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# Combined vaginal–laparoscopic–abdominal approach for the surgical treatment of rectovaginal endometriosis with bowel resection: a comparison of this new technique with various established approaches by laparoscopy and laparotomy

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## Abstract

**Background** A new combined vaginal–laparoscopic–abdominal approach for rectovaginal endometriosis allows intraoperative digital bowel palpation to assess bowel infiltration and prevents unnecessary bowel resections. This technique was compared to various established approaches where bowel resection was indicated by clinical symptoms and imaging results only.

**Methods** Patients operated for rectovaginal endometriosis with endometriotic bowel involvement between March 2002 and April 2006 at the gynecological department Charité, Berlin, Germany were included. Bowel involvement was suspected by clinical symptoms, clinical examination, and/or results of imaging techniques.

The study group (SG) was operated by the combined vaginal–laparoscopic–abdominal approach ( $n = 30$ ) and the control group (CG) ( $n = 18$ ) by laparoscopy ( $n = 4$ ), laparotomy ( $n = 3$ ), laparoscopy followed by laparotomy for bowel resection ( $n = 8$ ) or laparoscopy followed by vaginal bowel resection ( $n = 3$ ). In all cases histopathology was performed.

**Results** The study group and the control group were comparable regarding age, body mass index, symptoms, American Society for Reproductive Medicine (ASRM) classification, colorectal operative procedures, operating times, length of the resected bowel specimen, and concomitant surgical procedures. However, only in the CG were protective stomas required ( $p = 0.047$ ). There were significantly less complications in the SG ( $p = 0.027$ ). No patient experienced leakage of anastomosis. Bowel involvement by endometriosis was confirmed by histopathology in the SG in all cases whereas in the CG only in 16/18 (88.9%) cases. Hospitalization time was significantly shorter in the SG. Rehospitalizations were necessary only in the CG to repair one rectovaginal fistula and to reverse three stomas.

**Conclusions** With the presented technique of a combined vaginal–laparoscopic–abdominal surgical procedure for rectovaginal endometriosis, we showed that the complication rate, rehospitalization rate, and hospitalization time were significantly lower than in the patients of the CG. Furthermore, the combined vaginal–laparoscopic–abdominal technique allowed better evaluation of the invasiveness of the endometriotic lesion and avoided unnecessary bowel surgery.

**Keywords** Rectovaginal endometriosis · Combined vaginal · laparoscopic · abdominal approach · Complications · Bowel resection

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Though rectovaginal endometriosis is a benign condition it may have substantial impact on quality of life due to severe pelvic pain, dyspareunia, dysmenorrhoea, and infertility [1–3]. Deep infiltrating (>5 mm) endometriosis involving the vagina, rectum, Douglas and rectovaginal septum is

defined as rectovaginal endometriosis [4–6]. Rectovaginal endometriosis is less frequent than peritoneal and ovarian endometriosis [4, 5]. The estimated incidence of bowel endometriosis is 5.3–12% [1, 2, 7–9], with rectum and the rectosigmoid colon being the main locations of bowel endometriosis [1].

While asymptomatic rectovaginal endometriosis seems to be a condition with limited progression [10], very little is known of the natural history of symptomatic rectovaginal endometriosis. Due to the lack of long-term studies it is not known how often symptomatic endometriosis is progressive, i.e., leads to major complications such as bowel stenosis or bowel hemorrhage.

Medical suppressive therapy may be beneficial in some patients with symptomatic rectovaginal endometriosis, but often it is either ineffective or only temporarily effective, whereas surgical therapy is effective in relieving pain conditions [11, 12]. Other studies have shown that operative therapy of rectovaginal endometriosis does not modify reproductive prognosis [13] but significantly reduces pain and improves quality of life [1–3, 13–18]. The best long-term results are obtained after complete excision of the endometriotic tissue [14]. Rectovaginal endometriosis with bowel involvement can be treated by ablative or resective surgery [1–3, 14, 15, 19–21] using laparoscopic, laparotomic, [1, 3, 15, 16, 18, 22] transvaginal [23], or a combined approach: vaginal–laparoscopic, vaginal–abdominal [4, 17, 23–25] or the presented combined vaginal–laparoscopic–abdominal [5, 26–28] approach.

