

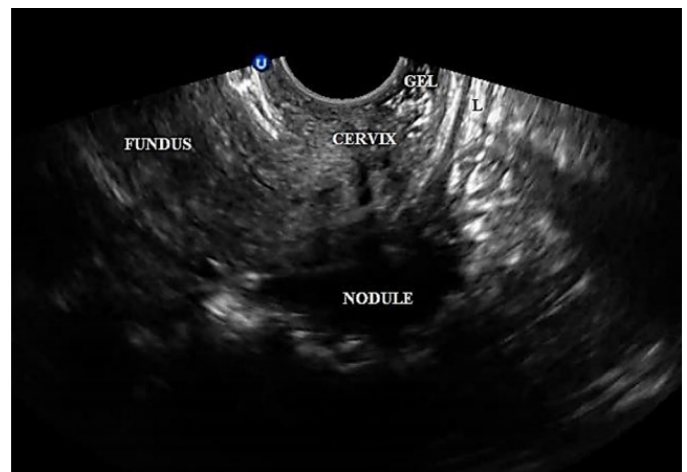


Figure 1. A transvaginal ultrasound image (sagittal plane) showing a deep infiltrating endometriotic nodule involving the anterior rectum. The “sliding sign” was negative at the retro-cervical region (due to adhesions between the anterior rectal nodule and posterior cervix), indicating a complete pouch of Douglas obliteration
L: Lumen of the rectum

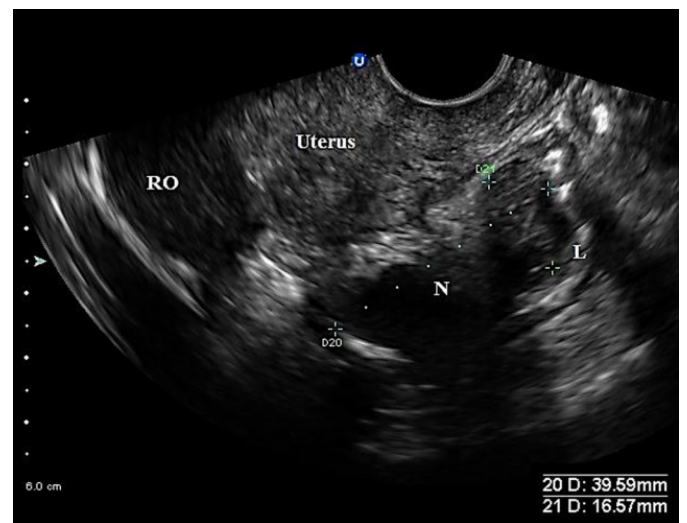


Figure 2. Transvaginal ultrasound image (sagittal plane) demonstrating a right ovarian endometrioma with a co-existing deep infiltrating endometriotic nodule (N) of the rectosigmoid bowel
RO: Right ovary, L: Bowel lumen

(Ethicon) linear stapler. The proximal colon is then adequately mobilized to allow for tension-free anastomosis. The colon is exteriorized through the iliac fossa from the left using a muscle-splitting incision. The anvil of the circular stapler is then secured into the proximal colon. The bowel is returned to the peritoneal cavity and end-to-end stapled anastomosis is performed using the circular stapler. A flexible sigmoidoscopy is performed to assess the integrity of the anastomosis.

Ethics approval

This study was approved by the Nepean Blue Mountains Local Health District Human Research Ethics Committee in accordance with the National Health and Medical Research Council Act 1992, and the National Statement on Ethical Conduct in Human Research 2007 (updated July 2018).

Statistical Analysis

Data collection was performed using Excel (Microsoft, Redmond, WA, USA). Continuous variables were expressed as mean and standard deviation and a median with an interquartile range. Categorical variables were expressed as counts and proportions with percentages. A comparison of proportions was performed by estimating the relative risk and conducting a chi-square test, or multinomial logistic regression and odds ratios. A p-value <0.05 was considered significant. Data were analyzed using SAS software (v.9.4; SAS Institute Inc., Cary, NC, USA).

Results

A total of 167 patients underwent combined gynecological and colorectal surgery for intestinal DE. Complete data was available for 108 patients, who were included in the final analyses. The most common symptom in patients undergoing surgery was pelvic pain, which 82/108 (75.9%) patients reported as their primary symptom. Dysmenorrhea, dyspareunia, and dyschezia were reported by 72/108 (67.3%), 70/108 (64.8%), and 64/108 (59.3%) patients, respectively; 43/108 (39.8%) patients also had issues with infertility at the time of their operation. In our cohort, 42/108 (38.9%) patients had previously undergone surgery for endometriosis (Table 1).

