
Laparoscopic Disk Resection for Bowel Endometriosis Using a Circular Stapler and a New Endoscopic Method to Control Postoperative Bleeding from the Stapler Line

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- BACKGROUND:** Complete laparoscopic excision of endometriosis offers good longterm symptomatic relief, especially for those with severe or debilitating symptoms. Intestinal endometriosis affect between 3% and 36% of women with endometriosis and 50% of women with disease severe enough that intestinal surgery, with or without intestinal segmental resection, may be required.
- STUDY DESIGN:** Between January 2003 and September 2006, we performed 35 laparoscopic complete excisions of endometriosis with full thickness disk resections of bowel endometriosis using the CEEA stapler (US Surgical) inserted transanally.
- RESULTS:** The endometriotic nodule of the bowel was completely removed in all patients. No major or minor surgical complications occurred during the primary surgical procedure. One patient underwent a diverting temporary ileostomy because of air loss after insufflation of the rectosigmoid colon, which was closed successfully 1 month after surgery. In three of seven cases of rectal bleeding from the stapler line, for the first time, we successfully used conservative endoscopic management.
- CONCLUSIONS:** In properly selected patients, full thickness disk excision using a circular stapler is a feasible procedure that avoids the potential morbidities of a low anastomosis. We suggest conservative management by endoscopic hemostasis before referring patients for a new operation in cases of rectal bleeding from the anastomotic site. (J Am Coll Surg 2008;207:205–209. © 2008 by the American College of Surgeons)
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Complete laparoscopic excision of endometriosis contributes to satisfactory longterm symptomatic relief, especially in patients presenting with severe or debilitating symptoms. The aim of surgical treatment of endometriosis is removal of all visible areas of endometriotic lesions and restoration of the pelvic anatomy.

Intestinal endometriosis affects between 3% and 36% of women with the disease^{1,2} and 50% of women with severe disease.³ Consequently, intestinal surgery with or without intestinal segmental resection is often required.⁴ Most frequent sites include the sigmoid colon and the rectum, ac-

counting for 72% to 85% of cases.⁵⁻⁷ Clinical diagnosis of colorectal endometriosis remains difficult because of the nonspecific nature of the symptoms and the poor yield of clinical examination.⁸ Common symptoms of bowel involvement include abdominal colic discomfort, abdominal distention, rectal pain, rectal bleeding, diarrhea, constipation, tenesmus, and bloating.⁹⁻¹¹

In the past, bowel endometriosis diagnosed at laparoscopy most often required conversion to laparotomy.¹² Operative laparoscopy has become a relatively safe and cost-effective alternative to laparotomy for treatment of bowel endometriosis. It results in extreme pain relief and improves the quality of life of the patients.¹³⁻¹⁸ But it carries morbidity rates that are not negligible, depending on the technique used and the topography of the intestinal endometriotic lesions. The technique of anterior rectal wall excision using the circular stapler was first proposed by Gordon and colleagues¹⁹ in 2001 to avoid the risks of a low extraperitoneal anastomosis in cases of nodular endometriosis invading the rectovaginal septum. Data on the safety of the procedure are scant and come from a small series only.¹⁰

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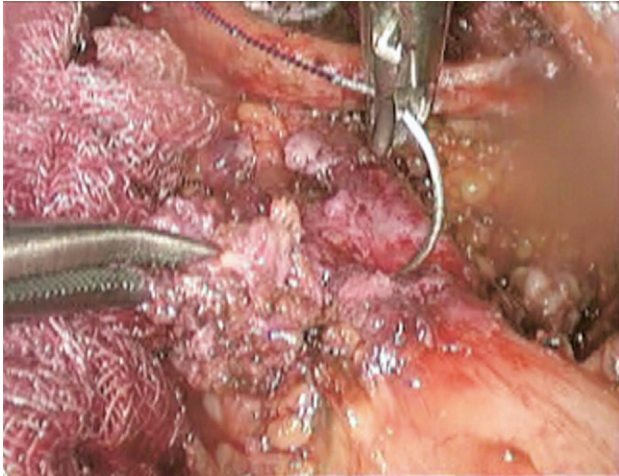


Figure 1. Transfixion of the intestinal nodule transversely to the axis of the bowel.

