

Surgical, Clinical, and Functional Outcomes in Patients with
Rectosigmoid Endometriosis in the Grey Zone: 13-Year Long-term
Follow-up

Mohamed Mabrouk MD, PhD , Diego Raimondo MD ,
Michele Altieri MD , Alessandro Arena MD ,
Simona Del Forno MD , Elisa Moro MD , Giulia Mattioli MD ,
Raffaella Iodice MD , Renato Seracchioli MD Prof

PII: S1553-4650(18)31347-5
DOI: <https://doi.org/10.1016/j.jmig.2018.08.031>
Reference: JMIG 3679



To appear in: *The Journal of Minimally Invasive Gynecology*

Received date: 26 May 2018
Revised date: 27 July 2018
Accepted date: 17 August 2018

Please cite this article as: Mohamed Mabrouk MD, PhD , Diego Raimondo MD , Michele Altieri MD , Alessandro Arena MD , Simona Del Forno MD , Elisa Moro MD , Giulia Mattioli MD , Raffaella Iodice MD , Renato Seracchioli MD Prof , Surgical, Clinical, and Functional Outcomes in Patients with Rectosigmoid Endometriosis in the Grey Zone: 13-Year Long-term Follow-up, *The Journal of Minimally Invasive Gynecology* (2018), doi: <https://doi.org/10.1016/j.jmig.2018.08.031>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Original Article**Surgical, Clinical, and Functional Outcomes in Patients with Rectosigmoid Endometriosis in the Grey Zone: 13-Year Long-term Follow-up**

Mohamed Mabrouk, MD, PhD, Diego Raimondo, MD, Michele Altieri, MD, Alessandro Arena, MD, Simona Del Forno, MD, Elisa Moro, MD, Giulia Mattioli, MD, Raffaella Iodice, MD, Renato Seracchioli, MD, Prof.

*From the Department of Obstetrics and Gynecology, DIMEC, S.Orsola Hospital, University of Bologna, Italy (Drs Mabrouk, Raimondo, Altieri, Arena, Del Forno, Moro, Mattioli, and Seracchioli),
From the Department of Obstetrics and Gynecology, Faculty of Medicine, University of Alexandria, Egypt (Dr Mabrouk).*

Corresponding author: Diego Raimondo, MD, Department Gynecology and Human Reproduction Physiopathology, DIMEC, S.Orsola Hospital, University of Bologna, Massarenti, 13 - 40138 Bologna, Italy. Tel: + 39 051 2144389; Fax: +39 051 6364392. E-mail: die.raimondo@gmail.com

Disclosure statement: The authors declare that they have no conflicts of interest.

Funding: No funding was received for this study.

Precis: Conservative surgery versus radical surgery in women affected by recto-sigmoid endometriosis with intermediate risk of segmental bowel resection.

Keywords: Discoid excision; Segmental resection; Shaving.

Abstract

Objectives: To date, there is no consensus regarding the choice between radical (segmental resection) or conservative (shaving, discoid excision) surgical management for rectosigmoid endometriosis (RSE), in particular for patients with preoperative intermediate risk of bowel segmental resection (the grey zone). The objective was to compare long-term surgical, clinical, and functional outcomes between conservative and radical surgery in patients with RSE and preoperative intermediate risk of segmental resection.

Design: Retrospective cohort study (Canadian Task Force classification II-2).

Setting: Endometriosis tertiary level referral center, Sant'Orsola Academic Hospital, Bologna, Italy.

Patients: Three hundred and ninety-two patients with RSE presented for complete macroscopic surgical excision between January 2004 and January 2017.

Intervention: Assessment of laparoscopic bowel shaving, discoid or segmental resection for the treatment of RSE.

Measurements and Main Results: Patients were divided into three groups according to surgical technique: shaving (297/392, 75.8%), discoid excision (33/392, 8.4%) and segmental resection (62/392, 15.8%). Preoperative characteristics, surgical data, short- and long-term complications, rate of proven and suspected recurrence were assessed. The segmental resection group showed more short-term complications compared with the discoid group and shaving group (17.7% vs 9.1% vs 5.4%, respectively; $p = .004$). Median follow-up time was 43 months (range, 12–163). Suspected and proven RSE recurrence rates showed no statistically significant difference among the three groups. There were no significant differences concerning the rate of de novo chronic constipation and urinary retention.