All patients underwent pre-operative TVS to assess the degree of endometriosis. Ultrasound was used to detect rectosigmoid DE, which was identified in 101/108 (93.5%) patients pre-operatively. Uterosacral ligament DE was identified in 75/108 (69.4%) patients, and endometrioma was identified in 63/108 (58.3%) patients via pre-operative TVS. Additionally, 31/108 (28.7%) patients were identified as having rectosigmoid DE greater than 3 cm or multi-focal disease on pre-operative TVS. All operations were performed laparoscopically in our series; 27/108 (25%) patients underwent a rectal shave, 15/108

(13.9%) patients underwent disc resection, and 66/108 (61.1%) patients underwent segmental resection. Patients with a rectosigmoid lesion greater than 3 cm, or multi-focal rectosigmoid disease, were more likely to undergo segmental resection, and this was statistically significant ($p < 0.001$) (Table 2). In performing segmental resection, 65/66 (98.5%) patients had the IMA spared during their resection. Only 1 patient in our cohort required a diverting loop ileostomy. The median length of stay was 3 days in the rectal shave cohort, 3 days in the disc resection cohort, and 4 days in the segmental resection cohort. Endometriosis was confirmed on histology in 95 (92.2%) patients. Information was missing for 5 patients. Among the 108 patients, 5 patients suffered a Clavien-Dindo Grade IIIb complication requiring surgical intervention (Table 3). One patient suffered an anastomotic leak with a concurrent ureteric injury, which was subsequently repaired robotically via defunctioning ileostomy and left-ureteric reimplantation. Two patients had a ureteric injury; 1 case was suture-repaired intra-operatively, and 1 delayed thermal injury was managed conservatively with a ureteric stent. One patient had a uretero-vaginal fistula, which was initially

Table 1. Pre-operative data

Variable	Median (interquartile range)
Age	37 (31-41.5)
Pre-operative symptoms	n (%)
Pelvic pain	82 (75.9)
Dysmenorrhea	72 (68.5)
Dyspareunia	70 (64.8)
Dyschezia	64 (59.3)
Infertility	43 (39.8)
Previous endometriosis surgery	42 (38.9)
Transvaginal ultrasound scan	
Uterosacral ligament lesion	
1. Nil	33 (30.6)
2. Unilateral	39 (36.1)
3. Bilateral	36 (33.3)
Endometrioma(s)	
1. Nil	45 (41.7)
2. Unilateral	40 (37.0)
3. Bilateral	23 (21.3)
Rectosigmoid DE	101 (93.5)
Rectosigmoid DE lesion >3 cm/multifocal	31 (28.7)

DE: Deep endometriosis

Table 2. Association of the type of resection with the size of lesions and postoperative recurrence

Type of resection	n/n (%)		p-value
	Lesion multifocal = no; (n=76)	Lesion multifocal = yes; (n=31)	
Shave	26 (34.2)	1 (3.2)	<0.001
Disc	13 (17.1)	2 (6.5)	
Segment	37 (48.7)	28 (90.3)	
Type of resection	Recurrence = no; (n=54)		p-value
	Recurrence = no; (n=54)	Recurrence = yes (n=16)	
Shave	11 (20.4)	2 (12.5)	0.34
Disc	6 (11.1)	4 (25.0)	
Segment	37 (68.5)	10 (62.5)	

Table 3. Post-operative complications (Clavien-Dindo classification)

Grade	Complication (number)	Management (number)
I	Colitis (3)	Conservative treatment only
II	Urinary tract infection (3)	Treated with intravenous (IV) antibiotics
	Port site infection (1)	Treated with IV antibiotics
III	Bowel: Anastomotic leak	Managed with diverting ileostomy
	Urological: Inadvertent cystostomy (1)	Repaired intraoperatively
	Ureteric injury (3)	Surgical repair (2), Stent (1)
	Utero-vaginal fistula	Surgical repair
IV	Nil	

managed with a diverting nephrostomy and eventually surgically repaired via a ureteric re-implant. One patient had an inadvertent cystostomy, which was recognized and repaired intraoperatively. Seven patients suffered a Clavien-Dindo Grade I-II complication. Three patients were admitted post-operatively with colitis, which was managed conservatively. Three patients admitted with urinary tract infections were treated with antibiotics, and 1 patient had a port-site infection, which was treated conservatively with antibiotics. There were no deaths in our cohort.

Follow-up data was available for 93/108 (86.1%) patients. The median follow-up was for the duration of 12 months (interquartile range, 0-60 months); 16/93 (17.2%) patients had significant ongoing pain post-operatively. Ongoing dyschezia was present in 6/43 (14.0%) patients with available data. A follow-up DE scan was performed in 71 post-operative patients, with a median time from surgery to scan of 12 months. This revealed an overall ultrasound-detected DE recurrence rate of 22.5%. The recurrence rate in the rectal shave, disc excision, and segmental resection cases was 15.4%, 40%, and 20.8%, respectively. The type of resection was not statistically significantly associated with recurrence (Table 2).

All of the patients with recurrence were treated with medical management; no patients required a repeat operation within 12 months.

