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**Transvaginal-laparoscopic anterior rectum resection in a hysterectomized woman with deep-infiltrating endometriosis: Description of a gynecologic natural orifice transendoluminal surgery approach**

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1                   **Transvaginal-laparoscopic anterior rectum resection in a**  
2                   **hysterectomized woman suffering from deep-infiltrating endometriosis**  
3                   **– description of a Gynecologic Natural Orifice Trans-Endoluminal**  
4                   **Surgery (Gy-NOTES) approach**

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## 1 Abstract

2 Deep-infiltrating endometriosis may affect the vagina, the rectum, and the cervico-isthmic  
3 part of the uterus, resulting in severe pain, particularly dyschezia, dysmenorrhoea,  
4 dyspareunia, and diminished quality of life. Advanced surgical techniques, such as  
5 laparoscopic-assisted anterior rectum resection, are recognized as safe and effective  
6 therapeutic approaches. In most cases, a laparotomy or minilaparotomy has to be performed  
7 for technical reasons. This can be avoided in *some* cases by transvaginal-laparoscopic low  
8 anterior rectum resection. The technique is a 4-step-procedure, which can be described as  
9 follows: step 1 (vaginal) - rectovaginal examination, preparation of the rectovaginal septum,  
10 opening of the Douglas pouch, mobilization of the endometriotic nodule and the rectum,  
11 temporary vaginal closure; step 2 (laparoscopic) - removal of additional endometriotic  
12 lesions, adhesiolysis, final mobilization of the rectum, mobilization of the rectosigmoid,  
13 endoscopic resection using an endo-GIA; step 3 (vaginal) - transvaginal resection of the  
14 lesion, preparation of the oral anvil, closure of the vagina; step 4 (laparoscopic) - endoscopic  
15 transanal stapler anastomosis and “underwater-rectoscopy,” prophylaxis of adhesions,  
16 drainage. A more detailed account of the technique is contained in the body of this case  
17 report. We used this procedure to treat a 46-year old woman (II gravida, II para) who was  
18 admitted to our hospital for severe lower abdominal pain, constipation, dyspareunia,  
19 dyschezia and cyclic rectal bleedings. The symptoms were caused by an endometriotic nodule  
20 accompanied by a palpable rectum stenosis. In addition, she reported a past abdominal  
21 hysterectomy with complications caused by symptomatic myomatous uterus. As a  
22 gynecological natural orifice surgery approach, the transvaginal-laparoscopic anterior rectum  
23 resection may be an *additional* useful surgical technique which could be offered by surgical  
24 gynecologists to *some* women suffering from deep-infiltrating endometriosis.

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3 **Key words:**

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4 Deep-infiltrating endometriosis

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5 Natural Orifice Trans-Endoluminal Surgery (NOTES)

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6 Advanced gynaecological Laparoscopy

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7 Combined transvaginal-laparoscopic approach

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8 recto-sigmoid resection

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# 1 Introduction

2 Symptomatic deep\_infiltrating rectovaginal endometriosis often requires anterior rectum or  
3 segmental rectosigmoid resection with anastomosis <sup>1,2</sup>. Usually, these procedures have been  
4 performed by laparotomy <sup>3</sup>. Recently, however, laparoscopically assisted, <sup>1, 4</sup> combined  
5 vaginal-laparoscopic, <sup>5</sup> or even combined vaginal-laparoscopic-abdominal approaches <sup>3, 6</sup>  
6 have been introduced to achieve complete surgical removal of infiltrating endometriotic  
7 lesions. We would now like to introduce and report upon our employment of a transvaginal-  
8 laparoscopic technique in a patient who had previously undergone a hysterectomy for fibroids  
9 and who subsequently began to suffer from a 4 cm infiltrating rectum endometriosis.

# 1 Case Report

## 2 *Patient History*

3 In March 2008, a 46-year old woman (gravida II, para II) was admitted to our hospital for  
4 severe lower abdominal pain. In addition, she was suffering from constipation, dyspareunia,  
5 dyschezia and cyclic rectal bleedings. She reported that she had undergone an abdominal  
6 hysterectomy because of symptomatic myomatous uterus in 1993. This was followed by  
7 revision surgery several days later. Rectovaginal examination was very painful. It revealed a  
8 cystic process above the right end of the vaginal stump. The examination had to be interrupted  
9 because of the patient's extreme discomfort. As a result, no more details were detectable.  
10 Transvaginal ultrasound demonstrated an adnexal mass of 6 cm Ø. Renal sonography, blood  
11 values (including CA125, LH, FSH, E2, P), and CRP were within normal range. Our patient  
12 was informed that her symptoms could indicate a deep-infiltrating endometriosis of the  
13 bowel.