Conclusion: Conservative surgery is preferred to radical surgery in patients with RSE in the grey zone risk category because it results in similar suspected and proven RSE recurrence rates and is associated with less short-term complications.

Introduction

Bowel endometriosis is when endometrial-like glands and stroma infiltrate the bowel wall reaching at least the muscular layer [1] and is estimated to occur in 8% to 12% of patients with a diagnosis of endometriosis; rectum and sigmoid colon are responsible for about 90% of all intestinal lesions [2,3].

Although several surgical techniques such as laparoscopic bowel resection, disc excision, or rectal shaving have been described as treatment, there is no consensus regarding a standard technique to adopt [4]. Moreover, efficacy of different approaches in terms of recurrence is controversial; some authors state that bowel resection has a lower recurrence rate compared with rectal shaving [3,5], but this result has not been confirmed by other studies [6,7].

Bowel resection is known to have a higher risk of adverse surgical outcomes during the peri-operative period compared with conservative surgery [8,9]. Similarly, the risk of functional complications (urinary, bowel, and sexual) seems to be higher in patients undergoing the radical approach [10–12].

It is crucial to stratify patients before surgery according to risk of segmental bowel resection to make an informed and shared decision regarding technique. Nevertheless, in many cases intraoperative decisions about the type of bowel surgery tend to reflect the center's policy and surgeon preference and experience.

Given this background, the objective of the current study was to investigate surgical, clinical, and functional outcomes in patients undergoing rectosigmoid endometriosis (RSE) surgery for bowel endometriosis preoperatively stratified as *intermediate risk for bowel resection*, otherwise called the grey zone.

Materials and Methods

We conducted a retrospective cohort study by reviewing the medical records of consecutive symptomatic patients with RSE who presented for complete excision of macroscopic disease at

our referral academic center between January 2004 and January 2017 with a minimum follow-up of 12 months.

Preoperative data

All patients underwent bimanual examination, speculum examination, transvaginal ultrasound and transabdominal ultrasonography before surgery. In patients with large bowel nodules (maximum >3 cm), rectal implants involving inner muscularis propria at transvaginal ultrasonography or severe bowel symptoms (rectal bleeding, symptoms of subocclusion, severe dyschezia), multidetector computerized tomography enteroclysis urography or magnetic resonance imaging enema were performed preoperatively to check for critical bowel or urinary stenosis and to plan surgery. Demographic and clinical characteristics were recorded, including hormonal therapy within 6 months before surgery.

The surgical decision was personalized according to the individual patient. In the absence of distinct indications for segmental bowel resection in patients with bowel deep infiltrating endometriosis, the risk was stratified by the team of surgeons and sonographers evaluating and carefully assessing the clinical and imaging data. Patients who did not fall in the high or low risk groups were classified as *intermediate risk for rectosigmoid segmental resection* and were included in the present study for analysis (Table 1).

Surgical techniques and decision-making

The day before surgery, monobasic sodium phosphate (40 mL in the morning and 20 mL in the afternoon) and clear liquid diet were required. Operative procedures were performed by two gynecological surgeons with extensive experience in the management of deep infiltrating endometriosis utilizing a previously published technique [13]. Bowel resections were performed by a dedicated colorectal surgeon.

Shaving consisted of careful dissection of the endometriotic nodule, peeling it off the bowel wall with or without breaching the bowel lumen with subsequent sutures when necessary. For

persistent deep bowel wall vertical infiltration or severe damage of the muscularis propria, bowel resection was adopted after shaving. For bowel implants <3 cm, located on the ventral surface of the rectum, and within 15 cm from the anal verge, a discoid excision of the rectal wall (full thickness anterior resection) was performed using a transanal circular stapler. For bowel implants ≥ 3 cm or those impacting the sigmoid tract, segmental rectosigmoid resection was completed using linear stapler 1 to 2 cm under the involved tract. The bowel tract was exteriorized through a small incision (3 cm) at the point of the suprapubic trocar and was excised. End-to-end or lateroterminal anastomosis was performed using a circular stapler.