Surgical therapy of rectovaginal endometriosis is technically demanding, time consuming, and can be accompanied by major complications [1, 13, 29]. In the case of bowel surgery due to endometriosis complications increase up to 53% [1, 2, 13, 29].

Unnecessary bowel resections were reported [1, 3, 30] to occur in 1.7–28.6%, where no endometriosis was found in the surgical bowel specimen.

Therefore a correct intraoperative evaluation of an actual bowel involvement is mandatory.

We conducted a single-center study comparing the combined vaginal–laparoscopic–abdominal approach to abdominal and laparoscopic surgical techniques. The goal of the study was to evaluate the percentage of histologically verified endometriotic bowel involvement, complication rates, necessity for rehospitalization and duration of hospital stay.

## Materials and Methods

In this hospital-based cohort study we included all patients who were operated for rectovaginal endometriosis with endometriotic bowel involvement between March 2002

and April 2006 at the gynecological department Charité, Berlin, Germany.

Patients who underwent bowel resection due to endometriotic bowel involvement were identified from a surgical database. Data were collected from patients' hospital records. All 48 patients who were subjects of the analysis were seen in the endometriosis outpatient clinic. Bowel involvement was suspected by symptoms, findings on clinical examination and/or results of different imaging techniques (MRI, transvaginal sonography, rectal endosonography, and colonoscopy). Before surgery all women gave informed consent to the planned procedure including bowel resection, possible colostomy or ileostomy and in the case of laparoscopy to possible laparoconversion. All patients were informed of the possibility of postoperative bladder and/or bowel dysfunction as well as other complications. Bowel preparation was given to all patients preoperatively. All patients received antithrombotic prophylaxis with low-molecular-weight heparin, were operated under general anesthesia, and prophylactic antibiotics were given at the beginning of the operation.

The surgical goal was the complete excision of the endometriotic lesions.

The study group (SG) was composed of 30 patients operated by the combined vaginal–laparoscopic–abdominal approach. The transvaginal–laparoscopic–abdominal combined approach was described previously [5, 26, 31]. In summary: during the vaginal preparation of the endometriotic lesion bowel involvement was confirmed by direct digital palpation and the endometriotic nodule mobilized but left on the bowel. Additional endometriotic tissue was detected and excised or coagulated by laparoscopy followed by a nerve- and vessel-sparing laparoscopic mobilization of the rectosigmoid. The affected bowel was resected and anastomosis performed through a small abdominal incision. All patients of the SG were operated by the same surgeon. In all cases of the SG bowel resection was performed only after endometriotic infiltration was confirmed by vaginal preparation and digital palpation of the endometriotic lesion. Only patients with endometriotic bowel infiltration were included in this study.

The control group (CG) consisted of 18 patients who were operated by different operative techniques by two other surgeons: laparoscopy ( $n = 4$ ), laparotomy ( $n = 3$ ), laparoscopy followed by laparotomy for bowel resection ( $n = 8$ ) or laparoscopy followed by vaginal bowel resection ( $n = 3$ ). In these patients bowel resection was indicated by clinical symptoms, findings on clinical examination, and/or imaging results.

In all cases histopathology was performed to confirm bowel involvement, to evaluate resection margins, and to assess the depth of penetration. All specimens were

examined at the department of Pathology Charité, Berlin, Germany.

### Statistical methods

To compare categorical variables between the two study groups, crosstabs were calculated and Fisher's exact test was performed. To compare ordinal variables, descriptive statistics were assessed. In case of normal distribution the *t*-test was used, otherwise the Mann–Whitney *U*-test was used. A *p*-value < 0.05 was considered as significant. This study is exploratory, therefore we did not adjust *p*-values for multiple comparisons. All evaluations were done using SPSS 13.00

### Results

The study group and the control group were comparable regarding age, body mass index, symptoms, history of infertility, and ASRM classification [32] (Table 1). All women were premenopausal. The lesion size did not differ between the groups: SG 2.3 cm (1–4 cm), CG 2.0 cm (0.5–3.5 cm) (*p* = 0.249).