14 At that time, she gave her written consent only for “minor surgical procedures”- i.e.; resection  
15 of the ovarian endometriosis or bowel adhesiolysis- but not for bowel resection (with the  
16 exception of an appendectomy). Before laparoscopy, a rectovaginal examination under  
17 general anesthesia revealed an endometriotic nodule of approx. 4 cm Ø with 2/3 rectum  
18 stenosis (13 cm ab ano) directly under the right-side ovarian endometrioma. Staging  
19 laparoscopy revealed an ovarian endometriosis (rASRMstage III) and the endometriotic  
20 infiltration of the appendix. After right-side salpingoovariolysis and gentle ureterolysis, the  
21 endometrioma was removed by stripping the wall of the cyst. Laparoscopic appendectomy  
22 was performed using the stapler technique. After intense adhesiolysis of the small bowel  
23 adherent to the vaginal stump, the infiltrated rectum was visualized. Immediately after  
24 surgery, our patient was fully informed about all findings.

1 Rectosigmoidoscopy, transanal sonography, and MRI of the small pelvis were performed to  
2 improve characterization of the deep-infiltrating endometriosis. These techniques confirmed  
3 the results of the rectovaginal examination and laparoscopy. Rectum resection was  
4 recommended because of the patient's symptoms (dyschezia, dyspareunia, obstipation, rectal  
5 bleeding, stenosis). Endocrine treatment options <sup>7</sup> were discussed, but the patient rejected  
6 them. She was subsequently discharged on the 4<sup>th</sup> postoperative day.

7 The patient returned in July 2008, after having experienced greatly reduced quality of life. By  
8 this time, she had informed herself of the details of the possible treatment options. We then  
9 performed radical surgery for symptomatic rectal endometriosis.

#### 10 *Surgical Procedures*

11 The evening before surgery, Prepacol<sup>®</sup> (Guerbet GmbH, Sulzbach, Germany) was used for  
12 bowel preparation. The patient was placed in the Trendelenburg position. At 13 cm ab ano,  
13 rectovaginal examination revealed the immobile infiltrating tumor of the rectum (approx. 4  
14 cm Ø), adherent to the right sacrouterine ligament. Previously, the tumor had not been  
15 palpable without anesthesia because of patient discomfort. The vagina was not infiltrated by  
16 endometriosis but involved by typical scar-like adhesions. Surgery was performed by a  
17 gynecological team (ADE, SP, TB). After gentle disinfection, the edges of the vaginal stump  
18 were grasped by sharp clamps. Application of 10 mL lidocaine-adrenaline (200,000:1)  
19 supported local haemostasis. The rectovaginal septum was opened by incision. Under rectal-  
20 digital control, the dorsal wall of the vagina was gently resected from the anterior rectum, and  
21 the Douglas pouch was opened. The infiltration area of the endometriotic lesion became  
22 visible (Fig. 1A). It was necessary to perform a bilateral opening of the pararectal spaces for  
23 better mobilization of the rectum and for “medialization” of the rectal lesion. The tumor could  
24 then be grasped using sharp clamps. The mesorectum and the typical coarse adhesions,

