

# Full-Thickness Disc Excision in Deep Endometriotic Nodules of the Rectum: A Prospective Cohort

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**BACKGROUND:** To date, a majority of patients presenting with large endometriosis of the rectum are managed worldwide by colorectal resection. However, postoperative rectal function may be impacted by radical rectal surgery.

**OBJECTIVE:** The purpose of this study was to assess the postoperative outcomes of patients with rectal endometriosis who are managed by full-thickness disc excision and to compare outcomes of the 2 procedures using a transanal approach.

**DESIGN:** This was a prospective study.

**SETTINGS:** The study was conducted at a university hospital.

**PATIENTS:** Fifty patients with colorectal endometriosis that was managed by disc excision between June 2009 and November 2014 were included in the study.

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**INTERVENTIONS:** The procedure included laparoscopic deep shaving, followed by full-thickness disc excision to remove the shaved rectal area. Disc excision was performed using a semicircular transanal stapler (the Rouen technique) in 20 patients, an end-to-end anastomosis circular transanal stapler in 28 patients, and transvaginal excision in 2 patients.

**MAIN OUTCOMES MEASURES:** Preoperative and postoperative assessments of pelvic symptoms and digestive function using standardized gastrointestinal questionnaires were the main measures.

**RESULTS:** The largest diameter of specimens achieved was significantly higher using the Rouen technique ( $58 \pm 9$  mm) than the end-to-end anastomosis stapler ( $34 \pm 6$  mm). Two rectovaginal fistulas were recorded (4%), and 8 patients presented with transitory bladder voiding (16%). Median postoperative values for the Gastrointestinal Quality of Life Index and the Knowles-Eccersley-Scott-Symptom Questionnaire improved progressively 1 and 3 years after surgery. For patients intending to get pregnant, the cumulative pregnancy rate was 80%, and 63% of pregnancies were spontaneous.

**LIMITATIONS:** The study sample size is small and the design is not comparative; however, direct comparison of patients managed by disc excision and colorectal resection would be inappropriate, because of differences regarding nodule localization and size.

**CONCLUSIONS:** Disc excision is a valuable alternative to colorectal resection in selected patients presenting with rectal endometriosis, achieving better preservation of rectal function. The Rouen technique allows for successful removal of large nodules of the low and midrectum, with favorable postoperative outcomes. (See video abstract, <http://links.lww.com/DCR/A208>.)

**KEY WORDS:** Colorectal endometriosis; Colorectal resection; Deep endometriosis; Disc excision; Full-thickness excision; Transanal stapler.

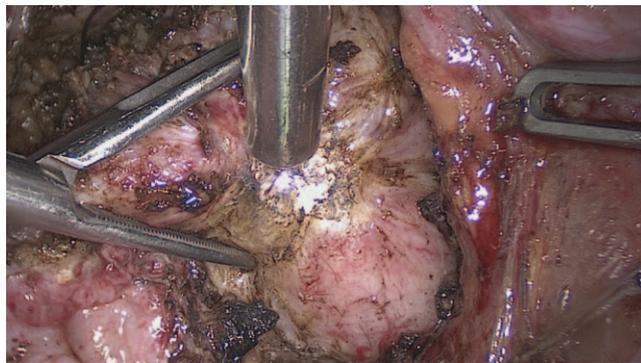
There are 2 surgical approaches that are generally used in the treatment of deep endometriosis infiltrating the rectum, including colorectal resection of the affected segment and nodule excision either without opening the rectum (shaving) or by removing the nodule along with the surrounding rectal wall (full-thickness disc excision).<sup>1</sup> Many surgeons perform colorectal resection, strongly believing that this approach greatly reduces the risk of recurrence.<sup>2,3</sup> Conversely, others perform selective excision of rectal nodules so as to allow for conservation of the rectum,<sup>4-6</sup> which could lead to better postoperative functional digestive outcomes.<sup>7-9</sup> As far back as 2001, Gordon et al<sup>6</sup> reported a series of patients managed by full-thickness disc excision using the transanal circular end-to-end anastomosis (EEA) stapler, and the procedure is now used by numerous surgical teams worldwide. The risk of unfavorable functional outcomes appears to be higher when colorectal resection involves the low and midrectum, requiring low colorectal or coloanal anastomosis. However, it is when the low rectum is infiltrated by huge endometriotic nodules that rectal shaving and laparoscopic or open disc excision can be awkward to perform. In 2009, in response to these challenges, we introduced a new technique using a transanal semicircular stapler in combined laparoscopic and transanal full-thickness disc excision of endometriotic nodules infiltrating the low and midrectum.<sup>10</sup> The Rouen technique first requires deep shaving of the rectum, and then the shaved rectal area is removed by the transanal route.<sup>11-13</sup>

The aim of this study conducted in our gynecology and obstetrics department at Rouen University Hospital was 2-fold: to report the postoperative outcomes of patients with deep infiltrating nodules of the rectum who underwent full-thickness disc excision and to compare the performances of transanal excision using either the Rouen technique or the EEA circular stapler.