All patients were informed and counseled regarding the risk of bowel resection and that the final decision would be determined at the time of surgery according to the depth of bowel involvement. In all cases, bowel segmental resection was avoided when possible. Surgical details and short- and long-term complications were recorded. Postoperative need for bladder self-catherization (in case of residual urine volume >100 mL) was noted at discharge and follow-up evaluations and was recommended until residual urine volume was less than 100 mL.

Surgical follow-up

Patients were followed 1, 3, 6, and 12 months after surgery and then every year with gynecological examination and ultrasound scan to check for endometriosis recurrence. Patient symptoms and postoperative complications were noted.

Short- and long-term complications were documented, pain symptoms were evaluated using the Visual Analogue Scale (VAS) score, endometriosis recurrence and need for re-intervention were compared among groups according to surgical procedure (shaving group [SG], discoid group [DG] and segmental resection group [RG]). In particular, recurrence of endometriosis (suspected or proven) was recorded and classified in three categories according to Meuleman et al [14]:

- a) Symptom recurrence based on patient history (VAS pain score ≥ 5), but no proof of recurrence by imaging and/or surgery;

- b) Endometriosis recurrence based on non-invasive imaging in patients with or without symptoms;
- c) Recurrence of histologically proven endometriosis; during secondary surgery, endometriosis is visually observed and confirmed histologically.

Suspicious endometriosis recurrence was defined as Categories a and b, while proven endometriosis recurrence was considered present if Category c criteria were met.

Long-term complications included de novo chronic constipation (persistent 3 months after surgery) and urinary retention (bladder catheterization for more than 3 months after surgery).

Owing to the retrospective design of the study, the institutional review board was notified and determined that approval was not required, and the local ethics committee approved the collection of data for research purposes. All patients signed informed consent during preoperative evaluation for deidentified data collection.

Statistical analysis

Continuous data are represented as mean \pm standard deviation (SD) or median (range).

Categorical variables were compared with Chi-square test. Continuous variables were assessed by Kruskal-Wallis test. A mixed model analysis of variance test was performed to compare the efficacy of the three techniques on patient symptoms. Significance was set at a $p < .05$. Data were analyzed using the Statistical Package for the Social Sciences 24.0 software (SPSS Inc., Chicago, IL, USA).

Results

During the study period, 1029 patients underwent bowel surgery for endometriosis. According to risk stratification for RSE, 422 patients (41%) with intermediate risk were included in the study group. Of those, 7.1% ($n = 30$) were lost to follow-up. Median follow-up was 43 months (range, 12–163). Finally, 392 patients were included in this study: 297 underwent shaving (75.8%), 33 discoid resection (8.4%), and 62 segmental resection (15.8%).

Patients were comparable in terms of age, body mass index, parity, presence of adenomyosis, use of medical therapy, and severity of preoperative symptoms. Length of follow-up was comparable between groups. The rate of previous bowel surgery for endometriosis was higher in RG (11.3%) and DG (12.1%) patients than SG patients (4%) (Table 2).

Surgical details are reported in Table 3. The three groups were comparable for concomitant procedures, while significant differences ($p < .001$) were observed regarding duration of surgery and hospitalization: mean operating time was 147 ± 47 minutes in SG patients, 186 ± 36 minutes in DG patients, and 207 ± 61 minutes in RG patients; mean hospital length of stay was 5.4 ± 3.0 days (SG), 7.2 ± 2.0 days (DG), and 9.3 ± 6.5 days (RG). Pathological examinations confirmed RSE in all patients.

Concerning overall short-term postoperative complications, RG presented a significantly ($p = .004$) higher rate compared with SG and DG patients. In the RG group, 11 patients (17.7%) developed the following complications: 1 rectal fistula, 1 urinary fistula, 2 with rectal bleeding requiring endoscopic intervention, 2 with hemoperitoneum requiring re-intervention, 2 with anemia requiring blood transfusion, and 3 with fever resolved with antibiotic therapy (Table 4). In the SG group, 16 patients (5.4%) presented the following complications: 1 rectal fistula, 4 urinary fistulae, 2 with ureteral stenosis requiring stenting, 7 with anemia requiring blood transfusion, and 2 with fever resolved with antibiotic therapy. In the DG group, 3 patients (9.1%) presented with postoperative complications: 1 bowel stenosis requiring endoscopic dilatation and 2 with anemia requiring blood transfusion. According to the Clavien-Dindo classification [15], all complications were grade 3b or lower, and complications that were grade 3b were statistically higher in the RG group (SG: 1.7%, DG: 0%, RG: 6.5%; $p = .03$).