1 respectively, were removed step-by-step around the tumor-bearing rectum segment using  
2 overholt clamps, bicoagulation clamps, and scissors. The infiltrated part of the rectum thus  
3 became mobile, and the laparoscopic resection was prepared transvaginally (Fig. 1B). The  
4 vagina was closed temporarily in order to perform laparoscopy. Laparoscopy was performed  
5 using AIDA-HDTV equipment (Karl Storz Endoskopie©). Two 5mm-trokars were placed in  
6 the left and right lower abdominal region. One 12-mm suprapubic incision and one 10-mm  
7 umbilical incision were made to gain access. Despite the patient's complicated treatment  
8 history, visualization of the entire abdominal cavity (including a complete bowel check-up)  
9 revealed no further endometriotic lesions. The endometriotic lesion of the rectum was  
10 identified, and some additional retrorectosigmoidal and pararectal mobilization was carried  
11 out. To guarantee a tension-free anastomosis, it was important to resect the physiological left-  
12 sided adhesions of the rectosigmoid *before* rectum resection. Transsection of the rectum was  
13 done using a linear endoscopic stapler (Endopath® ATB45, Ethicon Endo-Surgery, Inc.). It  
14 was introduced into the suprapubic incision. The involved rectum segment was then placed  
15 into the former Douglas, where it was pulled out through the vagina into the introitus. At this  
16 point, the affected rectum segment was resected. The 29-mm-anvil of the endoscopic curved  
17 intraluminal stapler (Endopath® ILS, Ethicon Endo-Surgery, LLC) was attached at the oral  
18 end, then reintroduced into the abdominal cavity (Fig. 1C, D). After final closure of the  
19 vagina (Fig. 1E), the laparoscopically assisted transanal anastomosis was finished using  
20 standard technique (by ADE and HR) (Fig. 1F). Rectoscopy was performed to exclude  
21 anastomosis insufficiency. The anastomosis was checked during rectal insufflation using  
22 *underwater*-laparoscopy. 1000 ml 4% Icodextrin Solution (Adept® Baxter, Deerfield, Illinois,  
23 USA) was applied to prevent adhesions. The estimated blood loss, assessed by combination of  
24 suction volume and visual estimation, was 250 ml.

25 The duration of surgery was 3.5 hours. The intravenous antibiotic regime (Mezlocillin and  
26 Metronidazole) was discontinued on the 4<sup>th</sup> postoperative day. An epidural catheter was used for



1 pain relief from day 0-4. Mobilization and physiotherapy were initiated on day 1 after  
2 surgery. The bladder catheter was removed on day 2 after surgery. A fast-track nutritional  
3 protocol was used. Vaginal wound healing was supported by vaginal Estradiol ovule  
4 (Oekolp<sup>®</sup>, Dr. Kade Pharmazeutische Fabrik GmbH, Berlin) for 3 postoperative days.

5 Histopathology of the rectum demonstrated intramural nodules of endometrial mucosa (Fig. 2  
6 A, B), thus confirming the clinical diagnosis of endometriosis resected in sano. Additional  
7 immohistochemical analysis provided a strong positivity for estrogen- and progesteron-  
8 receptors of stromal and epithelial cells within the endometriotic nodules. A moderate  
9 proliferative activity of stromal and epithelial cells was demonstrated by the use of the MIB-1  
10 monoclonal antibody.

11 Our patient was discharged in good health on the 8<sup>th</sup> postoperative day. Because of  
12 premenopausal LH and FSH, we recommended a prophylactic 3-month course of treatment  
13 with leuproreline acetate. Rehabilitation was also scheduled.

## 1 Discussion

2 It is well known that rectovaginal deep-infiltrating endometriosis is a challenge in advanced  
3 gynecological surgery <sup>2, 8-11</sup>. Resection of deep-infiltrating endometriosis can improve the  
4 gynecologic and digestive symptoms, as well as the overall pain score. <sup>7, 12</sup> Bowel surgery  
5 cannot provide an improved fertility rate. <sup>13, 14</sup> but in 44.6% of patients pregnancies have been  
6 reported. <sup>12</sup> Advanced surgery may lead to major complications. It is therefore important for  
7 women to be provided with appropriate knowledge of procedures and potential complications  
8 in order to give their informed consent. <sup>9, 15-19</sup> In some cases, radical bowel surgery and  
9 hysterectomy might be necessary, <sup>8, 20</sup> whereas in asymptomatic or even in symptomatic  
10 patients conservative medical treatment options should be considered. <sup>7, 13, 14, 21</sup> However,  
11 there is a growing body of evidence (or experience), that open and laparoscopically assisted  
12 techniques have their place in the treatment of deep-infiltrating endometriosis. <sup>1, 3, 6, 22</sup> It must  
13 be said, though, that most laparoscopic techniques do include some kind of laparotomy. This  
14 is necessary for anvil preparation. <sup>3, 6, 17</sup> Usually, the length of (Pfannenstiel) laparotomy can  
15 vary from 3-10 cm. As in some cases of rectal cancer, it may be possible, by using the  
16 transvaginal-laparoscopic procedure, to avoid even that small laparotomy in patients with  
17 deep-infiltrating endometriosis. <sup>23-26</sup>