## PATIENTS AND METHODS

### Laparoscopic Procedure: Rectal Shaving

The technique for full-thickness rectal nodule excision involves a combined laparoscopic and transanal or transvaginal approach. The first step is generally performed laparoscopically, and the goal is to achieve rectal shaving. We used the Ultracision Harmonic Scalpel (Ethicon Endo-Surgery, Cincinnati, OH) from 2009 to 2012 and the PlasmaJet (Plasma Surgical Limited, Abingdon, United Kingdom) after 2012. Deep subperitoneal spaces, located on both sides of the uterosacral ligaments, are widely and longitudinally opened to avoid injuries of the hypogastric and splanchnic nerves, which are identified. Dissection is performed in close contact with the lateral faces of the rectum. Dis-



**FIGURE 1.** Deep rectal shaving by in situ ablation of endometriosis fibrous implants using plasma energy.

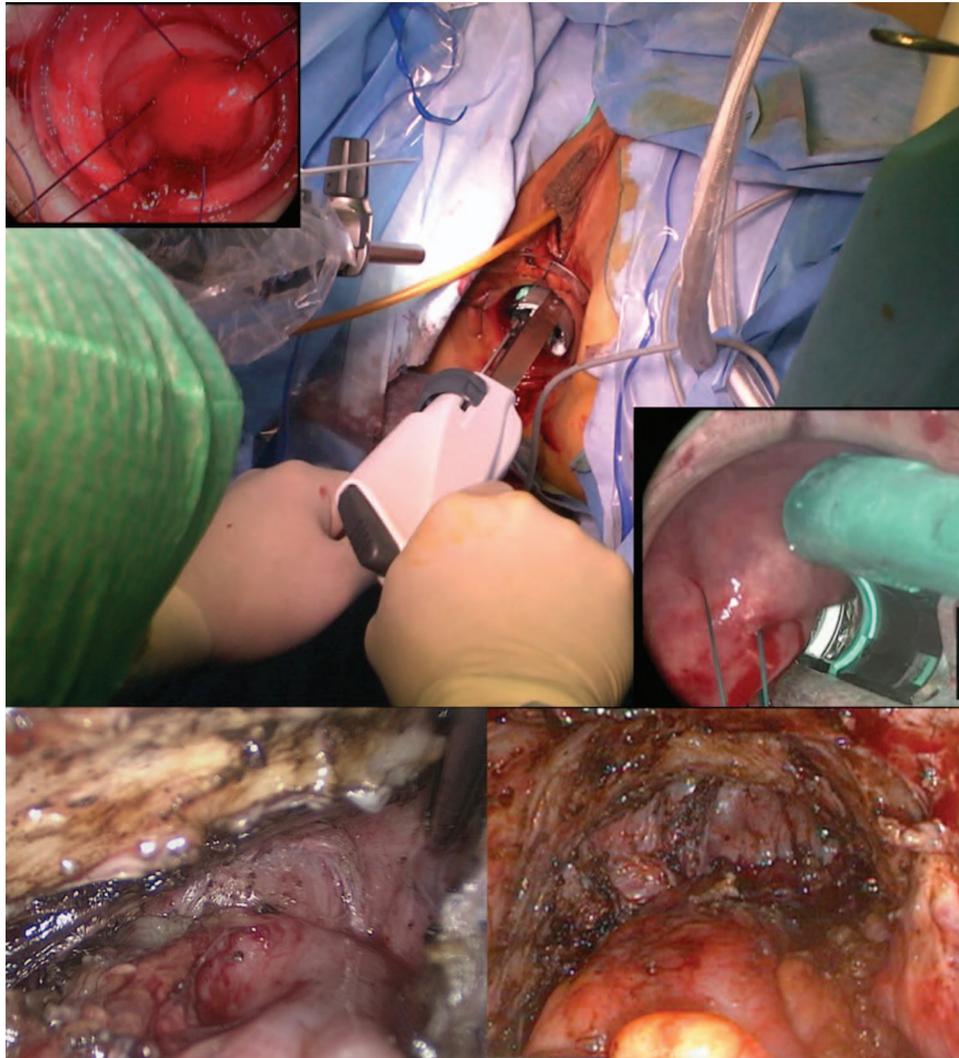
section is directed toward the healthy rectovaginal space located below the endometriosis nodule. Once the lateral faces of the rectum are freed, rectal shaving is performed as deeply as possible into the thickness of the rectal wall to remove abnormal fibrous lesions involving rectal layers.<sup>14,15</sup> The thinner and softer the shaved rectal wall, the larger the diameter of the rectal patch that can be removed using the transanal stapler (Fig. 1). Deep endometriotic nodules are treated, when required, by resection of the vaginal fornix adjacent to the uterine torus and to the anterior roots of the uterosacral ligaments, medially from the trajectory of the splanchnic nerves that are responsible for bladder voiding.

### Transanal Procedure

To achieve full-thickness disc excision by transanal route, the colorectal surgeon generally uses a semicircular transanal stapler when the shaved area is located  $\leq 8$  to 10 cm from the anus and the EEA circular stapler when it is located on the upper rectum.

### Rouen Technique: Disc Excision Using the Contour Transtar Stapler

**Parachute Suture Placement.** The circular anal dilator of the Contour Transtar-STR5G (Ethicon Endo-Surgery) stapling kit is then gently introduced into the anus and fixed to the perianal skin with 4 cardinal sutures. Using both transanal and laparoscopic views, an initial 2/0 Prolene traction suture (Ethicon Endo-Surgery) is placed at the center of the shaved rectal area, along with 2 or 3 supporting sutures so as to completely enclose the area within the sutures. The surgeon ensures that these transanally placed sutures do not trap any other viscera in the vicinity of the rectal wall and confirms the correct positioning of sutures on the shaved area within the rectal wall. Two similar sutures are placed to the left and right sides of the shaved area and tied loosely to gain good traction on the captured tissue. Care is taken to ensure against inadvertent trapping of tissue from the opposite wall of the rectum, which may lead to complete or partial closing of the rectum.<sup>11-13</sup>



