

Laparoscopic Treatment of Deep Infiltrating Endometriosis of the Intestine - Technical Aspects

Tratamento Cirúrgico de Endometriose Profunda Infiltrativa Intestinal por Laparoscopia - Aspectos Técnicos

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ABSTRACT

Surgery remains the best long-term treatment for deep infiltrating endometriosis affecting the bowel. Several surgical procedures (rectal shaving, mucosal skinning, discoid resection, and segmental bowel resection) have been performed with heterogeneous outcomes. In this article we discuss the indications of each procedure as well as the technical details.

Key words: Deep infiltrating endometriosis. Laparoscopy. Surgery. Colorectal. Bowel.

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INTRODUCTION

Endometriosis is a chronic inflammatory disease characterized by the growth of stroma and/or endometrial glands in areas outside the endometrial cavity. The prevalence of endometriosis in women of reproductive age is estimated at about 10%.¹ Infiltrative forms of the disease, called **deep infiltrating endometriosis (DIE)**, are responsible for painful symptoms whose intensity is correlated to the depth of lesions² and seem to affect about 20% of women with endometriosis.³

One of the basic characteristics of DIE is the multifocal pattern of distribution of lesions, which is of fundamental importance in both the diagnosis and treatment of the disease. There is a “preference” of the disease for the posterior pelvic compartment (uterosacral ligaments, retrocervical region, posterior vaginal fornix, rectosigmoid and ureter) over the anterior pelvic compartment (round ligament, anterior uterine wall/anterior peritoneal reflection, and bladder) and the remainder of the abdomen (small bowel, omentum, right colon and appendix).^{4,5} In addition, there is a direct association between the presence of cystic lesions of

endometriosis in the ovary (ovarian endometrioma) and DIE.⁶

Intestinal DIE is defined as a lesion of endometriosis that infiltrates at least the muscularis propria layer of the intestinal wall⁷ and has great preference for the rectosigmoid.^{5,8,9} There appears to be intestinal involvement in about 45% to 56% of patients with DIE^{5,8} and 57.1% of women with ovarian endometrioma.⁶ When it affects the rectosigmoid colon, the intestinal involvement usually occurs by contiguity and, over time, successive inflammatory processes triggered by cyclic bleeding of the lesions promote the “infiltration” of the lesion into the intestinal wall. Some characteristic findings of DIE in intestinal imaging are due this pathophysiological process, which promotes proliferation of the smooth muscle tissue and a fibrotic reaction, resulting in the formation of a solid **nodule**.¹⁰

The high rate of intestinal involvement by DIE has lead to the popularization and ongoing improvement of surgical techniques used to address this disease. In this article we describe in detail the surgical principles and operative tactics used by our group when approaching intestinal DIE.

PRE-OPERATIVE DIAGNOSIS

The preoperative evaluation of patients with endometriosis begins with a good history and a thorough physical examination.

Symptoms that should raise suspicion of the likely presence of the endometriosis include dysmenorrhea, dyspareunia, and chronic pelvic pain. Beside these, it is important to investigate digestive symptoms and menstrual or peri-menstrual urinary symptoms. In a retrospective study, FAUCONNIER and cols.¹¹ demonstrated that painful symptomatology was specific to an anatomic site or organ affected by the DIE implant.

Dyspareunia was associated with DIE involving the uterosacral ligaments; painful bowel movements during menstruation were associated with DIE involving the posterior wall of the vagina; non-cyclic pelvic pain and functional bowel symptoms were associated with intestinal involvement; and functional urinary symptoms were associated with DIE involvement of the bladder. In a prospective study of CHAPRON and cols.¹² observed that painful defecation during menses and severe dyspareunia are specifically related to the presence of DIE compromising the posterior pelvic compartment.

Recently, BALLESTER and cols.¹³ have shown that there is also an increased incidence of urinary symptoms in women with posterior DIE and that parametrial involvement is associated with changes in urinary function. In the case of intestinal DIE, there is greater likelihood of the presence of symptoms such as cyclic painful defecation, cyclical constipation, and longer evacuation time.¹⁴

These symptoms, however, may be absent; thus infiltrative lesions should be sought in all women who present with complaints of severe dysmenorrhea that alter their quality of life significantly (causing them to miss work, school, etc.) or that require use of potent analgesics. The questioning of patients regarding menstrual history during adolescence can identify markers associated with DIE.¹⁵ Patients with DIE have a positive family history of endometriosis, increased absenteeism from school during menstruation, and greater use of oral contraceptives for the treatment of severe primary dysmenorrhea.

The physical examination is a fundamental step in the preoperative evaluation of deep endometriosis lesions (Figure 1). On vaginal examination, one looks for a zone that is hardened, retracted, and extremely



Figure 1 - Speculum examination showing an endometriotic gland in the posterior vaginal fornix.

tender in the posterior fornix of the vagina and/or in the topography of the uterosacral ligaments. One should assess the volume and limits (inferior, posterior, and lateral) of the lesion. On rectal examination, one must determine the relationships between the lesion and the wall of the rectum, assessing the mobility of the layers of the rectal wall.

Vaginal examination alone, however, may be insufficient to accurately detect endometriosis prior to laparoscopy. The use of transvaginal pelvic ultrasound, performed by a well-trained radiologist, improves the diagnostic accuracy of the examination, especially in patients with ovarian endometrioma or DIE involving the uterosacral ligaments, the bladder, or the rectosigmoid.¹⁶ Several studies have shown that transvaginal pelvic ultrasound is of utmost importance for the preoperative mapping of endometriosis involving the ovaries, the region retrocervical region, or the rectosigmoid.^{6,8,10,16-19}

The objective of preoperative imaging, therefore, is to map more precisely the areas affected by the disease, identifying especially those lesions that affect the gastrointestinal and urinary tracts. Specifically in the case of intestinal DIE lesions, the preoperative mapping should contain the following information:^{10,18,19}

- size of the lesion;
- the depth of infiltration of the lesion in the layers of the intestinal wall;
- distance of the lesion from the anal verge;
- percentage of intestinal circumference involved;
- presence of multifocal lesions.

Ultrasonography of the urinary tract is also indispensable during the preoperative evaluation of bulky (> 30 mm) retrocervical DIE lesions and of lateral DIE lesions to exclude ureteral involvement by the disease.^{20,21}

Some authors^{22,23} have shown that magnetic resonance imaging (MRI) of the pelvis with opacification of the vagina and rectum with ultrasound gel has a high sensitivity for detection of DIE lesions. In our experience, MRI is important for assessing ovarian endometriomas and multifocal intestinal DIE lesions; it does not, however, replace ultrasound. The depth of infiltration of a lesion in the intestinal wall is best assessed by ultrasonography (Figure 2).