18 To our knowledge, the first transvaginal approach in a patient with rectovaginal endometriosis  
19 was described by Redwine et al. <sup>1</sup>. This team mobilized the rectosigmoid laparoscopically in  
20 five patients. A posterior colpotomy incision was made after the affected segment of bowel  
21 had been separated from its mesentery. The bowel was delivered through the vagina to the  
22 introitus. The affected segment was resected, and a hand-sutured anastomosis was performed.

23 After returning the bowel to the abdomen, the vagina was closed from below. <sup>1</sup>

24 The procedure we are suggesting consists of 4 major steps (2 vaginal and 2 laparoscopic):

25 **Step 1 (vaginal):** rectovaginal examination, preparation of the rectovaginal septum; opening  
26 of the Douglas pouch, mobilization of the endometriotic nodule and the rectum, temporary

1 vaginal closure;

2 **Step 2 (laparoscopic):** removal of additional endometriotic lesions, adhesiolysis, final  
3 mobilization of the rectosigmoid (and - if necessary – of the left flexure), endoscopic  
4 resection using a **linear endoscopic stapler**.

5 **Step 3 (vaginal):** transvaginal resection of the lesion, preparation of the oral anvil, closure of  
6 the vagina;

7 **Step 4 (laparoscopic):** endoscopic transanal stapler anastomosis and “underwater-  
8 laparoscopy,” prophylaxis of adhesions, drainage.

9  
10 Independently, excellent outcome has been reported for the suggested technique.<sup>27</sup> From our  
11 point of view, a left-side hemicolectomy, as performed in 11 cases by visceral surgeons, is not  
12 necessary.<sup>27</sup> Nevertheless, a sufficient bowel mobilization is important because the final  
13 colorectal anastomosis has to be completely tension-free. In addition, the size of the  
14 colpotomy should be greater than 1-2 cm. We recommend a posterior colpotomy that is as  
15 wide as possible. This approach will be technically difficult in nulliparous women with  
16 advanced deep-infiltrating endometriosis of the vagina, the parametrium, and the Douglas  
17 pouch. We know this well because of prior experience with vaginal-laparoscopic-abdominal  
18 and other approaches.<sup>3, 5, 6</sup> In most cases of deep-infiltrating endometriosis, the retrocervical  
19 part of the upper vagina is affected. Therefore, vaginal resection of all visible and palpable  
20 vaginal lesions under rectal-digital control should be performed to avoid vaginal recurrences.  
21 In addition, there is no need for the insertion of an endobag to protect the vital tissue of the  
22 vagina. Contamination of the vagina can be treated by accurate disinfection, perioperative  
23 antibiotic regime, and by an E<sub>1</sub>-containing vaginal suppository.

24 A possible source of criticism could be that the patient in this reported case was  
25 hysterectomized, and that the situation we found was therefore much much less complicated  
26 than it would have been in a patient who had not had a hysterectomy. We believe, however,

1 that this procedure could be of value even in *some* young women who still retain their uterus.  
2 <sup>1, 27</sup> Seen from this perspective, the transvaginal-laparoscopic anterior rectum resection may  
3 be an *additional* useful surgical technique which could be offered to some women suffering  
4 from deep-infiltrating endometriosis.

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6 work that has been done by all of our uncited colleagues and their teams.

