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Feasibility, complications and recurrence following discoid resection for colorectal endometriosis: a series of 93 cases

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MINI ABSTRACT

Prospective study of laparoscopic discoid resection for endometriosis evaluating the conversion to segmental resection, double discoid resection, complications and recurrence.

SHORT TITLE

Feasibility and outcomes of Laparoscopic Discoid Resection for Colorectal Endometriosis

ABSTRACT

Laparoscopic discoid colorectal resection is a surgical option for bowel endometriosis, one of the most severe forms of endometriosis. However, no study has clearly analysed the feasibility, or the complication and recurrence rates of the procedure in a homogeneous population with specific criteria for discoid resection. The aims were to evaluate the rate of conversion to segmental resection, the need for double discoid resection, and the complication and recurrence rates.

We conducted a prospective study of 93 consecutive patients who underwent discoid resection in Tenon University Hospital in Paris. The median follow-up was 20 months. We included patients with colorectal endometriosis (≤ 3 cm long and $< 90^\circ$ of bowel circumference) experiencing failure of medical treatment or associated infertility.

All the patients underwent a discoid colorectal resection using a transanal circular stapler.

The primary endpoint was the rate of conversion to segmental resection (3.2%). The second endpoint was the rate of double discoid resection (6.5%). The overall complication rate was 24% and the severe complication rate Clavien-Dindo IIIB was 3% ($n=4$). Postoperative voiding dysfunction requiring bladder self-catheterization was observed in 16% ($n=15$). The mean duration of bladder self-catheterization was 30 days (range 15-90) including 11 cases (74%) lasting less than 30 days and four cases lasting more than 30 days. No patients required bladder self-catheterization over 3 months. No difference in the complication rate or in voiding dysfunction was observed between double and single discoid resection.

The low rate of conversion to radical resection confirms the satisfactory preoperative evaluation of bowel endometriosis. Few publications report the rate of conversion to radical surgery. This raises the crucial issue of the right indications for discoid resection.

The present study confirms that discoid resection is probably the best option for small lesions due to its high feasibility and low complication rate. Further studies are required to evaluate the technique for larger colorectal endometriotic lesions.

KEY WORDS: deep endometriosis, colorectal endometriosis, voiding dysfunction, discoid

resection, conversion to segmental

KEY POINTS

Question: We wanted to evaluate the rate of conversion of discoid to segmental resection, the need for double discoid resection, and complication and recurrence rates.

Findings: We found low severe postoperative complication and conversion rates, and no patients experienced postoperative voiding dysfunction for more than 3 months.

Meaning: Discoid resection for colorectal endometriosis is probably the best option for lesions ≤ 3 cm in length involving less than 90° of the bowel circumference.

INTRODUCTION

The colorectum is the most frequent location of bowel endometriosis—one of the most severe forms of deep endometriosis (DE)—which affects about 10% of women with endometriosis (1–3). Colorectal resection is mainly performed after failure of medical treatment or after failure of two IVF cycles for infertility-associated endometriosis (2) due to the risk of complications such as rectovaginal fistula and voiding dysfunction (4–8). However, there is a lack of clear consensus for optimal patient management.

Thanks to improvements in imaging techniques (9,10), bowel endometriosis can now be diagnosed at the onset of rectal infiltration. This raises the issue of when radical segmental resection is the optimal surgical approach. While previous meta-analyses (4,11) have suggested lower complication rates for conservative surgery including rectal shaving and discoid resection compared to radical resection, a randomized trial comparing these two options did not find differences in complication rates, quality of life, digestive function or fertility outcomes between the groups (8). The absence of differences was probably related to the power calculation but also because the conservative surgery group of both rectal shaving and discoid resection included lesions of up to 5 cm in diameter (8). Conversely, using a propensity score analysis with strict criteria for discoid resection restricted to lesions not exceeding 3 cm in diameter and involving less than 90° of the circumference of the bowel, Jayot et al observed a lower incidence of complications for discoid resection (6). However, none of these studies clearly analysed the feasibility, or the complication and recurrence rates of discoid resection in a homogeneous population with specific criteria for discoid resection.

Therefore, the aims of the present prospective study were to evaluate the rate of conversion to segmental resection, the need for double discoid resection, and the complication and recurrence rates in women undergoing discoid resection for colorectal endometriosis.

MATERIALS AND METHODS

From September 2015 to December 2018, we conducted a prospective cohort study of consecutive patients undergoing discoid resection for colorectal endometriosis at Tenon University Hospital, Paris, France. All the patients gave their consent to participate to the study. The study was approved by the Ethics Committee of the National College of French Gynaecologists and Obstetricians (CNGOF) (reference number: CEROG 2012-GYN-10-03).