Some groups have experience with the use of barium enema as part of the preoperative evaluation and surgical planning of patients with intestinal DIE,²⁴ but transvaginal pelvic ultrasound has a higher sensitivity in detecting the presence of posterior DIE lesions.²⁵

As the predilection of the DIE implants is for the outer layers of the intestinal wall,²⁶ colonoscopy – which better evaluates the mucosa of the intestine – has a limited role in identifying intestinal DIE lesions. Still, colonoscopy may be able to identify extrinsic compression by deep endometriosis nodules and involvement of the intestinal mucosa in cases with complete infiltration of all intestinal layers (Figure 3).

CLINICAL TREATMENT

Medical management has an important role in controlling the painful symptoms resulting from DIE involving the bowel. In the review by VERCELLINI and cols.²⁷, pharmacological treatment of patients with rectovaginal endometriosis achieved good pain relief, reduced lesions during therapy, improved health-related quality of life, and patient satisfaction. The analgesic effect of the medications evaluated (GnRH agonists, danazol, intrauterine contraceptive with progestin, oral progestin, and combined oral contraceptive) was significant for the entire treatment period (from 6 to 12 months), with 60% to 90% of

patients reporting substantial reduction or complete relief of pain symptoms.

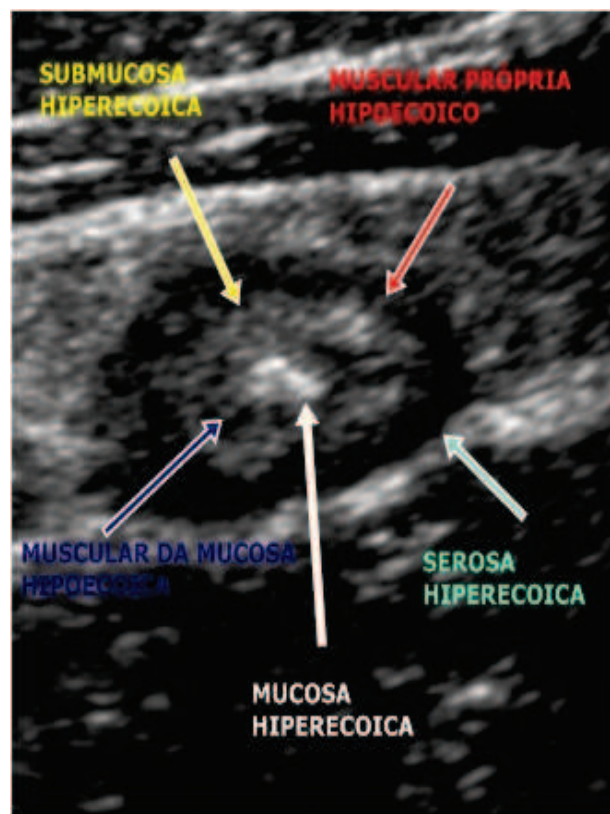


Figure 2 - Transvaginal pelvic ultrasound showing a cross section of the intestinal wall, with all its layers. From outside to inside: serosa, muscularis propria, submucosa, muscularis mucosa, and mucosa.

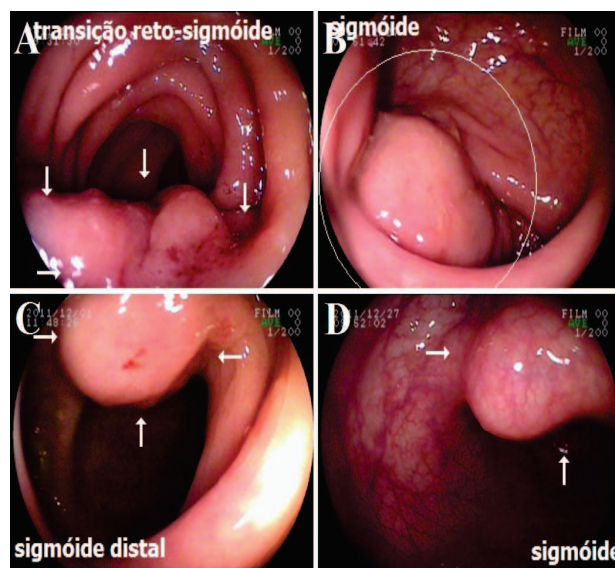


Figure 3 - Four DIE lesions causing extrinsic compression and infiltration of the intestinal wall.

FERRERO and cols.²⁸ evaluated six women with colorectal endometriosis infiltrating at least the muscular layer of the bowel, without stenosis exceeding 60% of the lumen, with painful symptoms and infections. They were treated with letrozole (2.5 mg/d) and norethisterone acetate (2.5 mg/d) continuously for six months and had improvement of pain symptoms, non-cyclic pelvic pain, deep dyspareunia, dyschezia, intestinal colic, abdominal distension, and the presence of mucus in the stool. Gastrointestinal symptoms improved in 67% of women.

Recently a prospective study²⁹ evaluated the efficacy of continuous use of low-dose oral contraceptive (15µg 60µg ethinyl estradiol and gestodene for 12 months) in the treatment of pain and other symptoms associated with colorectal endometriosis nodules. Twenty-six women of reproductive age with colorectal nodules infiltrating at least the intestinal muscularis propria and without intestinal stenosis exceeding 50% were evaluated. A significant improvement in the intensity of all symptoms (dysmenorrhea, non-menstrual pelvic pain, deep dyspareunia, and painful defecation) rated using a visual analog scale was observed. There was a reduction in diameter (mean reduction 26%) and volume (mean reduction of 62%) of the nodules after a period of 12 months of treatment.

Although the aforementioned studies show that medical management has an important role in controlling pain symptoms, it is important to understand that there may be progression of the lesion over the long term, even when patients' pain symptoms are controlled. When opting for medical management of endometriosis, monitoring with annual imaging studies should be performed, because the presence of obstruction of the urinary tract or gastrointestinal tract is an absolute indication for surgery. Furthermore, medical management has no benefit in the treatment of endometriosis-related infertility.

SURGICAL TREATMENT

Surgical treatment of deep infiltrating endometrial lesions of the intestinal is reserved for patients who have failed clinical treatment, have recurrent symptoms after stopping medical treatment, infertility related to endometriosis, obstruction of the urinary tract or gastrointestinal tract, or the presence of cyclic rectorrhagia.

We describe our surgical approach for DIE lesions located in the rectum and sigmoid colon, which represent more than 80% of DIE bowel lesions.⁴ For didactic purposes, we discuss the lesions affecting the rectum and rectosigmoid (up to 15cm from the anal margin) separately from those affecting the sigmoid.

Lesions of the rectum and rectosigmoid

Intestinal DIE involving the rectum and rectosigmoid can be treated in variety of ways.³⁰⁻³⁶ Surgical planning is performed in accordance with the preoperative diagnostic imaging findings as described above.^{10,18,19}

The techniques described in the literature to address these intestinal lesions of DIE include rectal shaving, rectal shaving with mucosal skinning, discoid resection and segmental resection. Each technique has its peculiarities in terms of surgical principles, risks of intraoperative and postoperative complications, recurrence rate, and postoperative fertility.