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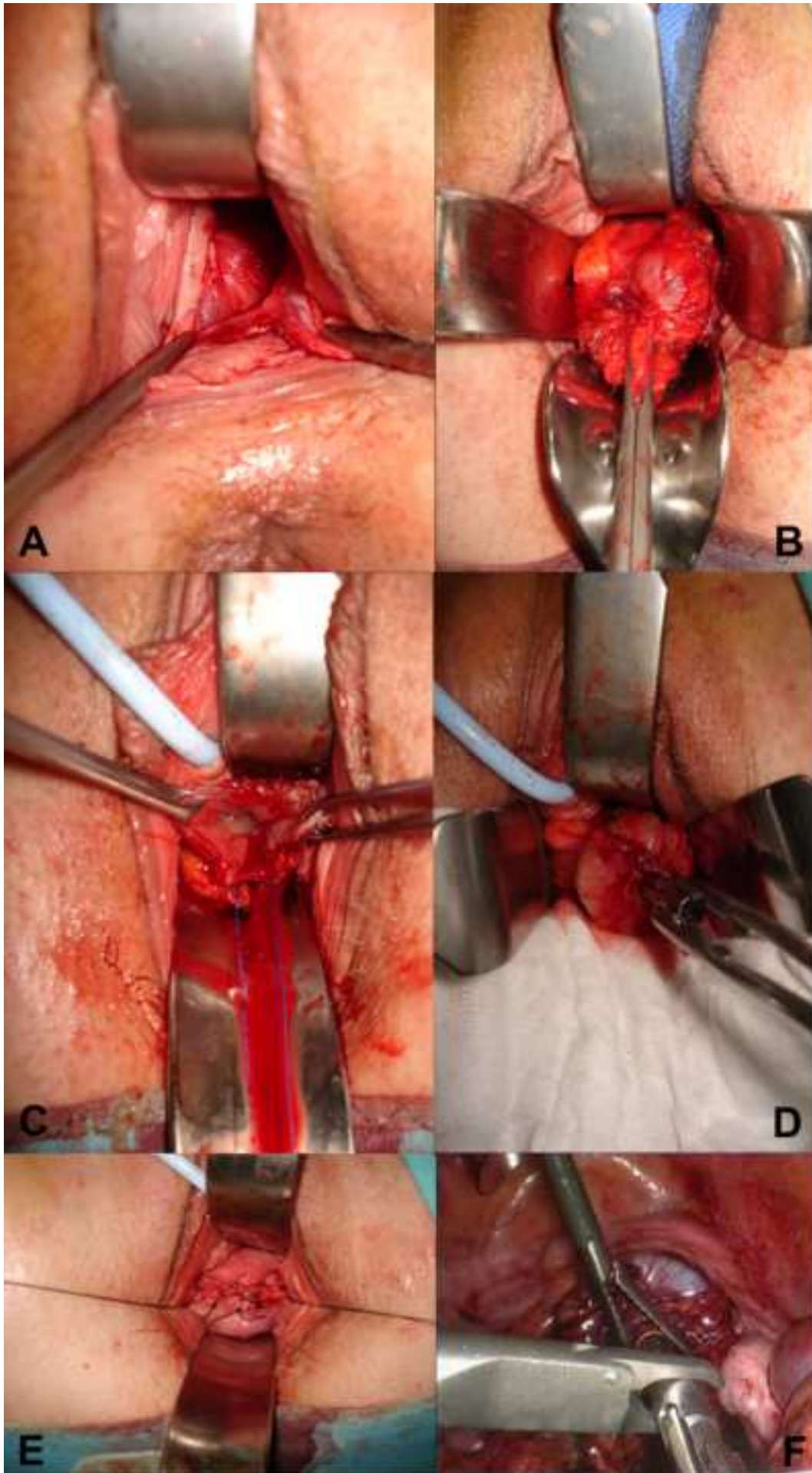
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## 1 **Figure legends**

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4 **2 Figure 1:** Transvaginal-laparoscopic anterior rectum resection: **(A)** Opening of the vagina  
5 and the Douglas pouch. The endometriotic lesion becomes visible. **(B)** The infiltrating lesion  
6 has been mobilized. It was possible to deliver the affected part of the bowel through the  
7 vagina to the introitus. After transient closure of the vagina, the infiltrated part of the rectum  
8 was mobilized by laparoscopy followed by endoscopic resection of the infiltrated part. The  
9 bowel was delivered through the vagina, where the aboral part of the rectum was resected and  
10 fixed by Allis clamps **(C)**. After the 29-mm anvil was prepared **(D)**, the whole rectum was  
11 reintroduced in the abdominal cavity, and the vagina was finally closed **(E)**; After the  
12 transanal-endoscopic anastomosis **(F)** was done, two easy-flows were placed on both sides.

13 **Figure 2:** Gross pathology of the affected rectum segment resected in sano **(A)**;  
14 Representative photomicrograph of the deep-infiltrating endometriosis (Hematoxylin/eosin  
15 staining, **B**).

Figure 1  
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**Figure 2**  
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