Patients

The inclusion criteria were as follows: symptomatic patients aged over 18 years with failure of medical treatment or with infertility; with colorectal endometriosis confirmed by transvaginal ultrasonography, magnetic resonance imaging (MRI), and rectal echoendoscopy (REE) using previously published criteria (12–15); and with a lesion evaluated preoperatively ≤ 3 cm in diameter and involving $< 90^\circ$ of the circumference. Patients had to be affiliated to the French health care system and to be able to speak and read French. We excluded patients with prior colorectal surgery for benign or malignant disease, and those who refused surgical management.

Surgical procedure

All laparoscopic colorectal resections were performed according to protocol guidelines with the same extent of resection including ovarian cystectomy, salpingo-oophorectomy, uterosacral ligament resection, hysterectomy, ureterolysis, and multiple bowel resections when required. The first step of the laparoscopy consisted in exploring the abdomen, mobilizing the colorectum to evaluate the size and extension of the bowel endometriosis, determining whether it was multicentric or multifocal, and identifying critical structures involved. For bowel resection, the ureter was identified crossing the pelvic brim and mobilization was continued inferiorly to open the pararectal space. In this way, the anterior branches of the hypogastric plexus were identified to allow for nerve-sparing surgery. In contrast to segmental resection, the mesocolon was not systematically opened nor

dissection extended down to the pararectal space and presacral space opening. When coexisting uterosacral, parametrial, visceral fascia or vaginal endometriotic lesions were observed, en-bloc resection was performed with the affected rectal segment. The second step of the procedure included rectal shaving removing the serosal component of the bowel endometriosis and associated DE lesions. Discoid resection was then performed using a transanal circular stapler CDH 33 (CDH33A, Endo-Surgery, Ethicon, France). A protective defunctioning stoma was restricted to women requiring a concomitant vaginal and colorectal resection, except for patients requiring a hysterectomy for whom a prevesical peritoneum was interposed between vagina and bowel suture was used as previously described (16). In patient requiring a colectomy with no desire to become pregnant, epiploplasty by omental hemisection from the transverse colon with suture to the posterior vaginal wall was used. For patient wishing to conceive, an ileostomy was used to limit the risk of pelvic adhesions source of infertility.

The intraoperative decision to perform double discoid resection was based on macroscopic analysis of both the bowel wall and specimen with no free margins suggesting non-*in sano* resection. Double discoid resection corresponds to two consecutive discoid resections on a single colorectal lesion. Decision to convert discoid resection to segmental resection was based on macroscopic features of colorectal lesions > 3 cm, multifocal lesions or after failure of double discoid resection (2,17).

Statistical analysis

The following patient characteristics were recorded: age, body mass index (BMI), parity, previous surgery, details of surgical procedures, size of specimens, and preoperative symptoms.

Both intra- and postoperative complications were recorded and classified according to the Clavien-Dindo classification as minor when of grade I-II and major when of grade IIIA and IIIB-IV. Voiding dysfunction defined by the need of intermittent bladder self-catheterization was also recorded. The patients were taught how to self-catheterize if their post-void residual

urine volume was greater than 100 mL (18–20). Immediate voiding dysfunction was defined by urinary dysfunction requiring bladder self-catheterization lasting less than 1 month postoperatively and persistent voiding dysfunction when lasting more than 1 month. The gold standard for the diagnosis of colorectal endometriosis was based on histology.

Quantitative variables were expressed in median and interquartile range (IQR) and nominal variables in proportion. Statistical analysis was based on the Student's t test, as appropriate for continuous variables, and the Chi-square test, as appropriate for categorical variables. Values of $p < 0.05$ were considered to denote significant differences. All analyses were performed with R software, version 2.15.2 (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Epidemiological and surgical characteristics of the population.

Between September 2015 and December 2018, 304 patients underwent surgery for colorectal endometriosis: 211 (69.5%) underwent segmental colorectal resection and 93 (30.5%) discoid resection. From September to December 2015, eight (23%) of the 35 resections were discoid resections; in 2016, 29 (27%) of the 107 resections were discoid; in 2017, 28 (30%) of the 94 resections were discoid; and in 2018, 28 (40%) of the 71 resections were discoid.

The characteristics of the population are summarized in Table 1. The median age was 34 years (range: 19-59) and median BMI was 23 kg/m² (17-37). Thirty-five percent of the patients had a history of surgery for endometriosis (n=33).

The main symptoms of the population were dysmenorrhea (91%), dyspareunia (67%), chronic pelvic pain (64%), dyschezia (54%), and painful defecation (48%). Thirty-six percent (n=34) of the patients had a history of infertility (Table 1). At physical exam, a rectal lesion was palpable in 48% of the whole population (n=45) (Table 2).