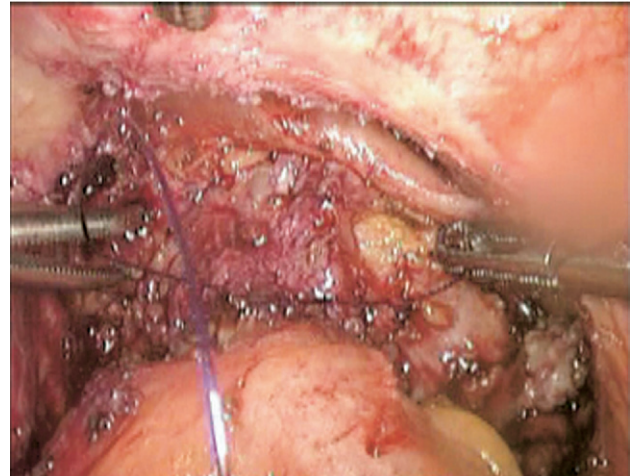


Figure 2. Endometriotic nodule pulled into the hollow between the anvil and the shoulder of the circular stapler.

The purpose of our study was to assess the effectiveness of the technique and to quantify potential short- and long-term risks for the patients.

METHODS

Between January 2003 and September 2006, we performed 35 laparoscopic complete excisions of endometriosis with full thickness disk resections of bowel endometriosis using a single use curved circular CEEA stapler (US Surgical). The average age of our patients was 30.14 years (range 19 to 41 years), and average body mass index was $21.29 \pm 2.96 \text{ kg/m}^2$. Twenty-six patients (74.2%) were nullipara. Eighteen patients (51.4%) underwent laparoscopic or laparotomic treatment for endometriosis at least once in the 5 years before referral to our clinic, and 22 (62.8%) had medical therapy before surgery. The mean American Society of Reproductive Medicine (ASRM) score was 81.41 (range 44 to 134). All patients reported dysmenorrhea, dyspareunia, and rectal pain or severe intestinal cramping with diarrhea or constipation during menstruation. Only one patient reported rectal bleeding during her period.

All patients underwent rectovaginal clinical examination, double-contrast barium enema, and a transabdominal and transvaginal ultrasonographic examination. In 10 patients, rectovaginal septum endometriosis was diagnosed preoperatively. The most frequent area involved, as assessed by double-contrast barium enema, was the medium rectum (26.08%), followed by the proximal rectum (21.7%), the distal rectum (4.3%), and the sigmoid colon (4.3%). Lesions were never larger than 25 mm.

All patients had stopped medical therapy with progestins, gonadotropin-releasing hormone agonist, or oral con-

traceptives for at least 3 to 4 months before the procedure. They were extensively counseled about the potential risks of the advanced surgery, and a written informed consent was obtained. All patients were clinically evaluated 1 month after operation. Followup included bimanual and ultrasonographic pelvic examination and a questionnaire to evaluate time to reach subjective well being and eventual short-term complications.

Technique

The operating room set-up, patient preparation, and technique have been described in detail in a 2006 article by Landi and associates.²⁰ Briefly, video laparoscopy was initially performed by a team of gynecologists with three 5-mm cannulas inserted, under direct vision, suprapubically and in each midquadrant of the abdomen, both lateral to inferior epigastric vessels, with a 10-mm laparoscope in the standard umbilical position. Complete excision of pelvic endometriotic lesions was performed using 5-mm bipolar scissors. This was followed by the intestinal operation performed by a skilled colorectal surgeon (GR) assisted by one member of the gynecologic team. In particular, the rectum was mobilized along the left and right pararectal spaces and along the rectovaginal septum anteriorly. The endometriotic lesion of the bowel was delineated and reduced to minimum size so that the extent of bowel involvement could be better evaluated. One 3-0 monocril suture was transfixed through the intestinal nodule transversely to the axis of the bowel (Fig. 1). This suture was used to pull the anterior rectal endometriotic nodule into the hollow between the anvil and the shoulder of the circular stapler inserted transanally and carefully opened in the usual manner (Fig. 2). Laparoscopic graspers pulled the nodule