In the SG seven patients reported a history of infertility for 10–66 months and in the CG five patients for 12–60 months (*p* = 0.743). Eight (26.6%) women in the SG had given birth to one or more children compared to three (16.6%) women in the CG (*p* = 0.500). Previous medical (*p* = 0.334) or surgical (*p* = 0.743) treatment due to endometriosis was comparable between the two groups. Previous medical treatment had been received by 21 women [oral contraceptives *n* = 11; gonadotropin-releasing hormone (GnRH) *n* = 3; oral contraceptives and GnRH agonists *n* = 7] in the SG and 10 women (oral contraceptives *n* = 4; GnRH *n* = 4; oral contraceptives and GnRH agonists *n* = 1; Danazol *n* = 1) in the CG. One to five previous surgical procedures due to endometriosis were performed on 23 women (76.6%) in the SG (laparoscopy *n* = 17; laparotomy *n* = 2; laparoscopy as well as laparotomy *n* = 4) and 13 women (72%) in the CG had undergone one to nine previous surgical procedures (laparoscopy *n* = 9; laparotomy *n* = 1; laparoscopy as well as laparotomy *n* = 3).

Resection of the rectosigmoid bowel was performed in all patients. Forty seven patients underwent a segmental bowel resection and one patient in the CG a full-thickness disc excision of the rectum. The bowel resections were performed in nine cases (50%) of the CG by a general surgeon.

The colorectal operative procedures, operating times and the length of the resected bowel specimen were

comparable between the two groups (Table 2). Concomitant surgical procedures were comparable as well. However, significantly (*p* = 0.047) more protective stomas (ileostoma *n* = 2, colectostoma *n* = 1) were required in the CG; the length of the resected bowel specimens in these patients was 173 mm (122–200 mm). In the SG more ureterolyses were performed (*p* = 0.022). In two patients, one in the SG (with hydroureter due to endometriotic stenosis) and another in the CG, unilateral ureter resection due to endometriotic lesions were necessary. Coexisting endometriotic lesions of the coecum (SG *n* = 2), proximal part of the sigma (SG *n* = 1), appendix (SG *n* = 2; CG *n* = 1), ileum (CG *n* = 1) and liver capsule (CG *n* = 1) were resected during the same intervention.

We noticed significantly less complications in the SG (*p* = 0.027). No blood transfusion or reoperation due to intra abdominal bleeding was necessary in either group. Transient paralytic ileus was noted in two patients: one patient in the SG who had two bowel resections and one patient in the CG who had received intraoperative a protective ileostoma. No patient in either group experienced leakage of anastomosis. One patient in the CG suffered from a stenosis of the anastomosis, which was treated by dilatation in sedation 43 days postoperative. One patient in the CG experienced a transient weakness to elevate one leg, most probably as a result of an intraoperative nerve compression caused by lying on the operating table.

In the SG, bowel involvement by endometriosis was confirmed by histopathology in all cases, whereas in the CG only in 16/18 (88.9%) cases. Otherwise, the histological results of the bowel specimens were comparable in the two groups. Involvement of the serosa was noted in 16/18 (88.8%) cases in the CG. Endometriotic invasion of the muscularis was seen in 14/18 cases (77.7%) and of the submucosa in 7/18 cases (38.8%). The mucosa was not involved in the CG. In the SG the serosa and muscularis was invaded by endometriosis in all cases. The submucosa showed endometriotic involvement in 10 cases (33.3%) and the mucosa in two cases (6.6%).

The hospitalization time was significantly shorter in the SG. Rehospitalizations were necessary in the CG to repair one rectovaginal fistula and to reverse three stomas.

### Discussion

Radical procedures for rectovaginal endometriosis are major operations. When bowel resection is not necessary complication rates of 1.2% are reported [14], though this rises to 15.5–53% when bowel resection is required [1, 2, 13, 29]. Therefore the surgeon's judgment on bowel involvement with the consequence of bowel resection is of the utmost importance.

**Table 1** Patients' characteristics

	Study group <i>n</i> = 30		Control group <i>n</i> = 18		<i>p</i>
	<i>n</i> /mean (min–max)	%/SD	<i>n</i> /mean (min–max)	%/SD	
Age (years)	34.7 (24–51)	6.701	36.2 (24–46)	6.129	0.512
body mass index	23 (17–29)	2.951	24 (20–34)	3.537	0.975
Symptoms					
pelvic pain	20	66.7	10	55.6	0.543
lower-back pain	4	13.3	2	11.1	1.000
dysmenorrhoea	25	83.3	15	83.3	1.000
dyspareunia	24	80.0	12	66.7	0.542
pain on defecation	20	66.7	12	66.7	1.000
gastrointestinal symptoms	5	16.7	5	27.8	0.266
cyclic rectal bleeding	2	6.6	1	5.6	1.000
dysuria	5	16.7	3	16.7	1.000
hydroureter	1	3.3	0	0	1.000
history of infertility	7	23.3	5	27.8	0.743
ASRM classification					0.848
ASRM I	5	16.7	3	16.7	
ASRM II	4	13.3	1	5.6	
ASRM III	7	23.3	6	33.3	
ASRM IV	14	46.7	8	44.4	