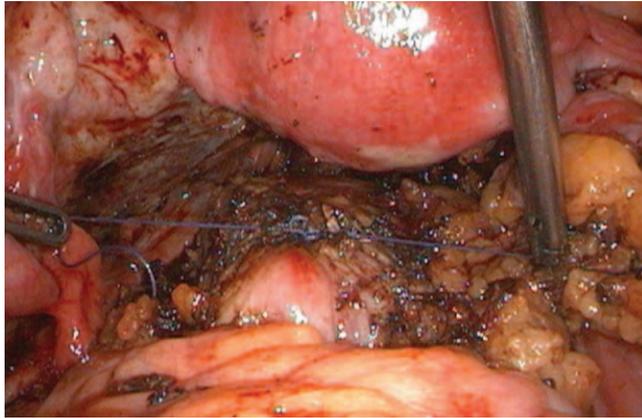
**FIGURE 2.** Parachute sutures are pulled laterally, the nodule and a margin of normal tissue are drawn into the jaws of the stapler, the stapler-retaining pin is applied, and the stapler is closed around the tissue.

**Transanal Excision of the Nodule.** The lubricated head of the Contour Transtar with opening jaws in the 3-o'clock position is introduced into the rectum. The instrument is then rotated counterclockwise and the shaved rectal area gently pulled inside the jaws until normal tissue can be seen seated within the proximal jaw of the device (Fig. 2). The parachute sutures are pulled downward in the direction of the shaft of the semicircular stapler, thereby drawing the shaved area along with a margin of normal tissue into the jaws of the stapler; the stapler retaining pin is then applied and the stapler closed around the tissue. This closure is maintained for a period of 15 seconds to maximize tissue compression and subsequent hemostasis. The stapler is engaged and then removed. During this step it is important to ensure that the quantity of normal tissue enclosed by the stapling device is not excessive, because this can impede correct deployment of the staples.<sup>11-13</sup>

The stapler cartridge is then replaced and the device reintroduced into the rectum. The procedure is repeated with lateral sutures if necessary until full-thickness resection of the shaved area and the surrounding normal tissue is performed. The final staple line is inspected for bleeding and secured with interrupted 3/0 Vicryl (Ethicon Endo-Surgery), as required. Reinforcement sutures along the staple line are placed as deemed necessary and are frequently required at each end of the stapled line.<sup>11-13</sup>

#### **Transanal Excision Using the EEA Circular Stapler**

The EEA stapler (Ethicon Endo-Surgery) is gently introduced into the rectum. We routinely use a device of 28- or 31-mm diameter. The stapler is progressively pushed inside the rectum, under laparoscopic view control, up to the shaved rectal area. Then, the stapler is opened so as to place the shaved area between the anvil and the shoulder of the stapler. In nodules responsible for rectal stenosis,



**FIGURE 3.** Disc excision using the end-to-end anastomosis (EEA) circular stapler.

the feasibility of the procedure requires deep shaving that is able to completely remove the narrowness of the rectum.<sup>15</sup> When shaving is only superficial, the stapler anvil cannot be pushed over the stenosis, and the procedure fails. In our experience, using plasma energy to perform in situ ablation of fibrotic tissue infiltrating the rectal wall enables deeper shaving and larger disc excisions.<sup>14,15</sup> A suture

**TABLE 1.** Patient antecedents

Variable	N = 50
Age, y	29.5 ± 4.3
BMI, kg/m <sup>2</sup>	24.1 ± 5.1
Smoking	21 (42)
Age at first period, y	12.9 ± 1.5
Age at first sexual intercourse, y	16.6 ± 3
Antecedents of endometriosis in patient's family	12 (24)
Antecedents of gynecological surgery	26 (52)
Laparotomies	6 (12)
Number of previous laparoscopies	
1	16 (32)
2	6 (12)
Justification for previous surgeries	
Pelvic pain	17 (34)
Infertility	4 (8)
Ovarian cysts	5 (10)
Endometriosis	16 (32)
Cystectomy	
Right ovary	9 (18)
Left ovary	6 (12)
Right oophorectomy	1 (2)
Adhesiolysis	4 (8)
Unilateral salpingectomy	2 (4)
Psychological care	19 (38)
Patients with suspicion of infertility	19 (38)
Obstetrical antecedents	
Nulligesta	36 (72)
Nullipara	37 (74)
Miscarriage	3 (6)
Ectopic pregnancies	2 (4)
Pregnancy intention before the surgery	28 (56)
Previous contraceptive pill intake	36 (72)

Data are mean ± SD or n (%).

**TABLE 2.** Principal pain symptoms related to pelvic endometriosis

Variable	N = 50
Dysmenorrhea	50 (100)
Primary dysmenorrhea	24 (48)
Biberoglou and Behrman dysmenorrhea score	3.2 ± 0.7
Intensity of dysmenorrhea (VAS scale >4)	49 (98)
Cyclic symptoms associated with dysmenorrhea	
Defecation pain	40 (80)
Rectorrhage	12 (24)
Constipation	30 (60)
Diarrhea	28 (56)
Appetite disorders	12 (24)
Bloating	25 (50)
Urinary pain	16 (32)
Having had sexual intercourse	46 (92)
Deep dyspareunia	40 (80)
Biberoglou and Behrman deep dyspareunia score	2.8 ± 1.2
Intensity of dyspareunia (VAS >4)	29 (58)
Evaluation of digestive function	
KESS constipation score (total value)	12.9 ± 6.3
Use of laxative (KESS item 2)	0.4 ± 0.7
Time taken to evacuate (KESS item 9)	1.1 ± 0.8
GIQLI score (total value)	86.7 ± 21.7
Embarrassed by bowel frequency (GIQLI item 7)	2.8 ± 1.3

Data are mean ± SD or n (%).