Rectal Shaving and mucosal skinning

Rectal shaving and mucosal skinning require finding – in the thickness of the muscular layer of the intestinal wall – a clean plane beyond which there are no more endometriosis lesions. This procedure is performed accepting a risk of opening the intestinal lumen. According to Donnez and cols.,³⁷ this resection should avoid as much as possible the risk of opening the intestinal lumen. For others, the resection should be complete (mucosal skinning = preservation only of the intact mucosal layer with manual suturing of the sectioned bowel wall), accepting the risk of an opening the lumen of the intestine in a certain number of patients,³⁸ at the expense of systematic attainment of a segmental resection of the intestine.^{39,40}

Two surgical tactics can be used:³⁵

- Traditional technique;
- Reverse technique.

Traditionally, gynecologists first separate the posterior surface of the nodule from the anterior wall of the rectum, and then perform the separation of the lesion from the posterior vaginal fornix and from the retrocervical region (Figure 4). It is important to remember that the lower the dissection, the more anterior the axis of scissors should be to avoid injuries to the rectum.

The retraction induced by the nodule causes the rectum to envelop the nodule; therefore the axis of the cut is not constant throughout the

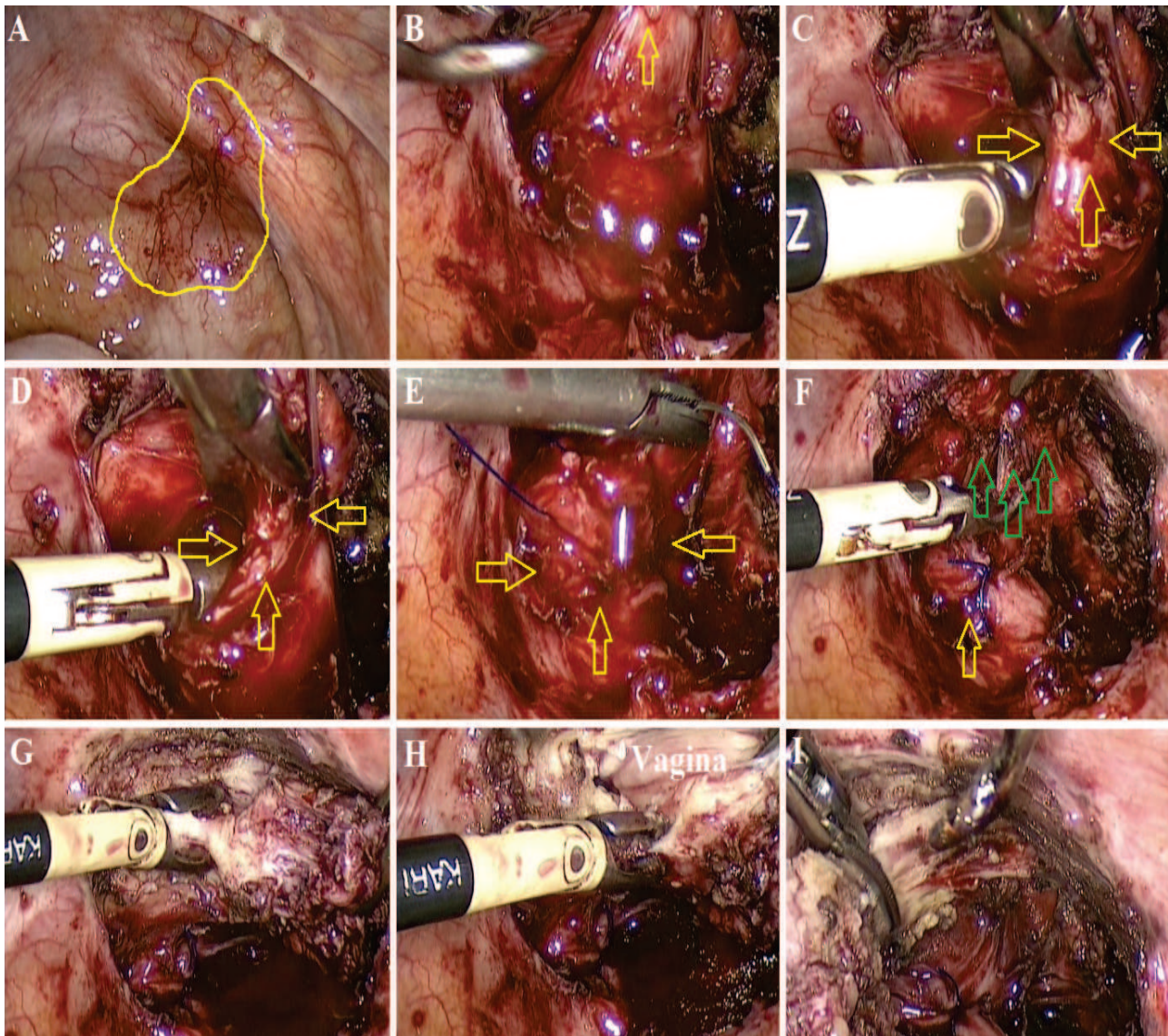


Figure 4 - (A) Deep endometriotic lesion involving the right uterosacral ligament, posterior vaginal fornix and the anterior wall of the rectum (to the muscle layer). (B) The arrow identifies the superior retraction of the rectum caused by the endometriosis lesion. (C and D) Opening of the fibers of the muscle layer of the rectum (arrows) for the removal of the endometriosis lesion. (E) Suturing with 3-0 polypropylene of the area of the defect in the muscle layer of the rectum (arrows). (F) Rectal suture (yellow arrow) and the area to be dissected in the rectovaginal septum (green arrows). (G to I) Separation of the endometriosis lesion from the retrocervical region and from the rectovaginal septum, and resection of the posterior vaginal fornix.

dissection. The surgeon should follow the contour of the rectum around the endometriotic nodule. The goal is to free the nodule completely from the bowel wall to identify the healthy vagina distal to the nodule. This dissection can be aided by a digital rectal and vaginal examination, by positioning a gauze compress or a malleable valve in the posterior or vaginal fornix or by the insertion of a rectal probe. After freeing the posterior face of the

nodule, it should be freed from the posterior aspect of the uterus, from the base of the broad ligament, and from the vagina.

When the case requires resection of the vagina, cold scissors or fine (1 mm diameter) monopolar tip with pure cutting current is used. Whenever opening a cyst containing chocolate-colored contents or if you see the appearance of small blackened points, resection is not sufficient, and the excision should be

expanded. Avoid the loss of CO₂ during this surgical time by placing a surgical glove containing two or three gauzes into the vagina.