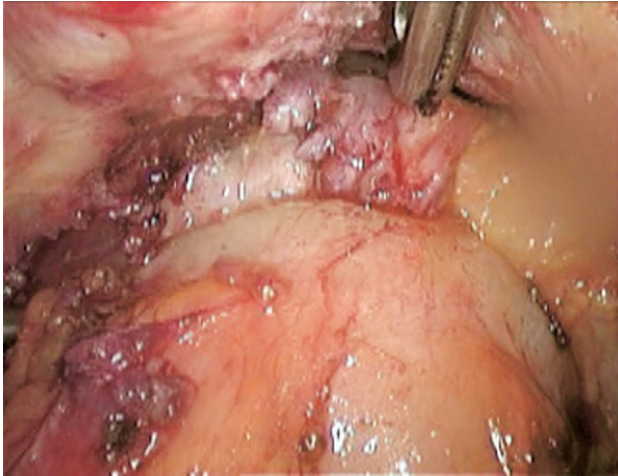


Figure 3. Final aspect of the suture line.

into the open stapler just until we were sure that the entire defect was enclosed in the stapler jaws. Then the stapler was closed, and after confirming that no posterior rectum was included in the opposite side of the stapler, it was fired and removed (Fig. 3). In four patients, depending on surgeon's judgment, a 3-0 Vicryl (Ethicon) additional running suture was placed. Two different types of circular stapler were used: Proximate Reloadable Linear Stapler 29 mm (Ethicon) and Premium Plus CEEA 28 mm, Auto Suture (United States Surgical). At the end of the operation, the integrity of the anastomosis was always tested by filling the pelvic cavity with saline solution and insufflating the rectosigmoid colon by means of a sigmoidoscope. The sigmoidoscope was also used to ensure that there was neither bowel stricture nor abnormal intraluminal bleeding. Copious lavage of the peritoneal cavity was performed with approximately 500 mL to 1 L of Ringer's lactate solution.

An intraperitoneal drain was used in 11 patients according to general surgeon evaluation and removed as soon as bowel functions were reestablished. Prophylactic antibiotic treatment with 2 g cefazolin followed by 1 g twice a day and 500 mg metronidazole three times a day for 3 days was administered postoperatively in all patients. Operations were carried out with an indwelling Foley's catheter in situ, which was removed as soon as the patient could independently reach the toilet, usually the day after surgery.

When the patient was voiding spontaneously, the effect of the operation on bladder function was examined when the amount of residual urine was consistently < 100 mL in two consecutive measurements. Daily temperature and blood pressure were checked at least twice. Clear fluids were allowed the day after surgery and a graduated diet was started the next day.

Table 1. Summary of Complications in our Study Population (n = 35)

Type of complication	n
Drop in hemoglobin > 3 g/dL	7
Blood transfusion	5
Hemoperitoneum	1*
Rectal bleeding	5
Severe pain > 24 h	2

*This patient underwent a second laparoscopy.

RESULTS

Table 1 summarizes our results. Histologic examination of the surgical specimens confirmed endometriosis in all patients. The endometriotic nodule of the bowel was completely removed in all cases, as demonstrated by the presence of disease-free tissue around the lesion. The median operative time was 230 ± 110 minutes, and median blood loss was 197 ± 100 mL. No major or minor surgical complications occurred during the primary surgical procedure. One patient had a temporary diverting ileostomy because of air loss after insufflation of the rectosigmoid colon; it was closed successfully 1 month after operation. One patient underwent a double discoid resection with partially overlapped stapler lines. No procedure was converted to laparotomy. All patients left the hospital within 5 days if no complications occurred.

Seven patients had a drop in hemoglobin of > 3 g/dL, and five of them underwent blood transfusion. In one of these patients, a second laparoscopy was performed to drain the hemoperitoneum. Four patients had rectal bleeding as a consequence of oozing from the stapler line that ceased spontaneously in one patient. The remaining three patients were treated with Ugurrol (tranexamic acid, Rotapharm SpA) 3 g intravenous for 3 to 6 days plus transrectal endoscopic injection of epinephrine 1:10,000 and clipping of bleeding vessels (MB). Injection of epinephrine was done using a Contrast Injection Therapy Needle with needle length of 4.0 mm, needle size of 25 gauge, and a working length of 240 cm (Interject, Boston Scientific Corporation). Clipping was done with a rotatable clip-fixing device (QuickClip2; Olympus Corporation) with clip angle of 135 degrees close to the stapler line inserted in the operative channel of a standard single-channel video-colonoscopy (CF-Q145L, Olympus Europe Co). The whole procedure was carried out under sedation. One patient had temperature > 38° C during hospitalization. No patients had dehiscence of the anastomosis or sepsis. At the 1-month postoperative followup visit, no other serious complications had been recorded.