At median follow-up of 43 months, a significant improvement of all pain symptoms was observed for all groups (Table 5).

Suspected and proven RSE recurrence was not statistically significant among the three groups (Table 5). Symptom recurrence was found in 35 SG patients (11.8%), 4 DG patients (12.1%), and

4 RG patients (6.5%). Suspected recurrence was detected by ultrasound during long-term follow-up in 12.8% of SG patients, 6.1% of DG patients, and 4.8% of RG patients. Proven endometriosis recurrence was diagnosed after re-intervention for RSE in 12 SG patients (4.0%), 1 DG patient (3.0%), and no RG patient.

There were no statistically significant differences in the three groups concerning the rate of de novo chronic constipation and urinary retention.

Discussion

To the best of our knowledge, the current study is the first to specifically evaluate the surgical outcomes of patients with RSE and preoperative intermediate risk for segmental resection, or the grey zone. Forty one percent of patients in the current study were determined to have grey zone RSE. In these patients, preoperative assessment is challenging, and it is hard to determine before surgery the appropriate procedure choice of shaving, discoid excision, or segmental resection.

Given the discouraging dearth of comparative research in this field, different and opposite intervention managements have been presented [2–6,9,16–19]. The presence of multiple lesions, the extension of the main nodule >3 cm, disease infiltration to the rectal mucosa and invasion of >50% of the circumference, together with other factors including patient symptoms and number of previous surgeries for RSE have been suggested as indications to stratify the patients as high risk for bowel segmental resection [2,3,5,16,17]. Conversely, it is recommended to treat small isolated rectosigmoid nodules without critical stenosis and subocclusion symptoms with a conservative approach (low risk of bowel segmental resection) [6,9,18], while some affirm that shaving should be considered first-line surgical treatment for deep infiltrating endometriosis, regardless of nodule size [4]. Moreover, the reported risk of recurrence after RSE surgery varies among studies, especially owing to various definitions of recurrence and length of follow-up [19].

During long-term follow-up of the current study, patients in the conservative surgery groups (SG and DG) had higher suspected RSE recurrence rates compared with patients treated with

segmental resection, although there was no statistical significance. Similarly, the SG and DG groups showed higher proven recurrence rates, identified after laparoscopic re-intervention for RSE, compared with the RG group (SG: 4.0%, DG: 3.0%, RG: 0%) without statistical significance.

The exact reasons for endometriosis recurrence after complete removal of macroscopic disease are still poorly understood, although several hypotheses have been noted: growth of microscopic hidden foci left behind after surgery, development of de novo lesions, shift of lymphatic and vascular lesions to the bowel [20–22].

A large meta-analysis conducted by Meuleman et al [14] noted a proven endometriosis recurrence rate significantly lower in the resection group (2.5%) compared with the mixed surgical group (5.7%) at mean follow-up of two years. The mixed surgical group included patients who underwent mixed surgical techniques (both radical and conservative). A significantly higher rate of reintervention in the shaving group compared with discoid or segmental resection groups was also observed by Afors et al [3] (27.6% in shaving, 13.3% in discoid, and 6.6% in segmental bowel resection) at mean follow-up of 24 months as well as by Roman et al [23] (8.6% after conservative surgery versus 0% after radical surgery) at mean follow-up of 80 months.

The current study data, even without statistical significance, showed similar reintervention rates and suspected recurrence rates [3,14,23]. This could be explained by the inclusion of only patients with intermediate risk of segmental resection.

In the RG group, more short-term complications were identified compared with the DG and SG groups (17.7% vs 9.1% vs 5.4%, respectively). Complications observed in the current study groups were comparable to those reported by other investigators [24,25]. In a systematic review, De Cicco et al [24] compared complications in 30 studies and concluded that the overall complication rate after segmental resection surgery was 22.2%. Abo et al [25] reported a three-arm comparative analysis of 364 consecutive patients undergoing surgery for bowel endometriosis; the early complication rate in the three groups was 5.5% for shaving, 7.5% for discoid, and 20.9% for segmental resection.