Alternatively, one may use a surgical approach called a “reverse” (Figure 5). In this technique, first the anterior surface of the nodule is freed from the posterior surface of the uterus and vagina. The mobility obtained after freeing the anterior face of the nodule allows better exposure of the nodule during the dissection of the most difficult area to be treated,

which is in contact with the rectum. When the nodule infiltrates the vagina, the vagina is opened at its superior segment, near the cervix, and then laterally to disease-free zones. The distal limit of vaginal sectioning is identified through the vagina, distal to the nodule. After sectioning the distal limit of the lesion, one identifies a healthy rectovaginal plane. In this way the nodule can easily be pulled with a grasping forceps to expose its posterior surface adhered to the anterior wall of the rectum, followed by the progressive

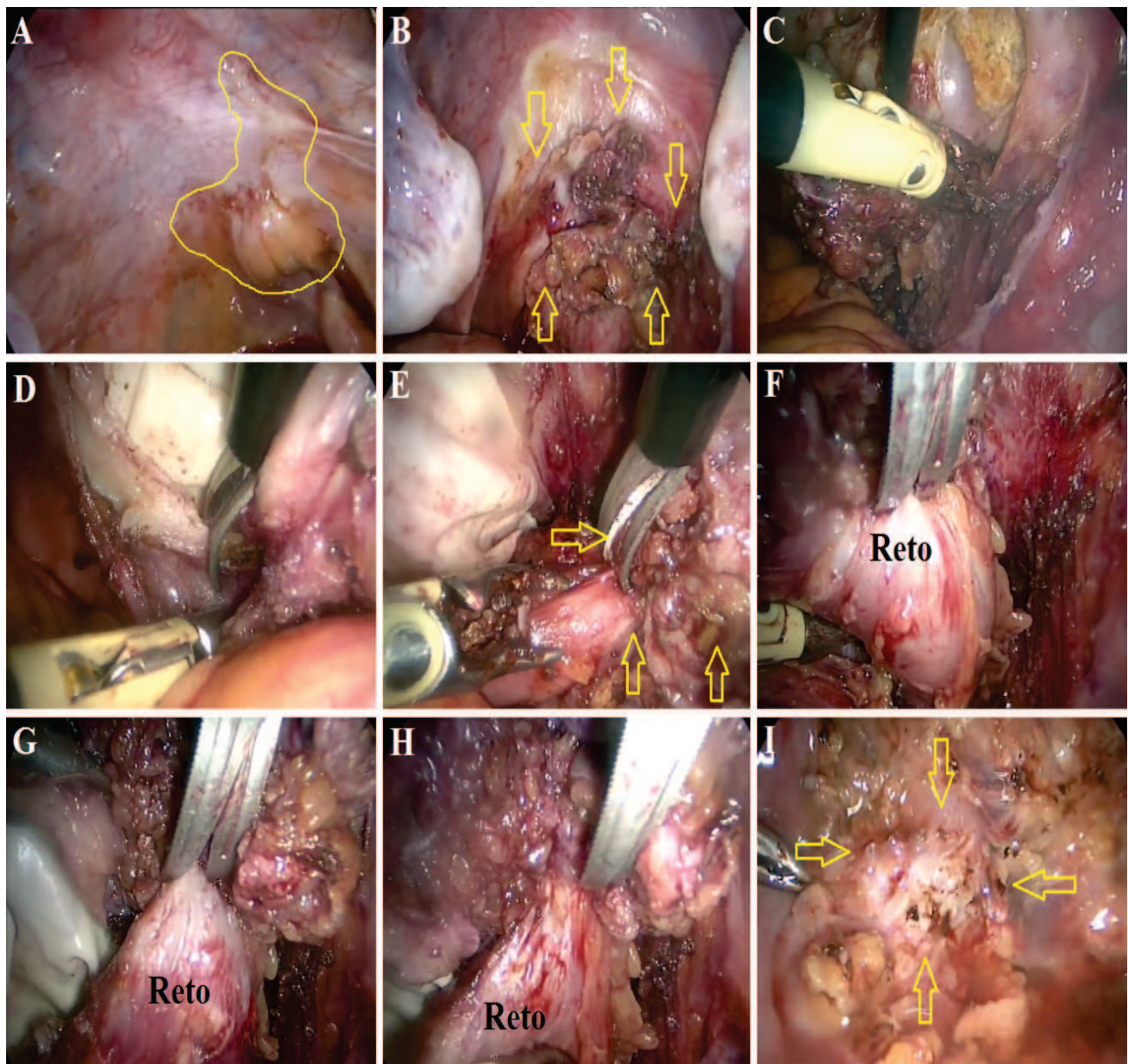


Figure 5 – (A) DIE lesion involving the intestine (in yellow). (B) Resection of the right uterosacral ligament and separation of lesion from the retrocervical region (arrows). (C and D) Resection of the posterior vaginal fornix with identification of the healthy area in rectovaginal septum. (E to H) Separation of DIE lesion (arrows) from the rectal wall progressively sectioning the muscle layer from the intestinal wall. (I) Thin appearance of the rectum (arrows).

separation of the lesion from the anterior wall of the rectum.

At the end of the procedure, if the shaving was deeper, with opening of the muscular layer or below, suturing is done with 3-0 or 4-0 monofilament (polypropylene) suture in a single plane with continuous or separated stitches.

Discoid Resection

Discoid Resection entails wedge resection of the anterior wall of the rectum, in total thickness. Here we describe two techniques that can be used:^{32,41}

- Resection of the endometrial nodule with the cold scissors, followed by rectal repair by manual suturing;

- Resection of the endometrial nodule using a circular stapler inserted transanally.

Most authors who use this technique reserve it for single lesions of DIE located on the anterior wall of the rectosigmoid colon, with deep infiltration beyond the muscle layer, that are smaller than 30mm in diameter and occupying less than one-third of the intestinal circumference.⁴¹ Some authors, however, have described an alternative technique of double stapling for resection of bulkier lesions, with promising results.⁴²

In the technique with manual suturing, two repair sutures are placed adjacent to the lesion, in healthy intestinal wall, and the anterior intestinal wall is resected in a wedge with a transverse incision into the intestinal lumen using cold scissors or ultrasonic energy. The defect area in the anterior intestinal wall is then repaired in two planes : one, the total plane, encompasses the full wall thickness with continuous sutures ; and the other, the sero-muscular plane, uses continuous or separated 3-0 or 4-0 monofilament (polypropylene) sutures.⁴²

We prefer to perform the discoid resection using the 29 or 33 mm circular intraluminal stapler (Ethicon Endosurgery Inc., Cincinnati, OH, USA) introduced transanally because the technique is quicker and there is no contact between the intestinal lumen and the abdominal-pelvic cavity during the procedure (Figure 6). After freeing the intestinal lesion from the retrocervical region, from the posterior vaginal fornix, and from the rectovaginal septum, as described above for the reverse technique, the endometriotic lesion remain attached only to the anterior wall of the rectum. A superficial shaving is performed to separate the posterior wall of the lesion

from the anterior wall of the rectum, leaving only the fibrotic area of deep infiltration by the endometriosis in the intestinal wall.