According to the preoperative MRI, 63% (n=59) of the patients had infiltrating rectal lesions, with a diameter \leq 3 cm in 49% cases (n=46). On preoperative REE, 78% of the patients (n=73) presented a rectal lesion with a median diameter of 15 mm (range: 10-25) and a median value of the circumference involved of 40° (15-100) (Table 2). The kappa coefficient between MRI and REE to detect colorectal infiltration was 0.397 (moderate accordance) (Table 3).

Double discoid resection was performed in six cases (6%) because of a lesion > 3 cm or for non-*in sano* resection on intraoperative macroscopic evaluation. Conversion to segmental resection was required in three cases (3.2%): in two because double discoid resection was not possible due to lesion length with a risk of stenosis, and in one due to a large lesion with a risk of incomplete lateral resection.

The median operating time was 150 min (range: 60-350). Concomitant colectomy was performed in 20 cases, parametrectomy in 28 cases and concomitant hysterectomy in

27 (Table 4). A protective defunctioning stoma was performed in the 10 patients (11%) who underwent concomitant colectomy. Prevesical peritoneum was interposed between the vagina and the discoid suture for the 27 patients who underwent hysterectomy (29%).

Surgical complications and follow-up

The median follow-up was 20 months (range: 1-40) (Table 5). Twenty-seven postoperative complications occurred including four cases of Clavien-Dindo classification grade IIIB (requiring a reoperation). The main complication was urinary tract infection observed in 14 patients (15%). Other complications consisted of: two wound infections, two vaginal dehiscences, one pelvic abscess requiring drainage under radiologic guidance, one ureteral injury, one rectal bleeding, three cases of isolated fever, one paralytic ileus, one blood transfusion, and one vesicovaginal fistula. No recto-vaginal fistula nor anastomotic leakages were observed.

Fifteen patients (16%) experienced postoperative voiding dysfunction requiring bladder self-catheterization. The mean duration of bladder self-catheterization was 30 days (range 15-90) including 11 cases (74%) lasting less than 30 days and four cases lasting more than 30 days. No patient required bladder self-catheterization over 3 months.

One case of colorectal endometriosis recurrence occurred 15 months after surgery in a patient with a non-*in sano* resection at histology.

No difference in either complication or voiding dysfunction rates was observed between double discoid resection (6 cases) and single discoid resection (87 cases) (Table 6).

DISCUSSION

The present study confirms the feasibility of discoid resection for colorectal endometriosis when using strict eligibility criteria. Moreover, the rate of severe complications and recurrence would appear acceptable suggesting that this technique should be offered to patients with small colorectal lesions.

Around 40% of our patients with colorectal endometriosis are now managed by discoid colorectal resection. This represents a significant increase since its introduction in September 2015 and is probably due to improved evaluation of bowel characteristics using MRI and REE, especially concerning the bowel circumference involved, even if some discrepancies exist between the two imaging techniques (21). The increase cannot be linked to changes in the indication for colorectal resection as our expert committee did not modify the protocol during the study period: bowel resection was always restricted to symptomatic patients with medical failure and to patients with endometriosis associated infertility after failure of two IVF-ICSI cycles (22). The rate of conversion to radical surgery requiring segmental resection was low in our population (3.2%) confirming satisfactory preoperative evaluation of bowel endometriosis. Few publications report the rate of conversion to radical surgery. In the ENDORE trial (8) comparing radical to conservative surgery for colorectal endometriosis, the rate of conversion was 2.7% (representing two of the 27 patients in the conservative surgery arm) for both rectal shaving and discoid resection. However, unlike in our study population, the ENDORE trial included patients with a lesion of up to 5 cm in length. This raises the crucial issue of the right indications for discoid resection (2,6,17). Our criteria depend on the limits of the endoscopic stapler available (33 mm in diameter) restricting resection of lesions of more than 3 cm in length and 90° of circumference. However, our criteria are questionable as discoid resection could be performed using classic bowel suture possibly under robotic control even if previous studies have suggested a higher risk of pelvic abscess and anastomotic leakage of conventional suture compared to automatic stapler (17). Our study also demonstrated the feasibility of double discoid resection without an increase in complication rate compared to single discoid resection

suggesting the possible extension of discoid resection for lesions over 3 cm in length. Our results are in agreement with those of Oliveira et al. (25) reporting the feasibility of double discoid resection for a large and distensible rectum. However, the extension of this technique to lesions with a circumference over 90° increases the risk of anastomose stenosis as suggested by Abrao et al for lesions involving more than 40% of bowel circumference (2).