DISCUSSION

In 1993, Nezhat and colleagues²¹ were the first to report a case series of eight patients treated with laparoscopic disk excision for endometriosis in the colon anterior wall using laparoscopic suturing. With a postoperative followup of 5 to 18 months, six women reported complete relief of symptoms, two still had menstrual cramping and pain in the abdominal right lower quadrant, and one of the two infertility patients had achieved a pregnancy. The only complication was an ecchymosis of the abdominal wall. Anterior rectal wall excision using the circular stapler was first proposed by Gordon and associates¹⁹ to avoid the risks of a low extraperitoneal anastomosis in cases of nodular endometriosis invading the rectovaginal septum. Our data and that from the series by Woods and coworkers¹⁰ confirm the feasibility of laparoscopic full thickness disk excision of endometriosis with the only limitation being the size of the lesion. The upper limit of the size of the lesion that can be removed is questionable and subjective because it is assessed by vision, but we generally agree that the lesion should not exceed 2 to 3 cm, and should not involve more than one-third to one-half the total circumference of the rectum.

We experienced fewer severe complications than did Woods and colleagues¹⁰ because we had no fistula or sepsis, but we did have a higher incidence of bleeding. Possible explanations for these differences in the types of complications are a study population that was too small to allow any comparison, different pre- and postoperative management, different experiences of the general surgeons, small but significant differences in the technique used, or different technical equipment.

It is worth noticing that despite a relatively high incidence of bleeding, we report a low incidence of new operations. The reason for this is that before admitting the patients for another operation, an endoscopic attempt to stop the oozing was made. This technique is the same used for control of postpolypectomy hemorrhage.²² To the best of our knowledge, this is the first report of this technique after laparoscopic bowel resection. From the available data, laparoscopic disk excision using CEEA seems to compare favorably with the only alternative technique for removing small infiltrating nodules, that is, segmental bowel resection, which inherently carries a high risk of dehiscence of up to 15.5%.²³ It is questionable whether a simple full thickness disk excision responds to the basic principle of complete surgical removal of all endometriosis. Anaf and colleagues²⁴ demonstrated that endometriosis seems to infiltrate the large bowel wall preferentially along the nerves, even at 3 cm from the palpated lesion.

Remorgida and coauthors²⁵ demonstrated that interstitial cells of Cajal (ICC) were functionally damaged whenever subserous plexus and nerves were interrupted by the endometriotic lesions. Damage to the ICC was observed even at a distance from the involved area, and most importantly, even in the absence of muscular alteration.²⁵

Loss or damage to the ICC can cause serious motor dysfunction.²⁶ These findings raise the question whether full thickness disk excision and also nodulectomy or mucosal skinning should be considered a complete excision. This kind of surgery probably cannot resolve the problem of more extensive neural involvement of the intestinal tract. The clinical implications of leaving microscopic foci of endometriosis along the nerves at a distance from the main nodule and the damage remaining in the ICC surrounding the lesion are not known and need additional research. In conclusion, in properly selected patients, full thickness disk excision using a circular stapler is feasible and avoids the potential morbidities of a low anastomosis. But before we can claim it as a completely safe technique, a larger study population is needed. We suggest conservative management by endoscopic hemostasis before referring the patient for a new operation in case of rectal bleeding from the anastomotic site.

Author Contributions

Study conception and design: Landi, Pontrelli
Acquisition of data: Surico, Ruffo
Analysis and interpretation of data: Soriano, Mereu
Drafting of manuscript: Landi, Pontrelli, Benini
Critical revision: Minelli

REFERENCES

1. Jerby BL, Kessler H, Falcone T, Milsom JW. Laparoscopic management of colorectal endometriosis. *Surg Endosc* 1999;13:1125–1128.
2. Remorgida V, Ragni N, Ferrero S, et al. How complete is full thickness disc resection of bowel endometriotic lesions? A prospective surgical and histological study. *Hum Reprod* 2005;20:2317–2320.
3. Magos A. Endometriosis: radical surgery. *Baillieres Clin Obstet Gynaecol* 1993;7:849–864.
4. Duepre HJ, Senagore AJ, Delaney CP, et al. Laparoscopic resection of deep pelvic endometriosis with rectosigmoid involvement. *J Am Coll Surg* 2002;195:754–758.
5. Fagan CJ. Endometriosis: clinical and roentgenographic manifestations. *Radiol Clin North Am* 1974;12:109–112.
6. Macafee CH, Greer HL. Intestinal endometriosis. A report of 29 cases and a survey of the literature. *J Obstet Gynaecol Br Emp* 1960;67:539–555.
7. Jenkinson EL, Brown WH. Endometriosis: a study of 117 cases with special reference to constricting lesions of the sigmoid and colon. *JAMA* 1943;122:349–354.

