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CASE REPORT

Advantages of the robotic approach to deep infiltrating rectal endometriosis: because less is more

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Abstract For symptomatic deep infiltrating endometriosis, surgery is often required to achieve symptom relief and restore fertility. A minimally invasive approach using laparoscopy is considered the gold standard. However, specific limitations of the laparoscopic approach deep in the pelvis keep challenging even surgeons with a solid experience with minimally invasive techniques. Robotic surgery has the potential to compensate for technical drawbacks inherent in conventional laparoscopic surgery, such as limited degree of freedom, two-dimensional vision, and the fulcrum effect. In the present report, we aim at demonstrating the central role of robotic surgery for deep infiltrating endometriosis, with special emphasis in the ability to practice organ (rectal) preservation. A 45-year-old white female with a 4-month history of chronic pelvic pain, dyschezia, and dysmenorrhea, refractory to hormonal therapy was referred to our unit. MRI findings were diagnostic of deep infiltrating endometriosis (retrocervical and rectovaginal) extending to the anterior rectal serosal layer (partial-thickness rectal invasion). Using a fully robotic approach, appropriate dissection of the rectovaginal septum and of the extraperitoneal rectum followed by complete excision of the endometriotic rectal nodule with organ (rectal) preservation was undertaken. It is our belief that using a robotic approach, the potential to boost rectal preservation might be established. Moreover, it is possible that in many cases, a robotic operation may allow the surgeon to perform the intervention with greater accuracy and comfort. As a result, more patients with deep infiltrating endometriosis may benefit from rectal sparing procedures.

Keywords Endometriosis · Robotics · Laparoscopy · Rectal diseases · Minimally invasive surgical procedures

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Background

Endometriosis is a gynecologic disorder defined by the presence of endometrial glands and stroma outside the uterine cavity. It affects 6–15 % of reproductive-age women, 20–50 % of infertile women, and 71–87 % of women with chronic pelvic pain [1, 2].

Although endometriosis may lead to infertility, chronic pelvic pain, dysmenorrhea, deep dyspareunia and bowel disorders may also seriously impair patients' quality of life. Currently, there are three forms of endometriosis: superficial endometriosis, which involves the peritoneum, ovarian endometriomas, and deep infiltrating endometriosis (DIE) [3]. DIE invades 5 mm to the retroperitoneum of the pelvic sidewalls, the rectovaginal septum, or the muscularis of the bowel, bladder or ureters. Bowel involvement is reported in up to 12 % of women with endometriosis, with the rectum being the most common site [4].

For symptomatic DIE, medical therapy should always be the first-line treatment [5]. However, for DIE, treatment response is frequently suboptimal. Moreover, infertility is more frequently not affected [6]. Therefore, surgery is

often required aiming at excising affected tissues to achieve symptom relief [7, 8]. A minimally invasive approach using laparoscopy is considered the gold standard option aiming at complete disease excision [9].

When surgery is indicated, a complete resection is required to achieve the best outcome. To obtain complete disease excision, a minimally invasive approach is considered the gold standard and a multidisciplinary approach involving urologists and colorectal surgeons as conducted in the present case is essential for correct management [10]. There is moderate quality evidence that laparoscopic surgery for endometriosis reduces overall pain and increases live birth or ongoing pregnancy rates [11].

Conventional laparoscopy has several proven advantages over laparotomy, including faster postoperative recovery, shorter length of hospital stay, and cosmetic benefits. Moreover, improved intraoperative visualization, decreased blood loss, and fewer complications [8, 12] are also frequently noticed. However, a laparoscopic approach may be, in an unpredictable way, a challenging procedure in patients with DIE. This may be due not only to variables related to the disease itself, but also to current limitations of laparoscopy like 2-dimensional view, counterintuitive hand movements, fulcrum effect, and anti-ergonomic position during surgery [9]. These issues may seriously hamper the use of this technology by a considerable number of minimally invasive surgeons, some of them experienced in the management of other pelvic conditions.

It is widely considered that robotic surgery (RS) has the potential to compensate for technical drawbacks inherent in conventional laparoscopic surgery. Robotic surgery (RS) represents the ultimate minimally invasive approach to several pelvic diseases since the approval of the da Vinci robotic surgical system (Intuitive Surgical Inc., Sunnyvale, CA, USA) by the US Food and Drug Administration for use in gynecology in 2005. The number of robotically assisted procedures for benign and malignant gynecological conditions has rapidly grown worldwide [8, 13–15]. There are several advantages of RS when compared with conventional laparoscopic surgery that may directly impact the surgical approach to DIE. These features include a stable camera operated on by the surgeon sitting at an ergonomic console, a high-definition three-dimensional vision system, specific instrument articulation, and absence of tremor due to motion scaling. These advantages are especially important in the most complex procedures and should be greatly enhanced in the setting of DIE management, where extragenital endometriosis may diffusely involve pelvic structures including bowel and urinary tract. Moreover, the functionalities offered by RS may be highly valuable in the management of infertility with the assimilation of microsurgery principles into fertility-promoting procedures [14].