A monofilament (2-0 mononylon) suture is passed into the lesion laparoscopically and left free in the cavity with the long ends. Guided laparoscopically, the circular stapler is inserted transanally, until it is beyond the lesion. It is gently opened, observing the formation of a groove between the anvil and the stapler. The two ends of the suture are grasped with a needle holder and pulled vertically downward in order to introduce the fibrotic area of the anterior wall of the rectum into the groove of the circular stapler.

When the lesion is ideally positioned, the circular stapler is closed with the anterior wall of the rectum inside. During this closure, the stapler should be lowered so that its end is anteriorized, thereby avoiding the stapling of the posterior intestinal wall. The stapler is fired, and the anterior wall of the rectum is stapled and cut. After careful removal of the stapler, one can view the discoid of anterior rectal wall inside the circular stapler.

In attempting to expand the use of discoid resection several authors⁴² have developed the same technique with double stapling (Figure 7). In this way single lesions with lengths of up to 60mm and involving up to 40% the intestinal circumference can be removed. In this technique, the first suture is passed from the proximal free edge to the middle of the lesion. The first firing of the circular stapler removes part of the intestinal lesion. Another suture is passed including the staple line of the intestine and distal free edge of the lesion. The second firing of the circular stapler results in the removal of the rest of the intestinal DIE lesion.

We can call the three above-mentioned surgical techniques (rectal shaving, mucosal skinning, and discoid resection) “nodulectomies,” since all have the goal of removing only the intestinal DIE nodule from the intestinal wall.

Segmental resection of the intestine

Segmental resection of the bowel entails resecting the segment of the bowel affected by DIE. In theory, this technique offers “certainty” – once the margins of the resection are free of disease – that the lesion has been completely resected,^{39,40} but it has an immediate operative morbidity, and a more significant long-term morbidity.^{30,34,43,44} For some authors, this action should be systematic whenever the DIE infiltrates the muscle.^{39,45}

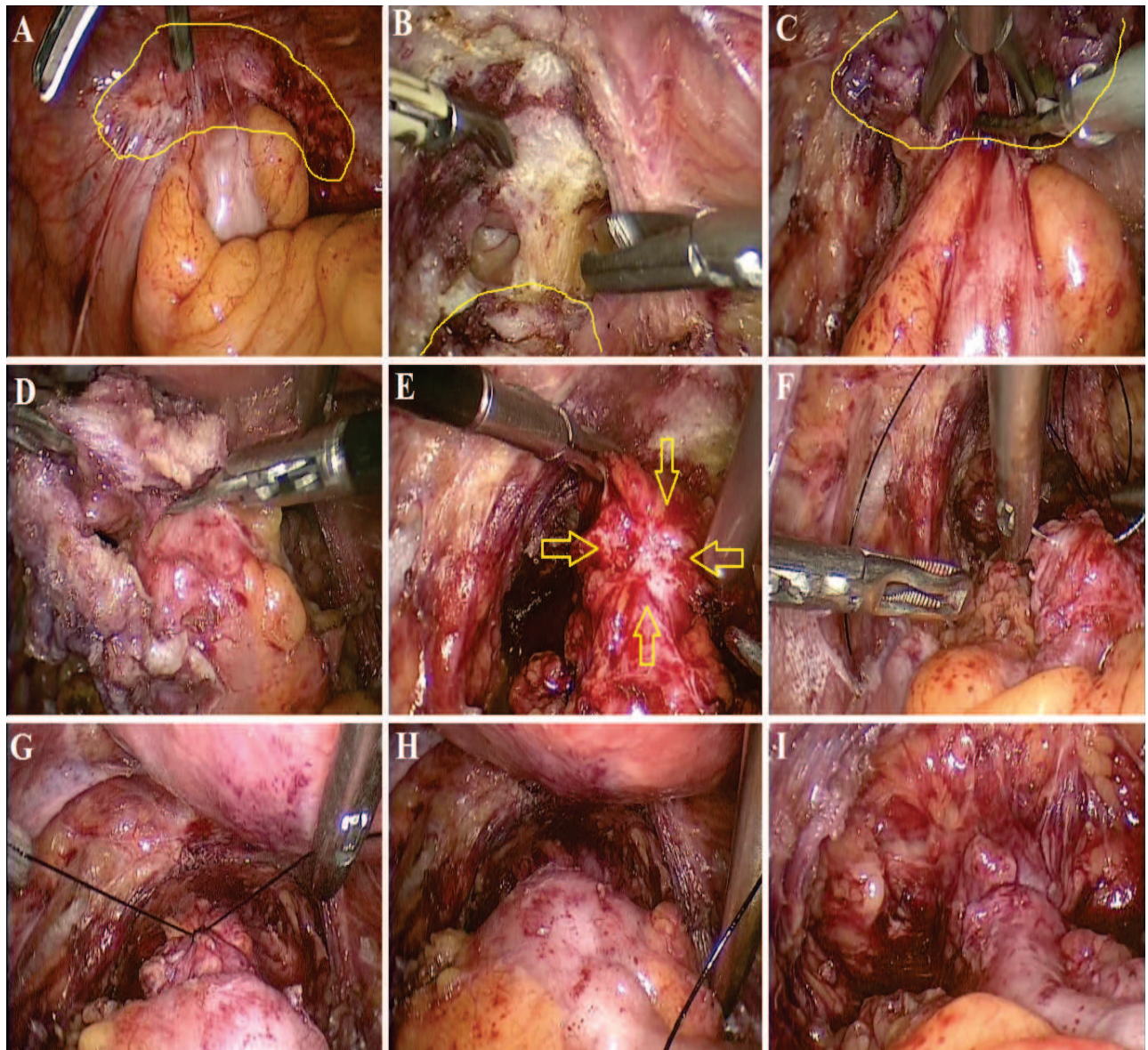


Figure 6 - (A and B) Separation of the lesion (in yellow) from the retrocervical region, leaving it attached to the anterior wall of the rectum. (C and D) Separation of the DIE lesion from the anterior wall of the rectum. (E) Residual area of infiltration of DIE in the intestinal wall (yellow arrows). (F) Passing the suture through healthy edges of the lesion. (G to I) Adjustment of the lesion within the circular stapler introduced transanally, finalizing the discoid resection.