8. Fauconnier A, Chapron C, Dubuisson JB, et al. Relation between pain symptoms and the anatomic location of deep infiltrating endometriosis. *Fertil Steril* 2002;78:719–726.
9. Mohr C, Nezhat FR, Nezhat CH, et al. Fertility considerations in laparoscopic treatment of infiltrative bowel endometriosis. *JSL* 2005;9:16–24.
10. Woods RJ, Heriot AG, Chen FC. Anterior rectal wall excision for endometriosis using the circular stapler. *ANZ J Surg* 2003;73:647–648.
11. Rambo WM, Johnson BL. Endometriosis mimics general surgical disease. *Am Surg* 1991;57:679–681.
12. Landi S, Barbieri F, Fiaccavento A, et al. Preoperative double-contrast barium enema in patients with suspected intestinal endometriosis. *J Am Assoc Gynecol Laparosc* 2004;11:223–228.
13. Garry R, Clayton R, Hawe J. The effect of endometriosis and its radical laparoscopic excision on quality of life indicators. *BJOG* 2000;107:44–54.
14. Ford J, English J, Miles WA, Giannopoulos T. Pain, quality of life and complications following the radical resection of rectovaginal endometriosis. *BJOG* 2004;111:353–356.
15. Thomassin I, Bazot M, Detchev R, et al. Symptoms before and after surgical removal of colorectal endometriosis that are assessed by magnetic resonance imaging and rectal endoscopic sonography. *Am J Obstet Gynecol* 2004;190:1264–1271.
16. Fedele L, Bianchi S, Zanconato G, et al. Long-term follow-up after conservative surgery for rectovaginal endometriosis. *Am J Obstet Gynecol* 2004;190:1020–1024.
17. Abbott JA, Hawe J, Clayton RD, Garry R. The effects and effectiveness of laparoscopic excision of endometriosis: a prospective study with 2–5 year follow-up. *Hum Reprod* 2003;18:1922–1927.
18. Hollett-Caines J, Vilos GA, Penava DA. Laparoscopic mobilization of the rectosigmoid and excision of the obliterated cul-de-sac. *J Am Assoc Gynecol Laparosc* 2003;10:190–194.
19. Gordon SJ, Maher PJ, Woods R. Use of the CEEA stapler to avoid ultra-low segmental resection of a full-thickness rectal endometriotic nodule. *J Am Assoc Gynecol Laparosc* 2001;8:312–316.
20. Landi S, Ceccaroni M, Perutelli A, et al. Laparoscopic nerve-sparing complete excision of deep endometriosis: is it feasible? *Hum Reprod* 2006;21:774–781.
21. Nezhat C, Nezhat F, Ambroze W, Pennington E. Laparoscopic repair of small bowel and colon. A report of 26 cases. *Surg Endosc* 1993;7:88–89.
22. Rex DK, Lewis BS, Wayne JD. Colonoscopy and endoscopic therapy for delayed post-polypectomy hemorrhage. *Gastrointest Endosc* 1992;38:127–129.
23. Dubernard G, Piketty M, Rouzier R, et al. Quality of life after laparoscopic colorectal resection for endometriosis. *Hum Reprod* 2006;21:1243–1247.
24. Anaf V, El Nakadi I, Simon P, et al. Preferential infiltration of large bowel endometriosis along the nerves of the colon. *Hum Reprod* 2004;19:996–1002.
25. Remorgida V, Ragni N, Ferrero S, et al. How complete is full thickness disc resection of bowel endometriotic lesions? A prospective surgical and histological study. *Hum Reprod* 2005;20:2317–2320.
26. Sanders KM, Ordog T, Ward SM. Physiology and pathophysiology of the interstitial cells of Cajal: from bench to bedside. IV. Genetic and animal models of GI motility disorders caused by loss of interstitial cells of Cajal. *Am J Physiol Gastrointest Liver Physiol* 2002;282:G747–756.