KESS = Knowles-Eccersley-Scott-Symptom Questionnaire; GIQLI = Gastrointestinal Quality of Life Index; VAS = visual analog scale.

using a 3/0 resorbable stitch is placed laparoscopically in the center of the shaved area, and the threads are cut 10 cm from the knot. The gynecologic surgeon holds the threads with 2 laparoscopic grasps and pushes them downward to imbricate the shaved area between the anvil and the shoulder of the stapler. Concomitantly, the colorectal surgeon gently pushes the tip of the EEA stapler upward to avoid catching the posterior wall of the rectum in the stapler. The stapler is progressively closed under laparoscopic control to ensure that the whole shaved area is caught in the stapler (Fig. 3). Then, the stapler is fired and the closure maintained for ≤15 seconds to improve hemostasis. The stapler is removed and the excised rectal wall area is examined, the diameter of which can be as large as 40 to 50 mm. In rare cases, the mucosa of the posterior wall can inadvertently be caught in the stapler, and the specimen will look like a signet ring. In our opinion, repeating the procedure to increase the whole area of the rectal wall that is excised is not recommended, because the first stapled line may be incompletely removed. In this case, the 2 stapled lines may delimit a small rectal area of poor vascularization with further risk of necrosis and delayed rectal fistula.

### Direct Disc Excision

In patients presenting with large endometriotic nodules infiltrating both the rectum and the vagina, disc excision can be performed directly after a large vaginal excision. In such cases, the colorectal surgeon introduces a finger into the rectum and pushes the shaved rectal area upward.

**TABLE 3.** Intraoperative findings

Variable	N = 50
Largest diameter of the disc removed, mm	
Mean (SD)	45 (15)
Median (range)	40 (25–90)
Height of the rectal nodule, mm	
Mean (SD)	84 (33)
Median (range)	90 (30–150)
Rectal nodule size, cm	
<1.0	0
1.0–2.9	13 (26)
≥3.0	37 (72)
Endometriosis foci revealed on specimen edge <sup>a</sup>	13 (27)
Preoperative assessment	
Deep endometriosis nodule clinically revealed	45 (90)
MRI	49 (98)
Endorectal ultrasound	47 (94)
CT-based virtual colonoscopy	48 (96)
Kidney ultrasound	2 (4)
CA125 assessment	2 (4)
Cystoscopy	2 (4)
Preoperative GnRH analogs plus back therapy	50 (100)
Operative time, mean ± SD, min	255 ± 95
Operative route	
Open surgery	0
Laparoscopy	45 (90)
Robotic assistance	1 (2)
Laparoscopy followed by open route	4 (8)
AFSr score, mean ± SD	54 ± 32
Douglas pouch complete obliteration	25 (50)
Associated localizations	
Diaphragm	7 (14)
Small bowel	4 (8)
Appendix	4 (8)
Caecum	1 (2)
Transverse colon	1 (2)
Sigmoid colon	12 (24)
Rectum	50 (100)
Bladder	2 (4)
Vagina	35 (70)
Management of ovarian endometriomas	
Right	19 (38)
Left	21 (42)
Adhesiolysis	
Right adnexa	27 (54)
Left adnexa	32 (64)
Deep posterior endometriosis nodules	
Left USL	7 (14)
Right USL	8 (16)
Rectovaginal septum	5 (10)
Left USL, right USL, and rectovaginal septum	30 (60)
Hysterectomy plus colectomy	4 (8)
Surgical procedures on digestive tract	
Rectal shaving (when more than 1 rectal nodule)	0
Sigmoid colon disc excision	5 (10)
Sigmoid colon resection	3 (6)
Transverse colon disc excision	1 (2)
Caecum resection	2 (4)
Appendectomy	2 (4)
Resection of small bowel	1 (2)
Transitory stoma	33 (66)

(Continued)

**TABLE 3.** Continued

Variable	N = 50
Surgical procedures on urinary tract	
Resection of the bladder	2 (4)
Advanced ureterolysis requiring JJ stent	2 (4)
Ureteral resection and ureterocystostomy	2 (4)
Treatment of peritoneal implants	
Complete	18 (36)
Incomplete (widespread implants)	30 (60)
Postoperative medical treatment	
Surgeon advice concerning desire for further pregnancy	
Spontaneous conception if postoperative normal fertility assessment	28 (56)
Ovulation induction	0
Intrauterine insemination	0
Systematic IVF	9 (18)
Oocyte donation	1 (2)
Patients without desire for pregnancy	12 (24)

Data are n (%) unless otherwise specified.

IVF = in vitro fertilization; USL = uterosacral ligament; GnRH = gonadotropin-releasing hormone; AFSr = Score de l'American Fertility Society.

<sup>a</sup>Histological analysis was not available in 1 patient who had undergone disc excision using the Rouen technique and in 3 using the end-to-end anastomosis stapler.

Using either a monopolar current or a harmonic scalpel, the surgeon circumscribes the shaved area to completely remove it. Rectal suture is then performed transversally using interrupted resorbable stitches. At the end of the procedure, the vagina is closed using a vaginal approach by interrupted resorbable sutures.