One of the important arguments in favor of this more aggressive “attitude” would be the certainty of complete treatment of the disease, as REMORGIDA and cols.⁴⁶ showed that the histological examination of the surgical specimen of the intestine resected after a “nodulectomy” was performed found residual lesions of endometriosis involving the muscle layer of the intestine in 43.8% of cases. This is a strong argument in favor of intestinal segmental resection, about which we can also offer some counter-arguments:

- The “nodulectomy” performed in cases where one knows that the segmental resection of the intestine will be performed during the same surgical procedure is probably not the same “nodulectomy” that gets performed under other circumstances;

- The segmental resection is not always a guarantee of disease-free margins. There is histological evidence of positive margins after segmental resection for treatment of intestinal DIE in up to 22% of cases;^{47,48}

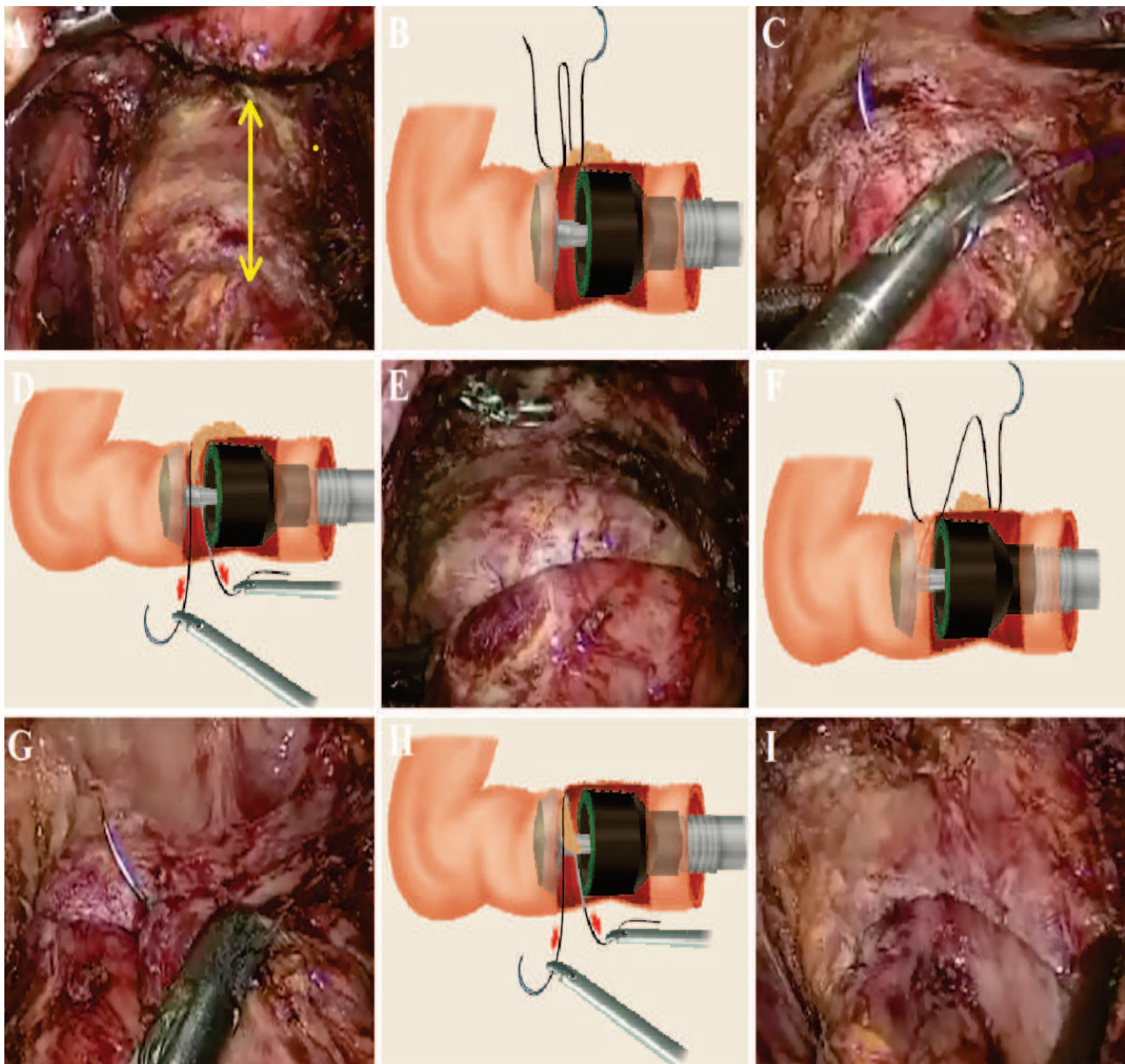


Figure 7 - Length of the DIE implant in the rectum. (B and C) Passing the first suture through the proximal end of the lesion. (D and E) Stapling of the proximal end of the lesion. (F and G) Passing the second suture encompassing the previous stapling area and the distal end of the lesion. (H and I) Second stapling, finalizing the double discoid resection.

- There is not always evidence of intestinal DIE (involvement beyond the muscle layer) in surgical specimens of segmental resections; 0.8% of the time the intestinal segment may not have histological evidence of transmural invasion by the disease;⁴⁷

- It is not clear that the radicality of resecting the full thickness of the rectal muscle confers a real clinical benefit to patients. Recently, MABROUK and cols.⁴⁹ demonstrated that there is no statistical difference in terms of recurrence, pain symptoms, or improvement in quality of life in patients with and

without positive margins after segmental resection of the bowel.

We reserve the segmental resection of the intestine for cases of bulky lesions of the rectosigmoid exceeding 30mm, stenotic lesions (that block advancing the circular stapler into position), lesions in the sigmoid colon (which are beyond the reach of the circular stapler), and multifocal lesions.

The opening of the left parietocolic gutter in Toldt's fascia allows mobilization of the descending colon (Figure 8). Rarely, it is necessary to completely