Regarding long-term complications, there was no statistical difference among the three groups of the current study. In accordance with the randomized controlled trial by Roman et al [26], the current study demonstrated that functional outcomes were similar when conservative surgery was compared to radical rectal surgery for deeply invasive endometriosis involving the bowel. However, Roman et al observed a higher incidence of digestive and urinary complications at 24-month follow-up, maybe owing to the smaller sample size and larger panel of functional complications investigated, including frequent bowel movements (≥ 3 stools/day), defecation pain, anal incontinence, and dysuria [26]. Adoption of the nerve-sparing technique and modulated segmental resection in terms of bowel length and vascularization preservation could prevent the high rate of pelvic organ dysfunctions reported [26–28].

The generalizability of the current study results is limited by the monocentric design of the study. Furthermore, despite the large study cohort and the long-term follow-up, the retrospective nature of this study did not allow for control of the confounding factors, including improvements in diagnostic and surgical techniques over the years.

Conclusion

Determining the correct surgical approach for RSE is challenging, owing to the numerous variables that must be considered before and during surgery. According to the current study, conservative surgery is preferred to radical surgery in patients diagnosed in the grey zone owing to similar results in terms of symptom severity improvement and recurrence rate, with less short-term complications.

References

- 1 Chapron C, Bourret A, Chopin N, et al. Surgery for bladder endometriosis: long-term results and concomitant management of associated posterior deep lesions. *Hum Reprod.* 2010;25:884–889.
- 2 Abrao MS, Petraglia F, Falcone T, Keckstein J, Osuga Y, Chapron C. Deep endometriosis infiltrating the recto-sigmoid: critical factors to consider before management. *Hum Reprod Update.* 2015;21:329–339.
- 3 Afors K, Centini G, Fernandes R, et al. Segmental and discoid resection are preferential to bowel shaving for medium-term symptomatic relief in patients with bowel endometriosis. *J Minim Invasive Gynecol.* 2016;23:1123–1129.
- 4 Donnez O, Roman H. Choosing the right surgical technique for deep endometriosis: shaving, disc excision, or bowel resection? *Fertil Steril.* 2017;108:931–942.
- 5 Malzoni M, Di Giovanni A, Exacoustos C, et al. Feasibility and safety of laparoscopic-assisted bowel segmental resection for deep infiltrating endometriosis: a retrospective cohort study with description of technique. *J Minim Invasive Gynecol.* 2016;23:512–525.
- 6 Donnez J, Squifflet J. Complications, pregnancy and recurrence in a prospective series of 500 patients operated on by the shaving technique for deep rectovaginal endometriotic nodules. *Hum Reprod.* 2010;25:1949–1958.
- 7 Roman H, Vassilief M, Gourcerol G, et al. Surgical management of deep infiltrating endometriosis of the rectum: pleading for a symptom-guided approach. *Hum Reprod.*

2011;26:274–281.

8 Remorgida V, Ferrero S, Fulcheri E, Ragni N, Martin DC. Bowel endometriosis: presentation, diagnosis, and treatment. *Obstet Gynecol Survey*. 2007;62:461–470.

9 Fanfani F, Fagotti A, Gagliardi ML, et al. Discoid or segmental rectosigmoid resection for deep infiltrating endometriosis: a case-control study. *Fertil Steril*. 2010;94:444–449.

10 Ballester M, Dubernard G, Wafo E, et al. Evaluation of urinary dysfunction by urodynamic tests, electromyography and quality of life questionnaire before and after surgery for deep infiltrating endometriosis. *Eur J Obstet Gynecol Reprod Biol*. 2014;179:135–140.

11 Barbara G, Facchin F, Meschia M, Berlanda N, Frattaruolo MP, Vercellini P. When love hurts. A systematic review on the effects of surgical and pharmacological treatments for endometriosis on female sexual functioning. *Acta Obstet Gynecol Scand*. 2017;96:668–687.