### Patients

We included all of the patients who had undergone disc excision between June 2009 and November 2014. Prospective recording of data concerning antecedents, clinical symptoms, findings of clinical and imagery examinations, surgical procedures, and postoperative outcomes was performed through the CIRENDO database (NCT02294825). This database is the North-West Interregional Female Cohort for Patients With Endometriosis, which is a prospective cohort financed by the G4 Group (university hospitals of Rouen, Lille, Amiens, and Caen) and coordinated by one of the authors (H.R.). Information was obtained using self-questionnaires and surgical and histological records, whereas data recording, contact, and follow-up were carried out by a clinical research technician. Standardized gastrointestinal questionnaires were routinely used to assess preoperative and postoperative digestive function: the Gastrointestinal Quality of Life Index,<sup>16</sup> the Knowles-Eccersley-Scott-Symptom Questionnaire,<sup>17</sup> and the Wexner scale and Fecal Incontinence Quality of Life index.<sup>18</sup> Prospective recording of data was approved by the French advisory committee on information processing in healthcare research. The procedure was not considered experimental and was therefore exempt from mandatory medical ethical approval by the institutional review board.

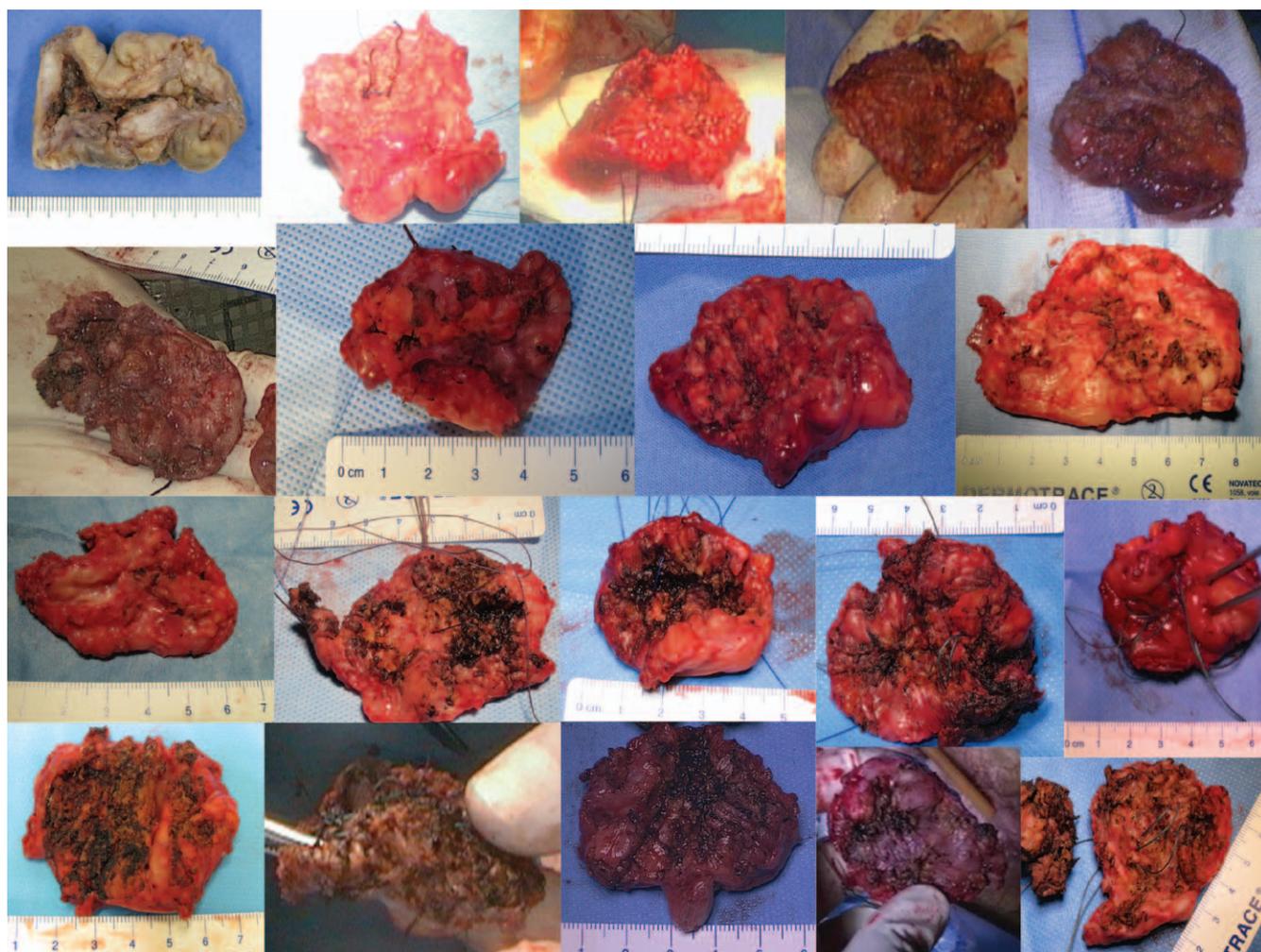
## RESULTS

From June 2009 to November 2014, we successfully performed the above procedure in 50 women who were managed for symptomatic deep endometriosis infiltrating the low and midrectum (Tables 1 and 2). They represented 17.5% of 291 women managed during this same period for rectal nodules by various procedures, including rectal shaving and colorectal resection, which were performed in 130 (44.7%) and 110 women (37.8%).