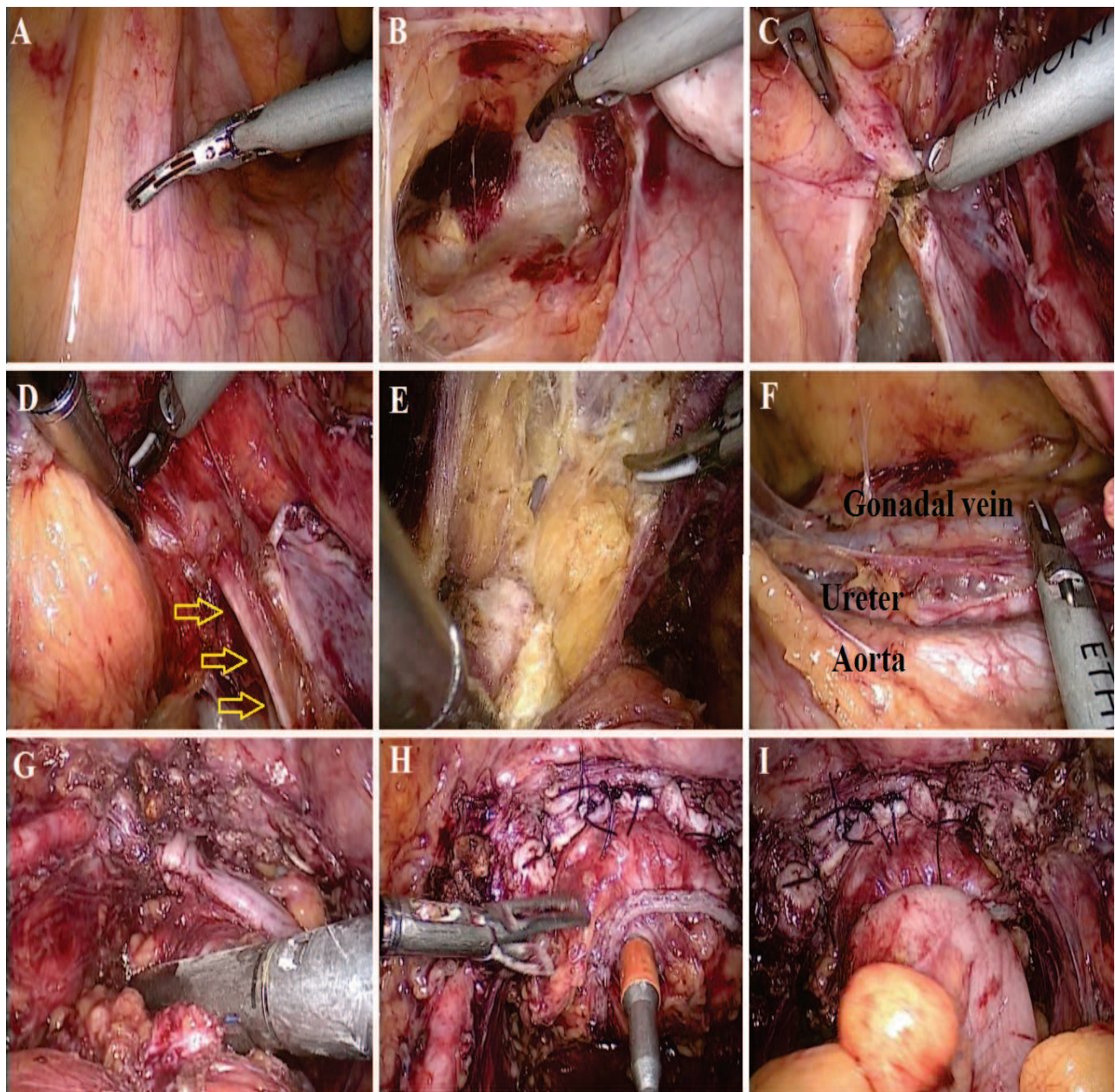


Figure 8 - (A and B) Opening of the mesorectum adjacent to the sacral promontory and dissection in a caudal direction. (C) Opening the peritoneal layer lateral to the rectum on the right side. (D) Nerve preservation is identified by yellow arrows. (E) Identification of the healthy area in the rectovaginal septum, distal to the intestinal DIE lesion. (F) Cranial dissection of mesorectum and mobilization of left parietocolic gutter. You can identify retroperitoneal structures: aorta, left ureter, and left gonadal vein. (G) Stapling distal to the intestinal DIE lesion. (H and I) End-to-end anastomosis using a circular stapler inserted transanally.

mobilize the left colon by the opening the gastrocolic ligament, entering the epiploic retrocavity, freeing of the splenic flexure of the colon, and separated the colon from the omentum.

The rectosigmoid is pulled vertically by the assistant, up and toward the left pelvic wall, exposing the mesorectum and the sacral promontory. The mesorectum is dissected over the sacral promontory,

first caudally to the level of the elevators and then cranially. The peritoneum layer lateral to the rectum is incised bilaterally and the peritoneal reflection of the posterior fornix is opened.

The dissection proceeds until a healthy area in rectovaginal septum is reached, which has been previously dissected using the reverse technique mentioned above. The rectum is mobilized at least 2

cm below the endometriosis nodule. The 45mm articulated linear cutting endostapler (Ethicon Endosurgery, Inc., Cincinnati, OH, USA) is introduced into the cavity through a 12mm trocar positioned in right iliac fossa and the rectum is cut distal to the lesion (Figure 8G). At this point, there are some options for resection of the rectum or the rectosigmoid:

- A transverse minilaparotomy is performed in suprapubic region (Pfannenstiel). After extraction of the intestine through the incision, the rectum or rectosigmoid (depending on the length of the lesion) proximal to the lesion is cut using a cold scalpel. A purse string suture is performed on the end of the sigmoid with 2-0 mononylon and the anvil of the 29 mm or 33 mm intraluminal circular stapler (Ethicon Endosurgery, Inc., Cincinnati, OH, USA) is positioned and secured with the previously placed suture. The

intestine is repositioned inside the abdominal cavity, the abdominal wall is sutured, the pneumoperitoneum is reestablished, and the transanal end-to-end colorectal anastomosis is performed guided laparoscopically;

- In cases where it was necessary to resect the posterior vaginal fornix or perform a hysterectomy, the rectosigmoid can be extracted transvaginally.⁵⁰ The resection of the rectum or rectosigmoid is performed, followed by purse-string suturing of the end of the sigmoid and positioning of the anvil of the intraluminal circular stapler. The sigmoid is reintroduced into the abdominal cavity, a glove containing air and gauzes is introduced into the vagina to prevent the leakage of CO₂, the pneumoperitoneum is reestablished, and the transanal end-to-end colorectal anastomosis is performed (Figure 9).