12 Roman H, Vassiliev M, Tuech JJ, et al. Postoperative digestive function after radical versus conservative surgical philosophy for deep endometriosis infiltrating the rectum. *Fertil Steril*. 2013;99:1695–1704.

13 Seracchioli R, Poggioli G, Pierangeli F, et al. Surgical outcome and long-term follow up after laparoscopic rectosigmoid resection in women with deep infiltrating endometriosis. *BJOG*. 2007;114:889–895.

14 Meuleman C, Tomassetti C, D'Hoore A, et al. Surgical treatment of deeply infiltrating endometriosis with colorectal involvement. *Hum Reprod Update*. 2011;17:311–326.

15 Radosa M, Meyberg-Solomayer G, Radosa J, et al. Standardised registration of surgical

complications in laparoscopic-gynaecological therapeutic procedures using the Clavien-Dindo classification. *Geburtshilfe Frauenheilkd.* 2014;74:752–758.

16 Abrão MS, Podgaec S, Dias JA Jr, Averbach M, Silva LF, Marino de Carvalho F. Endometriosis lesions that compromise the rectum deeper than the inner muscularis layer have more than 40% of the circumference of the rectum affected by the disease. *J Minim Invasive Gynecol.* 2008;15:280–285.

17 Goncalves MO, Podgaec S, Dias JA Jr, Gonzalez M, Abrao MS. Transvaginal ultrasonography with bowel preparation is able to predict the number of lesions and rectosigmoid layers affected in cases of deep endometriosis, defining surgical strategy. *Hum Reprod.* 2010;25:665–671.

18 Roman H, Darwish B, Bridoux V, et al. Functional outcomes after disc excision in deep endometriosis of the rectum using transanal staplers: a series of 111 consecutive patients. *Fertil Steril.* 2017;107:977.e2–986.e2.

19 Ianieri MM, Mautone D, Ceccaroni M. Recurrence in deep infiltrating endometriosis: a systematic review of the literature. *J Minim Invasive Gynecol.* 2018;25:786–793.

20 Milone M, Vignali A, Milone F, et al. Colorectal resection in deep pelvic endometriosis: surgical technique and post-operative complications. *World J Gastroenterol.* 2015;21:13345–13351.

21 Taylor E, Williams C. Surgical treatment of endometriosis: location and patterns of disease at reoperation. *Fertil Steril.* 2010;93:57–61.

22 Abrao MS, Podgaec S, Dias JA Jr, et al. Deeply infiltrating endometriosis affecting the

rectum and lymph nodes. *Fertil Steril*. 2006;86:543–547.

23 Roman H, Milles M, Vassilieff M, et al. Long-term functional outcomes following colorectal resection versus shaving for rectal endometriosis. *Am J Obstet Gynecol*. 2016;215:762.e1–762.e9.

24 De Cicco C, Corona R, Schonman R, Mailova K, Ussia A, Koninckx P. Bowel resection for deep endometriosis: a systematic review. *BJOG*. 2011;118:285–291.

25 Abo C, Moatassim S, Marty N, et al. Postoperative complications after bowel endometriosis surgery by shaving, disc excision, or segmental resection: a three-arm comparative analysis of 364 consecutive cases. *Fertil Steril*. 2018;109:172.e1–178.e1.

26 Roman H, Bubenheim M, Huet E, et al. Conservative surgery versus colorectal resection in deep endometriosis infiltrating the rectum: a randomized trial. *Hum Reprod*. 2018;33:47–57.

27 Mabrouk M, Spagnolo E, Raimondo D, et al. Segmental bowel resection for colorectal endometriosis: is there a correlation between histological pattern and clinical outcomes? *Hum Reprod*. 2012;27:1314–1319.

28 Ceccaroni M, Clarizia R, Bruni F, et al. Nerve-sparing laparoscopic eradication of deep endometriosis with segmental rectal and parametrial resection: the Negrar method. A single-center, prospective, clinical trial. *Surg Endosc*. 2012;26:2029–2045.