Current available evidence regarding the use of RS for DIE is limited to few case series establishing the feasibility of a single or combined procedure for DIE [6, 7, 14]. Moreover, in Brazil, the main reason for the still limited use of RS is the cost of the device and related expenditures for annual maintenance contracts and instruments.

The report of the present case derives from one singular but very significant feature of the management of complex DIE by a robotic approach: its potential to promote rectal preservation. Moreover, we speculate that, during the handling of this case, intraoperative decisions could not be adequately reached based exclusively on the findings and capabilities associated with an isolated conventional laparoscopic approach.

Case presentation

Clinical and radiological aspects

We report a case of a 45-year-old white female, with a 4-month history of chronic pelvic pain, dyschezia, and dysmenorrhea. These symptoms were refractory to hormonal, antispasmodic, and opioid therapy. Pain was clinically evaluated using a visual analogue scale (VAS) revealing severe (VAS score 9) dyschezia and severe (VAS score 8) dysmenorrhea.

Gynecologic and proctologic examination revealed a nodosity of the rectovaginal septum extending to the rectum. Bilateral infiltration down to the pelvic floor was also suspected. Flexible sigmoidoscopy was normal. MRI showed the following findings suggestive of DIE: low retrocervical and rectovaginal lesion partially obliterating the posterior fornix in contact with the posterior vaginal fornix, where there is unobtrusive wall thickening, measuring 1.3 × 0.6 × 1.5 cm. It extends to the anterior rectal serosal layer (at about 12 cm from the anal verge) without clear signs of full-thickness rectal wall infiltration (Fig. 1).

Operative treatment

Before surgery, the patient was fully informed about risks and benefits of the intervention. On the day before surgery, she received a clear-fluid diet and full bowel preparation (2 L of polyethylene-glycol). Low-molecular weight heparin was given 12 h after surgery. Prophylactic antibiotic therapy included intravenous ceftriaxone 2000 mg and metronidazole 500 mg, both administered at the beginning of the procedure.

The patient underwent general anesthesia and was placed in the modified lithotomy position with both arms closed and with legs placed in Allen stirrups in a deep right-tilted Trendelemburg position. A Foley catheter was

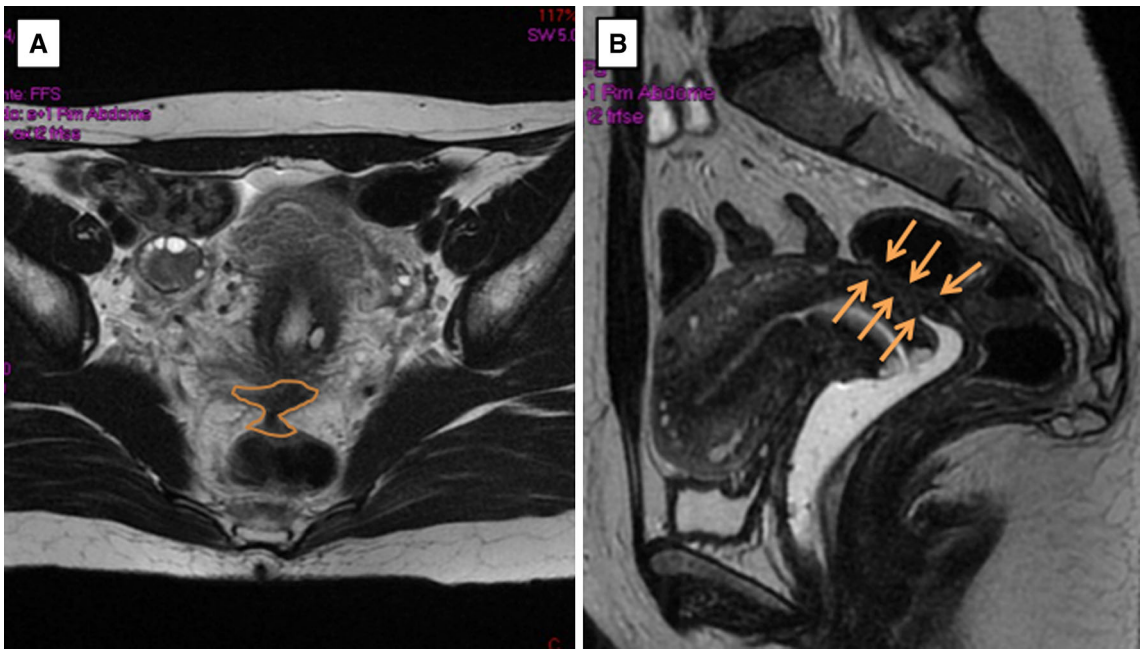

Fig. 1 MRI findings. **a** T2-weighted MRI axial pelvic image showing a low retrocervical, rectovaginal lesion partially obliterating the posterior fornix in contact with the posterior vaginal fornix (*circumscribed line*). **b** T2-weighted MRI sagittal image showing partial wall thickening, measuring 1.3 × 0.6 × 1.5 cm at about 12 cm from the anal verge without clear signs of full-thickness rectal wall infiltration (*yellow arrows*)