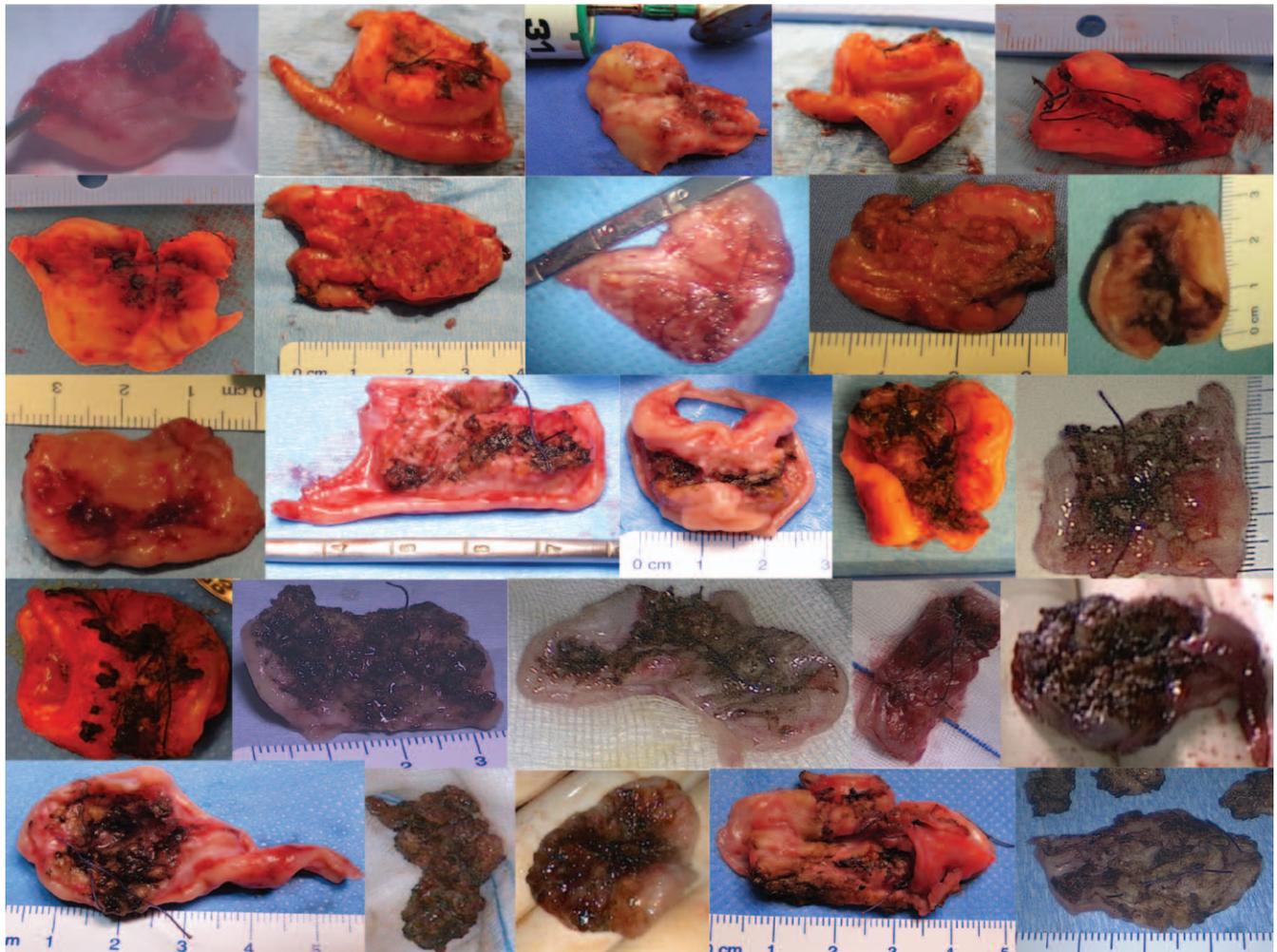
Twenty patients underwent disc excision using the semicircular stapler for low- and midrectal nodules (Table 3 and Fig. 4). The largest diameter of specimens varied from 40 to 80 mm ( $58 \pm 9$  mm; median value at 60 mm), and the height of the rectal suture positioned from the anus was  $60 \pm 19$  mm. The diameter of rectal infiltration was always superior to 3 cm. Twenty-eight patients had disc excision using the EEA stapler (Fig. 5). The largest diameter of specimens varied from 25 to 50 mm ( $34 \pm 6$  mm; median value at 32 mm) and was significantly inferior to that of specimens removed using the Rouen

technique above ( $p < 0.001$ ). The height of the rectal suture was  $104 \pm 26$  mm and was significantly higher than that recorded in the group of patients managed by the Rouen technique ( $p < 0.001$ ). The diameter of rectal infiltration was 1 to 3 cm and  $>3$  cm in 13 (46.4%) and 15 (53.6%) patients ( $p < 0.001$  when compared with diameters of infiltrations removed using the Rouen technique). Two patients had transvaginal disc excision for large deep endometriosis nodules involving the low and midrectum. In both cases, complete resection of deep vaginal endometriosis required vaginal excision large enough to allow for direct disc excision of the shaved rectal area. The diameter of the disc was 80 and 70 mm (Fig. 6).