Discussion

A growing volume of Australian data has become available in recent years regarding the surgical treatment of DE involving the bowel.¹²⁻¹⁴ In this study of 108 patients, all operations for DE involving the bowel were performed laparoscopically with no conversion to open. The surgeries involved segmental resection in 61.1% of patients. Previous studies have stated a conversion rate of 2-12%.¹⁵⁻¹⁷ The conversion rate has steadily improved over time, which could be attributed to increasing experience with laparoscopic bowel surgery. At our institution, there is a multi-disciplinary approach to the treatment of DE involving gynecology and colorectal teams. The combined experience in non-endometriosis laparoscopic surgery may also have allowed for a 0% conversion rate in our cohort.

In our series, 98.5% of patients who underwent a segmental resection for DE had the IMA preserved during surgery. The colonic mesentery was divided close to the segment of the bowel to be resected, thereby preserving the major vascular

pedicle to the remaining colon. Preservation of the IMA has also been utilized in resection for diverticular disease.¹⁸ Scioscia et al.¹⁹ indicated IMA-saving colorectal surgery for endometriosis to be safe and feasible. Although studies indicate no difference in anastomotic leak rates, IMA-saving resection can yield benefits, such as preserving bowel length and nerve preservation. A randomized control trial by Masoni et al.²⁰ showed that patients who underwent colonic resection with an IMA preserving technique had reduced incidence of defecatory disorders. We believe limited segmental resection for endometriosis to be safe, and that it should be utilized in patients undergoing bowel surgery for endometriosis, as long as other parameters for safe anastomosis can be achieved.

There is clinical equipoise regarding the treatment of bowel endometriosis. Various algorithms have been developed to suggest the ideal surgical treatment for this condition.²¹ In cases where lesions greater than 3 cm are present, for patients with multi-focal lesions, or cases with lesions involving >1/3 of the bowel lumen, segmental resection is recommended. Studies have shown greater complication rates with segmental resection.^{2,22} In our cohort, the decision for segmental resection was based on pre-operative and intra-operative information regarding bowel endometriosis. All patients received a pre-operative dedicated DE ultrasound to characterize bowel endometrial nodules. The intra-operative decision to undergo segmental resection was based on the location and extent of the disease. In our cohort, patients with rectosigmoid DE lesions greater than 3 cm or multi-focal DE lesions were more likely to undergo segmental resection. A systematic review in 2012 found an overall complication rate of 22% in patients who underwent surgery for bowel endometriosis. Severe intestinal complications were established at 6.4%, which included anastomotic leak, rectovaginal fistula, and bowel obstruction.² A recent retrospective study of 142 patients established a major complication rate of 8.5%.²³ Our study had a major complication rate of 4.6%. The majority of major complications occurred in the segmental resection cohort, which may have been related to the extensive dissection of tissue to clear the more complex burden of disease.

Post-operative recurrence of endometriosis can be difficult to measure. There are various ways in which recurrence can be defined; it can be symptomatic, defined by imaging, or histology. This has given rise to a vast number of heterogeneous studies reporting on recurrence rates after bowel endometriosis surgery. Vignali et al.²⁴ reported 3- and 5-year recurrence rates of 20% and 43%, respectively, for pain. The rate of recurrence on post-operative imaging has been reported to range between 10% and 50%.²⁵⁻²⁷ This high recurrence could also be attributed to residual disease, rather than a true recurrence rate.²⁸ If the definition of recurrence is ignored, the average

recurrence rate is reported to be approximately 20%.²⁹ This recurrence rate was very similar to our cohort, which had a recurrence rate of 22.5%.

Study Limitations

The authors recognize the limitations of this retrospective study. Not all patients in this study were followed up post-operatively for the same period of time. This may have led to an underestimation of post-operative complications. There is an assumption that, owing to the complex nature of this type of surgery, patients will present back to the same hospital with complications; however, patients may also seek medical attention elsewhere. Another limitation of this study is the reporting of recurrence. Although the majority of patients underwent a post-operative DE ultrasound to check for recurrence, this was not protocolized. Scanning patients at different time periods may have yielded a false positive reading on an ultrasound scan for recurrence. It is noted, however, that the gynecology unit at our institution has extensive experience with DE ultrasound.³⁰⁻³²

Conclusion

Complex laparoscopic surgery for the treatment of bowel endometriosis is safe if performed collaboratively. Segmental resection for bowel endometriosis can be performed without extensive dissection as long as the principles of safe bowel anastomosis are adhered to.

Ethics

Ethics Committee Approval: This study was approved by the Nepean Blue Mountains Local Health District Human Research Ethics Committee in accordance with the National Health and Medical Research Council Act 1992, and the National Statement on Ethical Conduct in Human Research 2007 (updated July 2018).

Informed Consent: Retrospective study.

Authorship Contributions

Concept: W.B., G.C., Design: W.B., G.C., Data Collection or Processing: A.S., N.D., Analysis or Interpretation: A.E., M.A., Literature Search: A.S., N.D., Writing: A.S., N.D.

Conflict of Interest: No conflict of interest was declared by the authors.

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