Table 1 Factors evaluated for risk stratification of rectosigmoid resection	
High risk*	Low risk
Nodule length ≥ 5 cm	Nodule length ≤ 2 cm
Multiple nodules	Single lesion
Critical bowel stenosis ($>50\%$)	No bowel stenosis
Critical circumferential infiltration ($>40\%$)	No evidence of circumferential infiltration
Mucosal infiltration at colonoscopy	No cyclic rectal bleeding
Cyclic rectal bleeding	No subocclusion symptoms
Subocclusion symptoms (abdominal distension, 1 stool for >5 consecutive days or radiological evidence of intestinal subocclusion)	
Previous conservative surgery for RSE	
*At least one of these factors. RSE = rectosigmoid endometriosis.	

Table 2
Patients clinical history

	SG n = 297 (75.8%)	DG n = 33 (8.4%)	RG n = 62 (15.8%)	P value
Mean age, years*	35 ± 6.0	33 ± 3.2	35 ± 5.6	NS
Mean BMI, kg/m ² *	22.3 ± 3.4	22.7 ± 3.4	21.8 ± 2.7	NS
Nulliparous, n (%)	243 (81.8)	30 (90.9)	50 (80.6)	NS
Desiring pregnancy, n (%)	109 (36.7)	12 (36.4)	22 (35.5)	NS
Infertility, n (%)	57 (19.2)	6 (18.2)	12 (19.4)	NS
Adenomyosis, n (%)	153 (51.5)	16 (48.5)	36 (58.1)	NS
Associated endometrioma, n (%)	200 (67.3)	23 (69.7)	38 (61.3)	NS
Previous medical therapy, n (%)	215 (72.4)	18 (54.5)	48 (77.4)	NS
Previous surgery for endometriosis, n (%)	102 (34.3)	9 (27.3)	30 (48.4)	NS
Previous rectosigmoid surgery for endometriosis, n (%)	12 (4.0)	4 (12.1)	7 (11.3)	.02
Dyspareunia, VAS*	5.2 ± 3.4	5.3 ± 3.2	5.5 ± 3.2	NS
Chronic pelvic pain, VAS*	4.7 ± 2.9	4.0 ± 2.5	4.7 ± 3.2	NS
Dysmenorrhea, VAS*	7.5 ± 2.7	8.2 ± 2.3	7.8 ± 2.7	NS
Dyschezia, VAS*	6.2 ± 3.2	6.2 ± 3.7	6.0 ± 3.6	NS
Dysuria, VAS*	1.1 ± 2.3	1.6 ± 2.6	1.8 ± 3.2	NS
Constipation, n (%)	59 (19.9)	6 (18.2)	12 (19.4)	NS
Diarrhea, n (%)	22 (7.4)	6 (18.2)	5 (8.1)	NS

*Mean ± standard deviation. BMI = body mass index; DG = discoid group; RG = segmental resection group; SG = shaving group; VAS = Visual Analogue Scale.

Table 3
Surgical details

	SG n = 297 (75.8%)	DG n = 33 (8.4%)	RG n = 62 (15.8%)	p value
Duration of surgery, minutes*	147 ± 47	186 ± 36	207 ± 61	<.001
Concomitant procedures, n (%)	286 (96.3)	29 (87.9)	58 (93.5)	NS
Hysterectomy, n (%)	25 (8.4)	0	8 (12.9)	NS
Ovariectomy, n (%)	22 (7.4)	3 (9.1)	1 (1.6)	NS
Unilateral, n (%)	17 (5.7)	3 (9.1)	1 (1.6)	NS
Bilateral, n (%)	5 (1.7)	0	0	NA
Ovarian cystectomy, n (%)	187 (63.0)	19 (57.6)	35 (56.5)	NS
Bladder shaving, n (%)	74 (24.9)	8 (24.2)	13 (21.0)	NS
Partial cystectomy, n (%)	20 (6.7)	0	5 (8.1)	NS
Ureteral nodule excision, n (%)	65 (21.9)	9 (27.3)	18 (29.0)	NS
Ureterectomy, n (%)	7 (2.4)	0	1 (1.6)	NS
Nephrectomy, n (%)	0	0	2 (3.2)	NA
USL, n (%)	118 (39.7)	12 (36.4)	17 (27.4)	NS
Unilateral, n (%)	75 (25.3)	4 (12.1)	13 (21.0)	NS
Bilateral, n (%)	43 (14.5)	8 (24.2)	4 (6.5)	NS
Parametrium, n (%)	87 (29.3)	12 (36.4)	16 (25.8)	NS
Unilateral, n (%)	70 (23.6)	11 (33.3)	11 (17.7)	NS
Bilateral, n (%)	17 (5.7)	1 (3.0)	5 (8.1)	NS
Appendectomy, n (%)	15 (5.1)	3 (9.1)	5 (8.1)	NS
Vaginal opening, n (%)	113 (38.0)	18 (54.5)	19 (30.6)	NS
Ileostomy, n (%)	0	0	4 (6.5)	NA
Hospital length of stay, days*	5.4 ± 3.0	7.2 ± 2.0	9.3 ± 6.5	<.001
*Mean ± standard deviation. DG = discoid group; RG = segmental resection group; SG = shaving group; USL = uterosacral ligament.				