Table 4 presents the major complications reported in our series. Two cases of rectovaginal fistulas were recorded (4%). One patient had disc excision using the Rouen technique, along with large excision of the vagina, omentoplasty, and diverting colostoma; despite an absence of symptoms, barium enema revealed rectovaginal fistulas 2 months later. The patient underwent a new surgical procedure with efficient reparation of the fistulas and favorable



**FIGURE 4.** Discs removed using the Rouen technique.



**FIGURE 5.** Discs removed using the end-to-end anastomosis (EEA) circular stapler.

outcome. The second case of fistula occurred in a patient who had undergone disc excision using an EEA stapler along with limited excision of the vagina; diverting stoma was not performed. She was admitted to hospital on day

6 with pelvic infection, and an emergency computed scan revealed a rectovaginal fistula, prompting performance of a diverting stoma for 3 months. Postoperative outcomes were favorable in both patients.

Fifteen patients who were managed using the Rouen technique (6 patients), EEA stapler (7 patients), and direct disc excision (2 patients) were enrolled in the Functional Outcomes of Surgical Management of Deep Endometriosis Infiltrating the Rectum (ENDORE) randomized trial comparing colorectal resection with conservative rectal surgery in large rectal endometriosis.<sup>19</sup>

Follow-up varied from 5 to 65 months. No patient was lost to follow-up. Among 20 patients with pregnancy intention, 16 achieved pregnancy (80%), 10 of them spontaneously (63%) and 6 by assisted reproductive technology (37%). Twelve patients ultimately delivered healthy infants (“take-home-baby” rate at 60%; Table 4).

The 1-year questionnaire was completed by the 26 women (52%) who had >1-year follow-up (Table 5). The 3-year questionnaire was completed by the 10 women (20%) who had >3-year follow-up. Main digestive



**FIGURE 6.** Discs removed transvaginally.

**TABLE 4.** Postoperative complications and fertility outcomes

Variable	N = 50
Bladder atony requiring 3-wk to 6-mo autocatheterization	8 (16)
Clavien 3 postoperative complications	13 (26)
Rectovaginal fistulas	2 (4)
Rectorrhage requiring endoscopy	1 (2)
Stoma-related complications	2 (4)
Bladder fistulas after bladder resection	1 (2)
Fertility outcomes (N = 20)	
Postoperative pregnancy intention	20 (40)
Pregnant	16 (80)
Ongoing pregnancy >25 wk	1 (5)
Delivery	12 (60)
Miscarriage, n	3
Ectopic pregnancy, n	1
Conception mode (N = 16)	
Spontaneous pregnancy	10 (63)
IVF	5 (31)
Intrauterine insemination	1 (6)
Reasons for conception failure (N = 4), n	
Attempting conception during <6 mo	2
Failure of ovarian reserve	1
Unidentified	1

Data are n (%) unless otherwise specified.  
IVF = in vitro fertilization.

symptoms, along with gastrointestinal standardized scores, significantly improved postoperatively (Table 6).

## DISCUSSION

Our study reports good functional outcomes in patients who were managed for large rectal endometriosis by disc excision using a combined laparoscopic-transanal/transvaginal approach. The size of disc was significantly larger using the Rouen technique than the EEA circular stapler. Large disc excision can also be achieved by direct transvaginal approach; however, this technique is only suitable in patients with low- and midrectal nodules and requires large excision of the vaginal fornix.

The main strengths of our study are the prospective design enabling the recording of a myriad of data on clinical history, endometriosis localizations, pathological examination, postoperative complications and close follow-up. The Rouen technique is original and reproducible and successfully replaces low colorectal resection, the functional outcomes of which may, in certain cases, be definitively unfavorable. No patient was lost to follow-up, resulting in an accurate evaluation of postoperative rectal function in the sample.

The weaknesses of our study are the small sample size, the monocentric enrollment of the patients, and the lack of a control group including patients with low colorectal resection. Although our prospective CIRENDO cohort includes numerous patients with colorectal resection, the features of their deep endometriosis nodules are different,

**TABLE 5.** Data on patients having completed the 1-year follow-up questionnaire

Variable	N = 26
Routine analgesic therapy	3 (12)
Routine periods	
Yes	10 (38)
No	16 (62)
Reasons for absence of periods	
Postpartum amenorrhea	0
Ongoing pregnancy	6 (23)
Hysterectomy	2 (8)
Hormonal treatment	8 (31)
Dysmenorrhea	
Yes	6 (23)
No	4 (16)
NA	16 (62)
Postoperative evolution of dysmenorrhea (in patients having had painful postoperative periods)	
Improved	5 (19)
Unchanged	0
Impaired	1 (4)
Cyclic symptoms associated with dysmenorrhea	
Defecation pain	2 (8)
Rectorrhage	0
Constipation	2 (8)
Diarrhea	0
Appetite disorders	0
Bloating	1 (4)
Dysmenorrhea VAS $\geq 5$	2 (8)
Biberoglu and Behrman dysmenorrhea score	3.2 +/- 0.6
Sexual behaviors (of 26 patients answering the questionnaire)	
Having sexual intercourse	20 (77)
Dyspareunia	8 (40)
Dyspareunia VAS $\geq 5$	4 (20)
Biberoglu and Behrman deep dyspareunia scale	2.8 +/- 1.2

Data are n (%) unless otherwise specified. VAS = visual analog scale; NA = not applicable.

thus any comparison would be inappropriate. The only method that could provide an accurate comparison of both surgical procedures is the randomization of patients who are potential candidates for either surgical procedure.