placed and a uterine manipulator was used since the beginning of the operation. A 12-mmHg pneumoperitoneum was fashioned using closed technique through a transumbilical incision. A four-port approach was chosen: (1) the umbilical port was a 12-mm laparoscopic trocar; (2) one 8-mm robotic port was placed at the lower right quadrant; (3) another 8-mm robotic port was placed at the left lower quadrant, and a 5-mm laparoscopic port was introduced in the upper right quadrant (patient-side assistant port). The Da Vinci Si dual console robotic platform (Intuitive Surgical, Sunnyvale, CA, USA) was then docked at the foot of the bed, between the patient's legs. Instruments included monopolar scissors, bipolar forceps, a monopolar hook, a suction/irrigator probe, and a large needle holder.

The entire abdominal cavity was explored to evaluate the extension of the endometriotic lesions. A complete endometriotic infiltration of the Douglas pouch and rectovaginal septum deepening bilaterally and caudally to both uterossacral ligaments was detected.

First, gynecologic surgeons carried out the dissection through the rectovaginal septum with the monopolar scissors. Expert handling of the uterine manipulator helped to assist this step. The vagina was mobilized down until a level below the nodule where a soft area distal to the palpable lump could be noticed. Next, a disc-shaped full-thickness excision of the posterior vaginal wall including the entire endometriotic lesion was accomplished. A robotic-assisted closure of the vaginal defect was undertaken using a non-interrupted double-layered 3/0 absorbable monofilament suture.

Afterwards, the degree of endometriotic infiltration of the anterior rectal wall and utero-sacral ligaments bilaterally was defined. Although the extent of involvement was considered wide (Fig. 2), a partial involvement of the muscular layer seemed to be the case. Therefore, colorectal surgeons decided to proceed to complete cold excision of the cloaking lesion. After opening and dissecting of the retro- and para-rectal spaces bilaterally (enabling identification and sparing of the superior hypogastric nerves), complete removal of the endometriotic lesion was successfully accomplished using monopolar scissors.

No complications occurred during the surgical procedure or postoperatively. Operative time was 220 min. Hospital stay was 3 days. Pathologic evaluation confirmed the diagnosis of endometriosis. The patient was followed up at 1, 3, 9 and 12 months after surgery.

Discussion

The radical surgical treatment of DIE remains one of the most challenging operations. In this particular setting, tissues, vessels and organs involved or in close relation to the disease are distorted by fibrosis and inflammation. Therefore, proper dissecting skills are required. Moreover,