Before comparing the feasibility and complication rates of discoid resection with previous studies, it is necessary to evaluate the imaging techniques and criteria used for eligibility for conservative surgery. As previously mentioned, in the current study, only patients with colorectal lesions under 3 cm in length and involving less than 90° of bowel circumference were eligible. First, our results show the moderate accordance between MRI and REE to evaluate features of colorectal lesion ($\kappa=0.397$) with a trend for lower values by REE. This discrepancy between the two techniques has been highlighted in previous studies (21,26) and can be explained by variations in the method of assessing the size of the lesion. Indeed, some authors using MRI or REE evaluate the direct distance between the highest and the lowest points of the colorectal lesion while others (as our team) evaluate the length of the lesion taking into account the curvature of the bowel linked to serous and muscular retractions. This latter method seems more appropriate for assessing the true size of the lesion. On the other hand, the evaluation of the circumference of the colorectum is less well evaluated by MRI than by REE emphasizing the complementarity of these two techniques for the choice of surgical technique (9).

We included 25 series in our literature review (Table 7). It should be noted here that we did not include the meta-analysis by Bala et al (4) in our review as they did not report data about the various conservative techniques in patients treated by discoid resection. Among the 25 series, only 11 (44%) reported criteria of eligibility. All of these apart from the ENDORE trial (8), which included lesions of up to 5 cm, restricted the indication to lesions of between 2 and 3 cm. Eight of the 11 series (72%) specified the circumference values which varied between one-third to one-half of the circumference with most authors including a circumference of up to 50% over the size recommended by Abrao et al (2). These results

raise the issue of consensus criteria. Further trials should be conducted taking into account the complication rate according to lesion length and circumference involved.

Another crucial issue is when to abandon discoid resection. In our series, three cases of discoid resection were converted to segmental resection. Although the literature is scarce, in two cases, this was because the lesion was too long for a double discoid resection, which would have exposed the patient to the risk of colorectal stenosis by plication. In the remaining case, the circumference was too large raising the risk of incomplete lateral resection. In the review of the literature, only the ENDORE trial reported one conversion from conservative surgery to segmental resection.

Except requirement of ileostomy for concomitant colorectal and vaginal resections that could be considered as potential complications linked to the need of a second surgery, 26 of our patients (27%) experienced postoperative complications according to the Clavien-Dindo classification including four cases of grade IIIB (4%) that required a reoperation: two for vaginal dehiscence not directly linked to the discoid colorectal resection; one for ureteral injury; and one a vesicovaginal fistula. No rectovaginal fistula or anastomotic leakages were observed. In the review of the literature, the rate of rectovaginal fistula, pelvic abscess and anastomotic leakage were 1% (n=6), 0.9% (n=5), and 0% (n=0), respectively. In contrast to classic postoperative complications, few data are available on voiding dysfunction that was observed in 15 of our patients including four lasting more than 1 month but none over 3 months. Only eight series (32%) reported the rate of postoperative voiding dysfunction varying between 0 and 5.8% in the largest series of Roman et al (24). We decided to exclude the series of Abo et al (7) because it presented all cases of conservative colorectal resection without distinguishing the Rouen technique from conventional discoid resection. In a literature review, Donnez and Roman (23) reported no cases of voiding dysfunction. This apparent discrepancy is probably due to the small sample size and the heterogeneity in the definition of voiding dysfunction (27). Finally, few data are available on the recurrence rate. Despite a relatively short follow-up, we recorded one case of recurrence linked to residual disease, as the margins were positive at histology.

Some limits of the current study deserve to be underlined. First, the relative short follow-up does not allow sufficient evaluation of the recurrence rate. Second, also due to the short follow-up period, insufficient data about fertility outcomes were available. Finally, further studies are required to define the best indication for double discoid resection.

Despite these limits, the present study confirms that discoid resection is probably the best option for managing colorectal endometriosis for patients with small lesion thanks to its high feasibility and low complication rates. However, further studies are required to evaluate whether this technique could be extended to larger lesions.