Despite the lack of comparative data, we believe that disc excision is a valuable alternative to colorectal resection in nodules responsible for rectal infiltration not exceeding 50% to 60% of the rectal wall circumference. Indeed, disc excision allows for significant improvement of rectal function and gastrointestinal quality of life. Furthermore, the postoperative pregnancy rate in our series was among the highest in the literature,<sup>20</sup> and 2 women of 3 conceived spontaneously.

Recent data suggest that, in women with deep endometriosis infiltrating the rectum, pursuing a policy that favors rectum conservation would lead to improvement in postoperative digestive functional outcomes.<sup>7,9</sup> Performing colorectal resection by laparoscopy requires sectioning of both the mesorectum and the mesocolon to

**TABLE 6.** Postoperative assessment of digestive function

Parameter	Baseline (N = 50)	1 y (N = 26)	3 y (N = 10)	p
KESS score (n.v. <7)	13.1 ± 6.3	9.0 ± 5.0	8.0 ± 7.5	0.003
GIQLI (n.v. >100)	86 ± 23	110 ± 18	119 ± 19	<0.001
Defecation pain	38 (76)	2 (8)	1 (10)	<0.001
Diarrhea	26 (52)	0	0	<0.001
Constipation	27 (54)	2 (8)	2 (20)	<0.001

Data are n (%) or mean ± SD unless otherwise specified. KESS = Knowles-Eccersley-Scott-Symptom Questionnaire; GIQLI = Gastrointestinal Quality of Life Index; n.v. = normal value.

allow for colorectal segment removal from the abdomen. Despite attempts to limit the size of the colorectal specimen removed, the length of the mesocolon sectioned is rigorously long. This may lead to denervation of the colon located immediately above the anastomosis,<sup>21</sup> which can be avoided by performing transanal excision. In patients benefiting from colorectal resection, the use of a transanal stapler can lead to progressive stenosis of the circular staple lines, which leads to recurrence of dyschesia and constipation. This appears to be more frequent in women who are managed for rectal endometriosis ( $\leq 19\%$ ) than for other diseases and may be attributed to chronic pelvic inflammation associated with severe endometriosis.<sup>22</sup> The use of transanal staplers to perform full-thickness disc excision of large rectal nodules is less likely to lead to stenosis,<sup>10</sup> because suturing does not involve the whole circumference of the rectum. Therefore, circumstances that lead to postoperative bowel dysfunction after colorectal resection are likely to be avoided by performing transanal excision. In addition, this hypothesis will be tested by our ongoing randomized trial (ENDORE), which aims to compare colorectal resection with conservative surgery in deep endometriosis infiltrating the rectum.<sup>19</sup>

Nevertheless, transanal excision may fail in nodules involving >50% to 60% of the rectal circumference or when the shaved rectal wall is too thick and hard. In our experience, using the plasma energy to shave the rectum and ablate the remaining fibrosis implants allows a softening and thinning of the rectal wall and improves the feasibility of the procedure.<sup>14,15</sup> When shaving is unable to sufficiently thin the rectal wall, it may be impossible either to fold and pull it into the stapler jaws or to completely close the cartridges.

The Rouen technique should only be used for deep endometriosis infiltrating the lower and midrectum. The greater the height of the nodule, the more challenging the parachute traction suturing becomes. Catching the opposite rectal wall remains a risk, especially in midrectal nodules, although parachute traction suture is correctly performed by the transanal route. The length of the rectal wall involved may be as long as 5 to 6 cm, but care should be taken beforehand to deeply shave the rectum by laparoscopic approach, rendering the rectal wall malleable enough to be folded and seized into the jaws of the stapler. It is our opinion that this technique would also be suitable for women with multiple

colorectal nodules, in which case a single rectal nodule excision with limited sigmoid colon resection would probably be preferable to removal of all of the digestive nodules by a single and lengthy colorectal resection.

Disc excision using the EEA stapler is feasible in nodules  $\leq 20$  cm from the anus, and the length of the stapler itself determines this distance. Disc diameter rarely exceeds 40 mm, thus the procedure is challenging in nodules infiltrating the rectum >3 cm. Because the anvil of 28 or 31 mm diameter must be pushed above the shaved rectal area, removing the stenosis at the level of rectal infiltration is mandatory.

The rate of complications in our series may seem high. However, our series only includes patients with severe rectal endometriosis (we excluded 45% of patients whose rectal endometriosis was less severe, which allowed management exclusively by rectal shaving). The overall rate of complication in the whole series of patients managed for colorectal endometriosis in our department is lower because of the enrollment of patients with the rectum shaved with plasma energy. However, the rate of rectovaginal fistula (4%) in our series is comparable with that reported in other large series from well-known tertiary referral centers, including 4.0% fistulas and 2.0% leakage for Dousset et al<sup>23</sup> and 3.9% and 1.1% for Minelli et al.<sup>2</sup> The rate of transitory bladder atony (16.0%) is also comparable with that reported previously in other series, with 9.5% urinary retention after 30 postoperative days.<sup>2,23</sup>

Overall, the postoperative functional outcomes in our series are satisfactory, as supported by the values of standardized gastrointestinal scores. As mentioned above, direct comparison of these results with those observed in our series of patients managed by colorectal resection would be inappropriate. Indeed, this latter group includes both women with large nodules of the upper rectum and circumferential endometriosis of the midrectum and lower rectum. However, more accurate data will be provided by the full report of the ENDORE randomized trial enrolling patients with rigorously comparable characteristics, of which follow-up will be complete in October 2015.<sup>19</sup>

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