Table 4 Short-term complications				
	SG n = 297 (75.8%)	DG n = 33 (8.4%)	RG n = 62 (15.8%)	P value
Rectal fistula, n (%)	1 (0.3)	0	1 (1.6)	NS
Bowel stenosis (required endoscopic dilatation), n (%)	0	1 (3)	0	NA
Urinary fistula, n (%)	4 (1.3)	0	1 (1.6)	NS
Ureteral stenosis (required stenting), n (%)	2 (0.7)	0	0	NA
Rectal bleeding (required endoscopic intervention), n (%)	0	0	2 (3.2)	NS
Anemia (required blood transfusion), n (%)	7 (2.4)	2 (6.1)	2 (3.2)	NS
Hemoperitoneum (required re- intervention), n (%)	0	0	2 (3.2)	NA
Fever (resolved with antibiotic therapy), n (%)	2 (0.7)	0 (0)	3 (4.8)	.01
Women with complications, n (%)	16 (5.4)	3 (9.1)	11 (17.7)	.004
Clavien-Dindo classification of complications				
1, n (%)	0	0	0	NA
2, n (%)	9 (3.0)	2 (6.1)	5 (8.1)	NS
3a, n (%)	2 (0.7)	1 (3)	2 (3.2)	NS
3b, n (%)	5 (1.7)	0	4 (6.5)	.03
4a, n (%)	0	0	0	NA
4b, n (%)	0	0	0	NA
5, n (%)	0	0	0	NA
DG = discoid group; RG = segmental resection group; SG = shaving group.				

Table 5
Follow-up

	SG n = 297 (75.8%)	DG n = 33 (8.4%)	RG n = 62 (15.8%)	p value
Median follow-up, months	43 (12–163)	46 (12–144)	46 (12–141)	NS
Use of medical therapy during follow up, n (%)	200 (67.3)	23 (69.7)	48 (77.4)	NS
Suspicious RSE recurrence	35 (11.8)	4 (12.1)	4 (6.5)	NS
Symptom recurrence, n (%)	38 (12.8)	2 (6.1)	3 (4.8)	NS
Non-invasive imaging recurrence, n (%)				
Proven RSE recurrence (Re-intervention), n (%)	12 (4.0)	1 (3.0)	0 (0)	NS
Dyspareunia, VAS score*	1.4 ± 2.1	1.2 ± 2.0	1.4 ± 2.5	NS
Chronic pelvic pain, VAS score*	1.0 ± 1.8	0.8 ± 1.4	1.1 ± 2.1	NS
Dysmenorrhea, VAS score*	1.3 ± 1.2	1.3 ± 1.4	1.4 ± 1.2	NS
Dyschezia, VAS score*	0.6 ± 1.7	0.7 ± 1.5	0.7 ± 1.9	NS
Dysuria, VAS score*	0.1 ± 0.5	0.2 ± 0.4	0.2 ± 1.0	NS
Constipation, n (%)	12 (4.0)	3 (9.1)	7 (11.3)	NS
Urinary retention, n (%)	3 (1.0)	1 (3.0)	2 (3.2)	NS

*Mean ± standard deviation. DG = discoid group; RG = segmental resection group; RSE = rectosigmoid endometriosis; SG = shaving group; VAS = Visual Analogue Scale.