Like Koninckx et al. [6], Martin et al. [4], and Redwine et al. [17] we are convinced that bowel involvement in rectovaginal endometriosis remains an intraoperative diagnosis. On the basis of magnetic resonance imaging, computerized tomography, barium enema, rectosigmoidoscopy, rectal endosonography, and clinical findings, bowel involvement was assessed preoperative [1, 2, 7, 11, 14, 19–21, 30, 33–35], without reporting its diagnostic value in the majority of studies. Magnetic resonance imaging and endosonography has a maximal sensitivity of 58 and 56%, respectively, and are therefore of limited clinical use in the preoperative judgment of bowel involvement in rectovaginal endometriosis [33]. In our study endometriotic infiltration of the bowel wall was assessed during the vaginal preparation by digital palpation. In all women of the SG, endometriotic involvement of the bowel specimen was verified by a histopathological work-up whereas in the CG in two cases no involvement of the bowel specimen and in an additional two cases no involvement of the muscularis was demonstrated (22.2%). According to the literature, in 1.7–28.6% no endometriosis was found in the surgical bowel specimens [1, 3, 30], and therefore an unnecessary bowel resection performed. The most reliable way to assess bowel involvement in rectovaginal endometriosis seems to be the intraoperative preparation of the rectovaginal septum and digital

palpation of the bowel during the vaginal part of the combined vaginal–laparoscopic–abdominal procedure [4, 6, 17, 26].

In 10.0% in the SG and 18.8% of patients in the CG, the resection margins of the bowel specimen showed endometriotic involvement. Different studies report of a 2.7% to  $\geq 40\%$  involvement of the resection margins [2, 5, 34]. Even though endometriosis is a benign condition [10] recurrence of symptoms and clinical findings have been reported [5, 16, 35]. Symptomatic recurrence of rectovaginal endometriosis is estimated to be 25% [35]. Fedele et al. were able to show that the performance of a bowel resection reduces the probability of a clinical and/or sonographic recurrence; OR 0.131 (95% CI 0.03–0.438) [35].

Complication rates of 23% in laparotomy and 15.5–53% in laparoscopy are reported following radical operation with bowel resection for rectovaginal endometriosis [1–3, 13, 29, 36]. Our complication rate was 10% and 38.9% in the SG and CG, respectively ( $p = 0.027$ ).

Only in the CG was transient postoperative urinary retention observed, in 22.2% ( $n = 4$ ) ( $p = 0.016$ ). In literature, transient postoperative urinary retention is reported to occur in 3.5–17.5% [2, 16, 29] and long-term urinary retention in 9.3% [35]. After vaginal mobilization, laparoscopic surgery allowed enhanced access to the