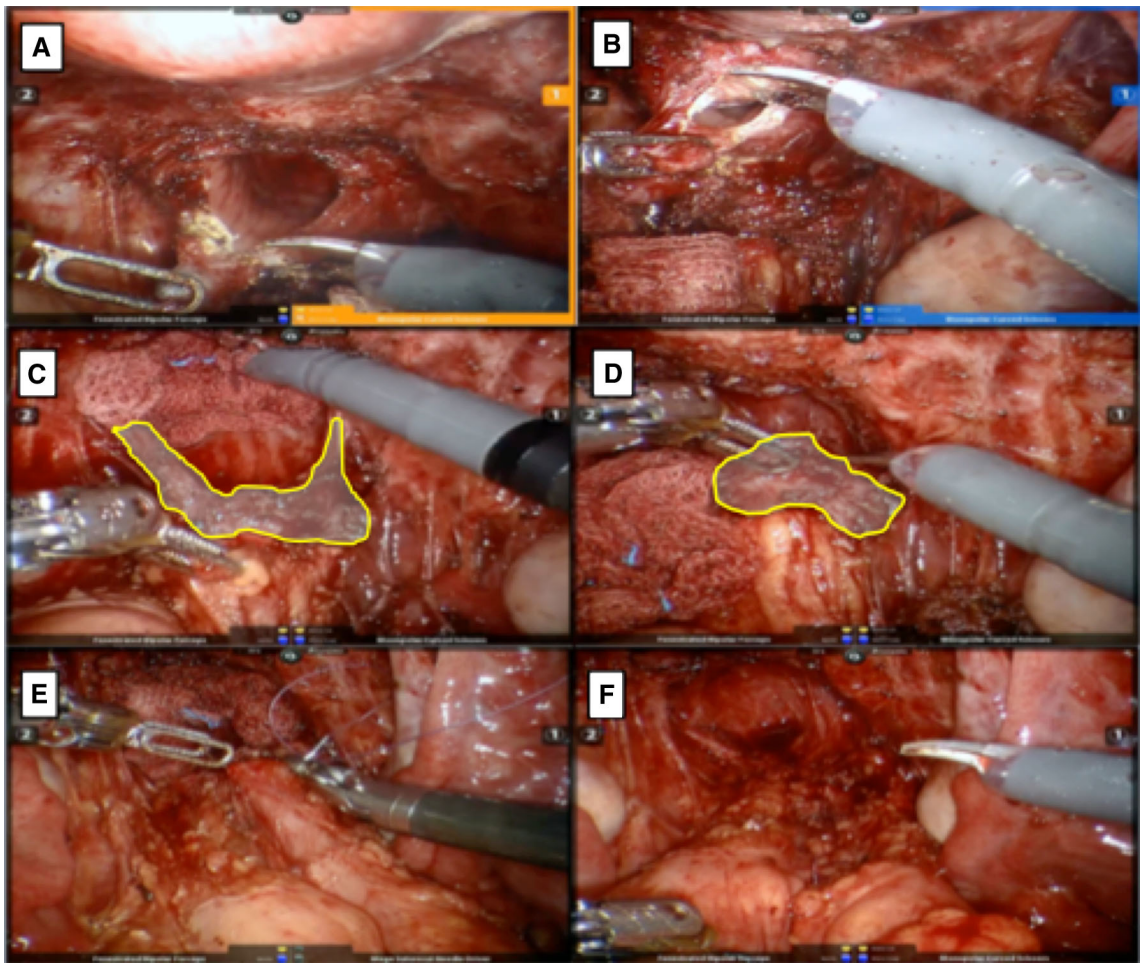

Fig. 2 Intraoperative findings and actions. **a**, **b** After clearance of the rectovaginal *cul de sac* obliterated by the endometrial nodule, this was properly donated to the posterior vaginal wall thanks to precise robotic dissection. Next, a full-thickness partial vaginal resection was undertaken. The vaginal defect was closed using a continuous double-layered suture approach. **c** The endometrial nodule infiltrating the anterior rectal wall below the anterior peritoneal reflection and over the uterosacral ligaments bilaterally is represented in *yellow*. **d** After bilateral robotic-assisted dissection over the uterossacral ligaments, the nodule remains attached to the rectum at this time eventually amenable to disk excision. **e**, **f** After complete shaving of the rectal endometriotic nodule, these are endoscopic aspect before (**e**) and after (**f**) double-layered continuous robotic suture of the anterior rectal wall defect

treatment must be tailored for each individual patient's desires and expectations. In the present report, we successfully managed to undertake shaving of the rectal nodule since it did not invade the rectal wall in a full-thickness fashion. Shaving carries a significantly lower overall complication rate when compared to disc excision or segmental resection and is associated with a lesser degree of neurologic/functional impairment [10]. Moreover, in patients with DIE, higher pregnancy rates are observed after shaving and discoid excision, when compared with anterior rectal resection [8]. This finding may be partially attributable to a more significant adhesion formation after more extensive surgery and its complications.

However, we dare to speculate that success in the procedure completion may be significantly attributable to the utilization of a tool framed for achieving precision during minimally invasive surgery. Many would agree that undertaking disk or anterior resection possibly requires less technical skills than a shaving procedure. The particular advantages of the robotic assistance are three-dimensional and stable magnified imaging of the operative field, smaller and articulated instruments, and tremor filtration. Ablating endometriotic lesions and lysing existing adhesions without entering the bowel lumen remains an essential point to take future fertility into account.

Conclusions

The surgical treatment of DIE remains a challenging assignment requiring specific technical skills, which may sometimes hamper its application by either gynecologist or

colorectal surgeon in spite of a solid experience with a minimally invasive approach. The management of DIE through a rectum-sparing operation is highly desirable due to its reduced impact on morbidity, on defecatory function, and over fertility. Despite the cost associated with the implementation of a dedicated program for approaching DIE robotically, it is possible that in many cases, a robotic operation may allow the surgeon to perform the intervention with greater accuracy and comfort. As a result, more patients may benefit from rectal sparing procedures when facing need for pelvic surgery due to DIE.

Compliance with ethical standards

Conflict of interest SEAA, VES, RMM, and MTVG declare that they have no potential (financial and no financial) conflict of interest.

Ethical approval The present study was approved by the IRB at our Hospital. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Written informed consent was obtained from the patient for publication of this Case Report and the two accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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