REFERENCES

1. Chapron C, Chopin N, Borghese B, Foulot H, Dousset B, Vacher-Lavenu MC, et al. Deeply infiltrating endometriosis: pathogenetic implications of the anatomical distribution. *Hum Reprod Oxf Engl*. 2006 Jul;21(7):1839–45.
2. Abrão 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 Jun;21(3):329–39.
3. Daraï E, Dubernard G, Coutant C, Frey C, Rouzier R, Ballester M. Randomized trial of laparoscopically assisted versus open colorectal resection for endometriosis: morbidity, symptoms, quality of life, and fertility. *Ann Surg*. 2010 Jun;251(6):1018–23.
4. Balla A, Quaresima S, Subiela JD, Shalaby M, Petrella G, Sileri P. Outcomes after rectosigmoid resection for endometriosis: a systematic literature review. *Int J Colorectal Dis*. 2018 Jul;33(7):835–47.
5. Kondo W, Bourdel N, Tamburro S, Cavoli D, Jardon K, Rabischong B, et al. Complications after surgery for deeply infiltrating pelvic endometriosis. *BJOG Int J Obstet Gynaecol*. 2011 Feb;118(3):292–8.
6. Jayot A, Nyangoh Timoh K, Bendifallah S, Ballester M, Darai E. Comparison of Laparoscopic Discoid Resection and Segmental Resection for Colorectal Endometriosis Using a Propensity Score Matching Analysis. *J Minim Invasive Gynecol*. 2018 Apr;25(3):440–6.
7. Abo C, Moatassim S, Marty N, Saint Ghislain M, Huet E, Bridoux V, 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(1):172–178.e1.
8. Roman H, Bubenheim M, Huet E, Bridoux V, Zacharopoulou C, Daraï E, et al. Conservative surgery versus colorectal resection in deep endometriosis infiltrating the rectum: a randomized trial. *Hum Reprod Oxf Engl*. 2018 01;33(1):47–57.
9. Bazot M, Daraï E. Diagnosis of deep endometriosis: clinical examination, ultrasonography, magnetic resonance imaging, and other techniques. *Fertil Steril*. 2017;108(6):886–94.
10. Nisenblat V, Bossuyt PMM, Farquhar C, Johnson N, Hull ML. Imaging modalities for the non-invasive diagnosis of endometriosis. *Cochrane Database Syst Rev*. 2016 Feb 26;2:CD009591.
11. Meuleman C, Tomassetti C, D'Hoore A, Van Cleynenbreugel B, Penninckx F, Vergote I, et al. Surgical treatment of deeply infiltrating endometriosis with colorectal involvement. *Hum Reprod Update*. 2011 Jun;17(3):311–26.
12. Bazot M, Darai E, Hourani R, Thomassin I, Cortez A, Uzan S, et al. Deep pelvic endometriosis: MR imaging for diagnosis and prediction of extension of disease. *Radiology*. 2004 Aug;232(2):379–89.
13. Roseau G. Recto-sigmoid endoscopic-ultrasonography in the staging of deep infiltrating endometriosis. *World J Gastrointest Endosc*. 2014 Nov 16;6(11):525–33.

14. Bazot M, Thomassin I, Hourani R, Cortez A, Darai E. Diagnostic accuracy of transvaginal sonography for deep pelvic endometriosis. *Ultrasound Obstet Gynecol Off J Int Soc Ultrasound Obstet Gynecol*. 2004 Aug;24(2):180–5.
15. Bazot M, Lafont C, Rouzier R, Roseau G, Thomassin-Naggara I, Daraï E. Diagnostic accuracy of physical examination, transvaginal sonography, rectal endoscopic sonography, and magnetic resonance imaging to diagnose deep infiltrating endometriosis. *Fertil Steril*. 2009 Dec;92(6):1825–33.
16. Vesale E, Boudy AS, Zilberman S, Bendifallah S, Ileko A, Darai E. [Rectovaginal fistula prevention after enbloc colorectal resection and hysterectomy for deep endometriosis]. *Gynecol Obstet Fertil Senol*. 2019 Feb 16;
17. Ballester M, Roman H. [Surgical management of deep endometriosis with colorectal involvement: CNGOF-HAS Endometriosis Guidelines]. *Gynecol Obstet Fertil Senol*. 2018 Mar;46(3):290–5.
18. Campin L, Borghese B, Marcellin L, Santulli P, Bourret A, Chapron C. [Urinary functional disorders bound to deep endometriosis and to its treatment: review of the literature]. *J Gynecol Obstet Biol Reprod (Paris)*. 2014 Jun;43(6):431–42.
19. Possover M. Pathophysiologic explanation for bladder retention in patients after laparoscopic surgery for deeply infiltrating rectovaginal and/or parametric endometriosis. *Fertil Steril*. 2014 Mar;101(3):754–8.
20. Ballester M, Chereau E, Dubernard G, Coutant C, Bazot M, Daraï E. Urinary dysfunction after colorectal resection for endometriosis: results of a prospective randomized trial comparing laparoscopy to open surgery. *Am J Obstet Gynecol*. 2011 Apr;204(4):303.e1-6.
21. Kanté F, Belghiti J, Roseau G, Thomassin-Naggara I, Bazot M, Daraï E, et al. [Comparison of the accuracy of rectal endoscopic sonography and magnetic resonance imaging in the diagnosis of colorectal endometriosis]. *Gynecol Obstet Fertil Senol*. 2017 Mar;45(3):131–6.
22. Bendifallah S, Roman H, Mathieu d'Argent E, Touleimat S, Cohen J, Darai E, et al. Colorectal endometriosis-associated infertility: should surgery precede ART? *Fertil Steril*. 2017;108(3):525–531.e4.
23. Donnez O, Roman H. Choosing the right surgical technique for deep endometriosis: shaving, disc excision, or bowel resection? *Fertil Steril*. 2017;108(6):931–42.
24. Roman H, Darwish B, Bridoux V, Chati R, Kermiche S, Coget J, 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 Apr;107(4):977–986.e2.
25. Oliveira MAP, Crispi CP, Oliveira FM, Junior PS, Raymundo TS, Pereira TD. Double circular stapler technique for bowel resection in rectosigmoid endometriosis. *J Minim Invasive Gynecol*. 2014 Feb;21(1):136–41.
26. Bazot M, Bornier C, Dubernard G, Roseau G, Cortez A, Daraï E. Accuracy of magnetic resonance imaging and rectal endoscopic sonography for the prediction of location of deep pelvic endometriosis. *Hum Reprod Oxf Engl*. 2007 May;22(5):1457–63.
27. Bonneau C, Zilberman S, Ballester M, Thomassin-Naggara I, Bazot M, et al. Incidence of pre- and postoperative urinary dysfunction associated with deep infiltrating