**Table 2** Data of the surgical procedures

	Study group <i>n</i> = 30		Control group <i>n</i> = 18		<i>p</i>
	<i>n</i> /mean (min–max)	%/SD	<i>n</i> /mean (min–max)	%/SD	
Concomitant surgical procedures					
ureterolysis	29	96.6	13	72.2	0.022
bilateral	28	93.3	8	44.4	
unilateral	1	3.3	5	27.8	
unilateral ureter resection	2	6.6	1	5.6	1.000
adhesiolysis	26	86.7	15	83.3	1.000
sacruterine ligament resection	5	16.6	4	22.2	0.711
unilateral	4	13.3	3	16.6	
bilateral	1	3.3	1	5.6	
vaginal wall resection	10	33.3	5	27.8	0.757
hysterectomy	3	10.0	5	27.8	0.132
adnexectomy	2	6.6	3	16.8	0.349
bilateral	1	3.3	1	5.6	
unilateral	1	3.3	2	11.2	
protective/transient stoma	0	0	3	16.7	0.047
duration of surgery (mins)	277	66.807	277	96.866	0.806
	(180–455)		(120–540)		
resected bowel specimen (mm)	82.8	41.381	90.2	64.584	0.774
	(22–180)		(20–209)		
Histological verification of bowel involvement					
Yes	30	100	16	88.9	0.136
No	0	0	2	11.1	
Resection margins					
Free	27	90.0	13	80.0	0.384
involved	3	10.0	3	20.0	
Complications					
No	27	90.0	11	61.1	0.027
Yes	3	10.0	7*	38.9	
infection of the abdominal wall	1	3.3	1	5.6	
rectovaginal fistula	0	0	1	5.6	
transient urinary retention	0	0	4	22.2	0.016
infection with chlostridium difficile	1	3.3	0	0	
stenosed anastomosis	0	0	1	5.6	
transient ileus	1	3.3	1	5.6	
leg elevation weakness	0	0	1	5.6	
Duration of hospital stay (days)	13.7	2.708	15.8	3.574	0.019
	(10–23)		(9–23)		
rehospitalization	0	0	4	22.2	0.016

\* two patients with >1 complications

retroperitoneal and rectovaginal space. Through the magnification effect and direct visualization, the autonomic innervations and blood supply to the bladder and the rectum could be preserved. The combined procedure allowed delineation of endometriosis from normal tissue with great accuracy. Our data are confirmed by the work from

Possover et al. who also reported 0% urinary retention following the combined procedure [26].

Ford et al. [3] report of two (3.5%) patients with a stenosis of the anastomosis. There was one patient in the CG who experienced a stenosis of the anastomosis, which was treated by dilatation in sedation.

There was no rectovaginal fistula, in the SG in our series but one (5.6%) in the CG. Rectovaginal fistulas are significant complications and occur in 3.3–10.3%, requiring additional surgery [1, 2, 7, 16, 29]. In three (16.7%) patients of the CG but in no patient in the SG were intraoperative protective stomas performed ( $p = 0.047$ ). The necessity for intraoperative protective stomas during laparoscopy or laparotomy is reported to occur in up to 10% [11, 16, 37] and in case of postoperative complications like rectovaginal fistulas, secondary stomas are realized in up to 8.6% [1, 7, 29].

Secondary surgery was not necessary in the SG, though required by four patients in the CG (22.2%) ( $p = 0.010$ ): as mentioned above, one due to the rectovaginal fistula and in three cases to reverse the protective stoma. According to the literature the necessity for further surgeries occurs in 10–13.8% [1, 2].

At present three resection techniques of infiltrative bowel endometriosis are performed: ablation of the endometriotic lesion with conservation of the rectum wall, anterior disc excision, and full-thickness bowel resection [1, 2, 20, 34]. Due to the lower clinical and sonographic recurrence rate after full-thickness bowel resection we currently prefer this approach [35].

The combined procedure involved the vaginal, laparoscopic, and abdominal approach, which was quite complex and demanding for the operating-room staff. Regarding operation time (SG: 277.47 minutes; CG: 277.22 minutes) the combined procedure is in line with other radical procedures for endometriosis, which are time consuming in general. Other groups report of 4–6.4 hours operating time for laparoscopy [2, 7, 23, 38] and 3–5 hours for laparotomy [22, 38]. The hospitalization was significantly shorter in the SG compared to the CG ( $p = 0.019$ ). The absolute number of days of hospitalization might still strike physicians from overseas as extremely long, though in fact in the German health care reimbursement system they are rather short.

The shortcoming in our study is the heterogeneity of the CG and its retrospective nature. However, the patients' numbers (30 in the SG and 18 in the CG) is relatively large considering that infiltrative bowel endometriosis is a relatively rare disease.

We were able to show that with the presented technique of a combined vaginal–laparoscopic–abdominal surgical procedure for rectovaginal endometriosis that the complication rate ( $p = 0.027$ ), rehospitalization rate ( $p = 0.016$ ), and hospitalization time ( $p = 0.019$ ) were significantly lower than in patients of the CG operated by laparoscopy, laparotomy, or laparoscopy followed by vaginal bowel resection. Furthermore, the combined vaginal–laparoscopic–abdominal technique allows a better evaluation of the invasiveness of the endometriotic lesion and avoids unnecessary bowel surgery.

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