endometriosis: relevance of urodynamic tests and therapeutic implications. *Minerva Ginecol.* 2013 Aug;65(4):385–405.

28. Coronado C, Franklin RR, Lotze EC, Bailey HR, Valdés CT. Surgical treatment of symptomatic colorectal endometriosis. *Fertil Steril.* 1990 Mar;53(3):411–6.
29. Bailey HR, Ott MT, Hartendorp P. Aggressive surgical management for advanced colorectal endometriosis. *Dis Colon Rectum.* 1994 Aug;37(8):747–53.
30. Nezhat C, Nezhat F, Pennington E, Nezhat CH, Ambroze W. Laparoscopic disk excision and primary repair of the anterior rectal wall for the treatment of full-thickness bowel endometriosis. *Surg Endosc.* 1994 Jun;8(6):682–5.
31. Jerby BL, Kessler H, Falcone T, Milsom JW. Laparoscopic management of colorectal endometriosis. *Surg Endosc.* 1999 Nov;13(11):1125–8.
32. 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 May;8(2):312–6.
33. Redwine DB, Wright JT. Laparoscopic treatment of complete obliteration of the cul-de-sac associated with endometriosis: long-term follow-up of en bloc resection. *Fertil Steril.* 2001 Aug;76(2):358–65.
34. Duepre HJ, Senagore AJ, Delaney CP, Marcello PW, Brady KM, Falcone T. Laparoscopic resection of deep pelvic endometriosis with rectosigmoid involvement. *J Am Coll Surg.* 2002 Dec;195(6):754–8.
35. Varol N, Maher P, Healey M, Woods R, Wood C, Hill D, et al. Rectal surgery for endometriosis--should we be aggressive? *J Am Assoc Gynecol Laparosc.* 2003 May;10(2):182–9.
36. Woods RJ, Heriot AG, Chen FC. Anterior rectal wall excision for endometriosis using the circular stapler. *ANZ J Surg.* 2003 Aug;73(8):647–8.
37. Ford J, English J, Miles WA, Giannopoulos T. Pain, quality of life and complications following the radical resection of rectovaginal endometriosis. *BJOG Int J Obstet Gynaecol.* 2004 Apr;111(4):353–6.
38. Mohr C, Nezhat FR, Nezhat CH, Seidman DS, Nezhat CR. Fertility considerations in laparoscopic treatment of infiltrative bowel endometriosis. *JSLs.* 2005 Mar;9(1):16–24.
39. Jatan AK, Solomon MJ, Young J, Cooper M, Pathma-Nathan N. Laparoscopic management of rectal endometriosis. *Dis Colon Rectum.* 2006 Feb;49(2):169–74.
40. Ribeiro PAA, Rodrigues FC, Kehdi IPA, Rossini L, Abdalla HS, Donadio N, et al. Laparoscopic resection of intestinal endometriosis: a 5-year experience. *J Minim Invasive Gynecol.* 2006 Oct;13(5):442–6.
41. Brouwer R, Woods RJ. Rectal endometriosis: results of radical excision and review of published work. *ANZ J Surg.* 2007 Jul;77(7):562–71.
42. Landi S, Pontrelli G, Surico D, Ruffo G, Benini M, Soriano D, et al. Laparoscopic disk resection for bowel endometriosis using a circular stapler and a new endoscopic method to control postoperative bleeding from the stapler line. *J Am Coll Surg.* 2008 Aug;207(2):205–9.

43. Maytham GD, Dowson HM, Levy B, Kent A, Rockall TA. Laparoscopic excision of rectovaginal endometriosis: report of a prospective study and review of the literature. *Colorectal Dis Off J Assoc Coloproctology G B Irel*. 2010 Nov;12(11):1105–12.
44. Wills HJ, Reid GD, Cooper MJW, Tsaltas J, Morgan M, Woods RJ. Bowel resection for severe endometriosis: an Australian series of 177 cases. *Aust N Z J Obstet Gynaecol*. 2009 Aug;49(4):415–8.
45. Fanfani F, Fagotti A, Gagliardi ML, Ruffo G, Ceccaroni M, Scambia G, et al. Discoid or segmental rectosigmoid resection for deep infiltrating endometriosis: a case-control study. *Fertil Steril*. 2010 Jul;94(2):444–9.
46. Moawad NS, Guido R, Ramanathan R, Mansuria S, Lee T. Comparison of laparoscopic anterior discoid resection and laparoscopic low anterior resection of deep infiltrating rectosigmoid endometriosis. *JSLs*. 2011 Sep;15(3):331–8.
47. Koh CE, Juszczak K, Cooper MJW, Solomon MJ. Management of deeply infiltrating endometriosis involving the rectum. *Dis Colon Rectum*. 2012 Sep;55(9):925–31.
48. Afors K, Centini G, Fernandes R, Murtada R, Zupi E, Akladios C, 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 Dec;23(7):1123–9.
49. Zheng Y, Zhang N, Lu W, Zhang L, Gu S, Zhang Y, et al. Rectovaginal fistula following surgery for deep infiltrating endometriosis: Does lesion size matter? *J Int Med Res*. 2018 Feb;46(2):852–64.

Table 1: Patient characteristics

Table 2: Clinical examination and imaging data before rectal surgery

Table 3: Correspondence between REE and MRI to detect colorectal infiltration

Table 4: Intraoperative characteristics and complications

Table 5: Voiding dysfunction and postoperative complications

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Table 7: Number of patients, rate of conversion to non-conservative surgery, criteria to perform discoid resection, rates of complications of studies included in the present review

TABLES

Table 1: Patient characteristics

Variable	Discoid resection n=93
Age (years)	
- Median (range)	34 (19-59)
- < 35, n (%)	54 (58)
BMI (kg/m ²)	
- Median (range)	23 (17-37)
- > 25, n (%)	29 (30)
- > 30	9 (10)
Previous surgery for endometriosis, n (%)	33 (35)
Infertility, n (%)	34 (36)
Gynecologic symptoms, n (%)	
- Dysmenorrhea	85 (91)
- Deep dyspareunia	67 (72)
- Chronic pelvic pain	60 (64)
Bowel symptoms, n (%)	
- Dyschezia	50 (54)
- Painful constipation	45 (48)

BMI: body mass index

Table 2: Clinical examination and imaging data before rectal surgery

Variables	Discoid resection n=93
Clinical rectal lesion, n (%)	45 (48)
Other clinical lesions than rectal, n (%)	86 (92)
- Uterosacral ligaments	14 (15)
- Parameters	32 (34)
- Vagina	
Rectal lesion at preoperative MRI, n (%)	71 (76)
Diameter of rectal lesion at preoperative MRI	15 (0-60)
- Median (range)	46 (49)
- < 3 cm, n (%)	13 (14)
- ≥ 3cm, n (%)	21 (22)
- No lesion on MRI (%)	13 (14)
- NA	
Rectal lesion at preoperative REE	73 (78)
- Diameter (mm), median (range)	15 (10-25)
- Circumference (degrees), median (range)	40 (15-100)
- No lesion on REE (%)	17 (16)

MRI: Magnetic resonance imaging

REE: Rectal echoendoscopy

Table 3: correspondence between REE and MRI to detect colorectal infiltration

	Infiltration on REE (n)	No infiltration on REE (n)	Total
Infiltration on MRI (n)	63	7	70
No infiltration on MRI (n)	11	10	21
Total	74	17	91

The kappa coefficient between MRI and REE to detect colorectal infiltration is 0.397 (moderate accordance).

MRI: Magnetic resonance imaging

REE: Rectal echoendoscopy

Table 4: Intraoperative characteristics and complications

Variables	Discoid resection n=93
Operating time (min), median (range)	150 (60-350)
Conversion to open from laparoscopy, n (%)	1 (0.9)
Conversion from discoid resection to segmental resection, n (%)	3 (3)
Double discoid resection, n (%)	6 (6)
Additional DE lesions resected, n (%)	
- Vagina	19 (20)
- Uterosacral ligaments	91 (98)
- Parameters	26 (28)
- Hysterectomy	27 (29)
Ileostomy, n (%)	10 (11)
Epiploplasty, n (%)	7 (7)
Prevesical peritoneum interposition, n (%)	27 (29)
Intraoperative complications, n (%)	
- Bladder injury	0
- Pneumothorax	1 (0.9)
- Haemorrhage	1 (0.9)

Table 5: Voiding dysfunction and postoperative complications

Variables	Discoid resection n=93
Duration of follow up (months), median (range)	20 (1-40)
Duration of hospitalization (day), median (range)	7 (3-18)
Postoperative complications according to Clavien-Dindo classification, n (%) <ul style="list-style-type: none"> - Overall - No complication - Grade I - Grade II - Grade IIIA - Grade IIIB - Grade IV 	26 (24) 68 (63) 15 (14) 16 (14) 1 (1) 4 (4) 0
Postoperative complications, n (%) <ul style="list-style-type: none"> - Death - Rectal bleeding - Colorectal anastomotic leakage - Rectovaginal fistula - Vesicovaginal fistula - Wound infection - Urinary infection - Pelvic abscess - Blood transfusion - Ureteral injury - Vaginal dehiscence - Reoperation 	0 1 (1) 0 0 1 (1) 2 (2) 14 (15) 1 (1) 1 (1) 1 (1) 2 (2) 4 (4)
Postoperative voiding dysfunction, requiring bladder intermittent self-catheterization, n (%)	15 (16)

Duration of postoperative self-catheterization, (day)	
- Mean (range)	30 (15-90)
- Immediate (≤ 30 days), n (%)	11 (11)
- Persistent (> 30 days), n (%)	4 (4)

Table 6: Postoperative complications in simple, double discoid and segmental resections

Variables	Simple discoid resection n=87 (93.5%)	Double discoid resection n=6 (6.5%)	Conversion in segmental resection n=3 (3%)	<i>P value</i>
Postoperative voiding dysfunction, requiring bladder intermittent self-catheterization, n (%)	15 (17)	0	0	0.59
Duration of postoperative self-catheterization, (day)				
- Mean (range)	30 (15-90)	0	0	-
- Immediate (≤ 30 days), n (%)	11 (12)			
- Persistent (> 30 days), n (%)	4 (4)			
Severity of postoperative complications without dysuria according to Clavien-Dindo classification, n (%)				
- Overall	26 (29)	0	0	0.33
- No complication	68 (78)	6 (100)	3 (100)	0.77
- Grade I	15 (17)	-		
- Grade II	16 (18)	-		
- Grade IIIA	1 (1)	-		
- Grade IIIB	4 (4)	-		
- Grade IV	0	-		

Table 7: Number of patients, rate of conversion to non-conservative surgery, criteria to perform discoid resection, rates of complications of studies included in the present review

Author, year	n	Type of study	Rate of conversion to non-conservative surgery (n)	Criteria to perform a discoid resection	Size of the resection (mm) (median, range)	Major complications (Clavien-Dindo 3-4) (n)	Recto-vaginal fistula (n)	Stenosis (n)	Pelvic abscess (n)	Anastomotic leakage (n)	Voiding dysfunction (n)
Coronado, 1990 (28)	5	Retrospective	NA	NA	NA	0	0	0	0	0	NA
Bailey, 1994 (29)	7	Retrospective	NA	NA	NA	0	0	0	0	0	NA
Nezhat, 1994 (30)	8	Prospective	NA	NA	40-60	NA	0	0	0	0	0
Jerby, 1999 (31)	5	Prospective	NA	Up to 3cm	NA	NA	0	0	0	0	NA
Gordon, 2001 (32)	1	Case report	0	NA	31	0	0	0	0	0	0
Redwine, 2001 (33)	21	Prospective	NA	NA	NA	0	0	0	0	0	NA
Duepree, 2002 (34)	5	Prospective	NA	3cm	NA	0	0	0	0	0	NA
Varol, 2003 (35)	12	Retrospective	NA	NA	NA	NA	NA	NA	NA	NA	NA
Woods, 2003 (36)	30	Retrospective	NA	Up to 2cm and up to one	NA	3	1	1	0	0	NA

Fanfani, 2010 (45)	48	Prospective	0	Up to 3cm and up to 60% of bowel stenosis	NA	2	1	NA	1	0	0
Moawad, 2011 (46)	8	Retrospective	NA	NA	28	0	0	0	0	0	0
Koh, 2012 (47)	65	Retrospective	NA	Up to 2cm and up to half of bowel circumference	NA	NA	0	0	0	0	NA
Oliveira, 2014 (25)	11	Retrospective, double discoid resections	NA	Up to 2-3cm and up to 40% of bowel circumference	37 (22-42)	0	0	0	0	0	1
Afors, 2016 (48)	15	Retrospective	NA	Up to 2-3cm, unifocal and non stenosis	NA	1	0	0	0	0	0
Roman, 2017 (24)	69	Prospective	NA	Up to 3cm	35 (20-60)	8	3	1	2	NA	4
Zheng, 2017	6	Retrospective	NA	NA	NA	NA	0	NA	NA	NA	NA

(49)		ctive									
Roman, 2018 (8) (ENDORE)	6	RCT	2/27 conserva tive surgeries	Up to 5 cm, unifocal and non stenosis	40 (40-50)	NA	NA	0	0	NA	NA
Total : n=25	54 7	-	-	-	-	18	6	4	5	0	5

NA: Not available