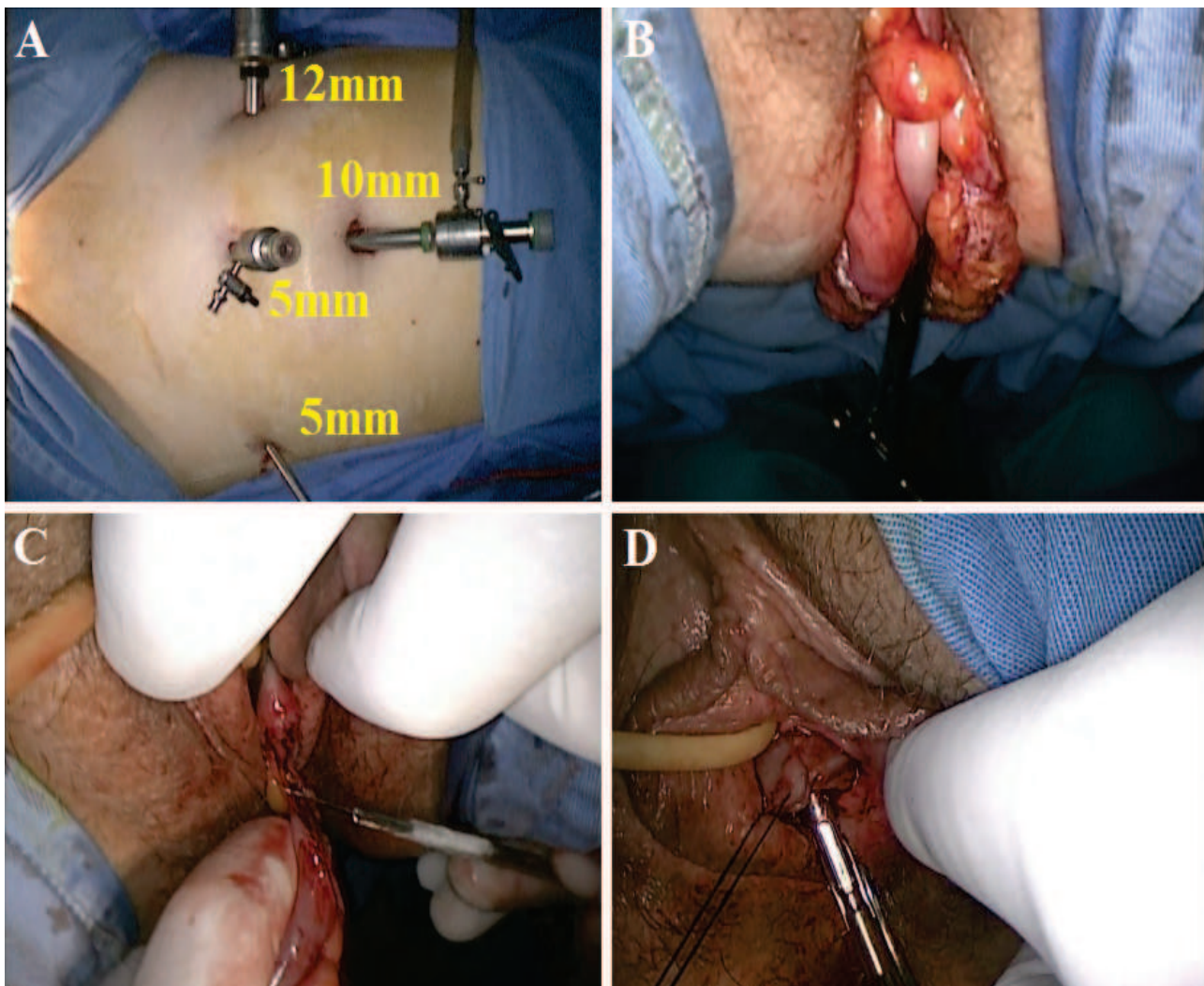


Figure 9 - (A) Positioning of trocars for segmental resection of the intestine with transvaginal extraction of the surgical specimen. (B) Transvaginal extraction of the rectosigmoid. (C) Sectioning of the sigmoid colon. (D) Purse string suturing and positioning the anvil inside the sigmoid colon.

SURGICAL TREATMENT OF ENDOMETRIOSIS LESIONS OF THE SIGMOID COLON

In cases of high lesions of the sigmoid colon (more than 15 cm from the anal margin), without evidence of multifocal lesions involving the rectum or rectosigmoid, one can opt for an isolated resection of intestinal DIE implant.

Because a circular stapler cannot be used to perform an anastomosis more than 15 cm from the anal margin, we avoid an extensive bowel resection performing the intestinal resection through a mini-Pfannenstiel incision (3 to 4 cm). In this way we can perform an economical bowel resection (remember we are dealing with a benign disease!) and preserve the rectum, which can reduce the chance of functional bowel changes postoperatively.

After treatment of the pelvic endometriosis lesions and complete mobilization of the sigmoid colon, a mini-Pfannenstiel incision of approximately 4 to 5 cm is made and the sigmoid colon is exteriorized through the incision. Two procedures can be performed:

Discoid resection

Discoid resection allows the maintenance of vascularization along the entire mesenteric margin of the intestinal wall (Figure 10). Two clamps are positioned on the loop of the sigmoid colon, one proximal and one distal to the lesion. The intestinal DIE lesion is resected with electrocautery (full thickness) giving rise to a defect in the anti-mesenteric margin of the sigmoid colon wall. The intestinal wall is sutured in two layers using continuous absorbable sutures of 3-0 polyglactin 910 (Vicryl®) or nonabsorbable 3-0 polypropylene (Prolene®).

Segmental resection of the intestine

Two intestinal clamps are positioned on the loop of the sigmoid colon, one proximal and one distal to the lesion. The vessels of the meso-sigmoid are ligated close to the intestinal wall with 3-0 cotton suture and the intestinal segment to be removed is cut with the cold scalpel. The end-to-end anastomosis is made in two planes: (1) through the total thickness of the bowel wall with a running suture using absorbable 3-0 polyglactin 910 (Vicryl®) or nonabsorbable 3-0 polypropylene (Prolene®), and (2) through the

seromuscular layers using running or separate sutures using the same suture material (Figure 11).

After the segmental resection of the intestine, the sigmoid colon is repositioned within the abdominal cavity. The incision in the aponeurosis is sutured with 0 or 1 polyglactin 910 (Vicryl®) and the pneumoperitoneum is restored. Hemostasis is verified, and the test of tubal permeability is performed using methylene blue, when indicated. Both in the setting of discoid resection and in the case of segmental resection, we usually do not test the integrity of the anastomosis with the "tire-fitter's" maneuver because the air injected transanally normally cannot reach the area of the anastomosis.

DISCUSSION

As previously mentioned, DIE involving the intestine can be treated using different surgical techniques. The choice of surgical technique depends on a number of factors including: the patient's symptoms, characteristics of the endometriosis lesions, the surgical team's experience with the different procedures, the patient's aspirations to have children, and the patient's consent after being informed of the risks of each procedure. All authors agree that an indication for surgery exists when the stenosis exceed 50% of the intestinal lumen, the urinary tract is obstructed, or in the presence of rectorrhagia.^{21,51,52}

With nodulectomy or the segmental resection of the intestine there is the possibility of complications. The postoperative results of the different surgical techniques have been compared for various services and there seems to be a tendency to choose less aggressive techniques when possible. In a prospective analysis of 500 cases of DIE nodules treated by rectal shaving,³¹ major complications included 7 cases (1.4%) of rectal perforation, 4 cases (0.8%) of ureteral injury, one case (0.2%) where bleeding exceeded 300 ml, and urinary retention in 4 patients (0.8%). Of the 388 women who wanted to get pregnant, 221 (57%), conceived naturally, and 107 (28%) through *in vitro* fertilization. The recurrence rate was 8% and was significantly lower ($p < 0.05$) in women who became pregnant (3.6%) than in women who did not become pregnant (15%).

In the experience of MOHR and cols.³⁰ encompassing 187 women treated laparoscopically for intestinal endometriosis, there was a significantly higher rate of complete pain relief in the immediate

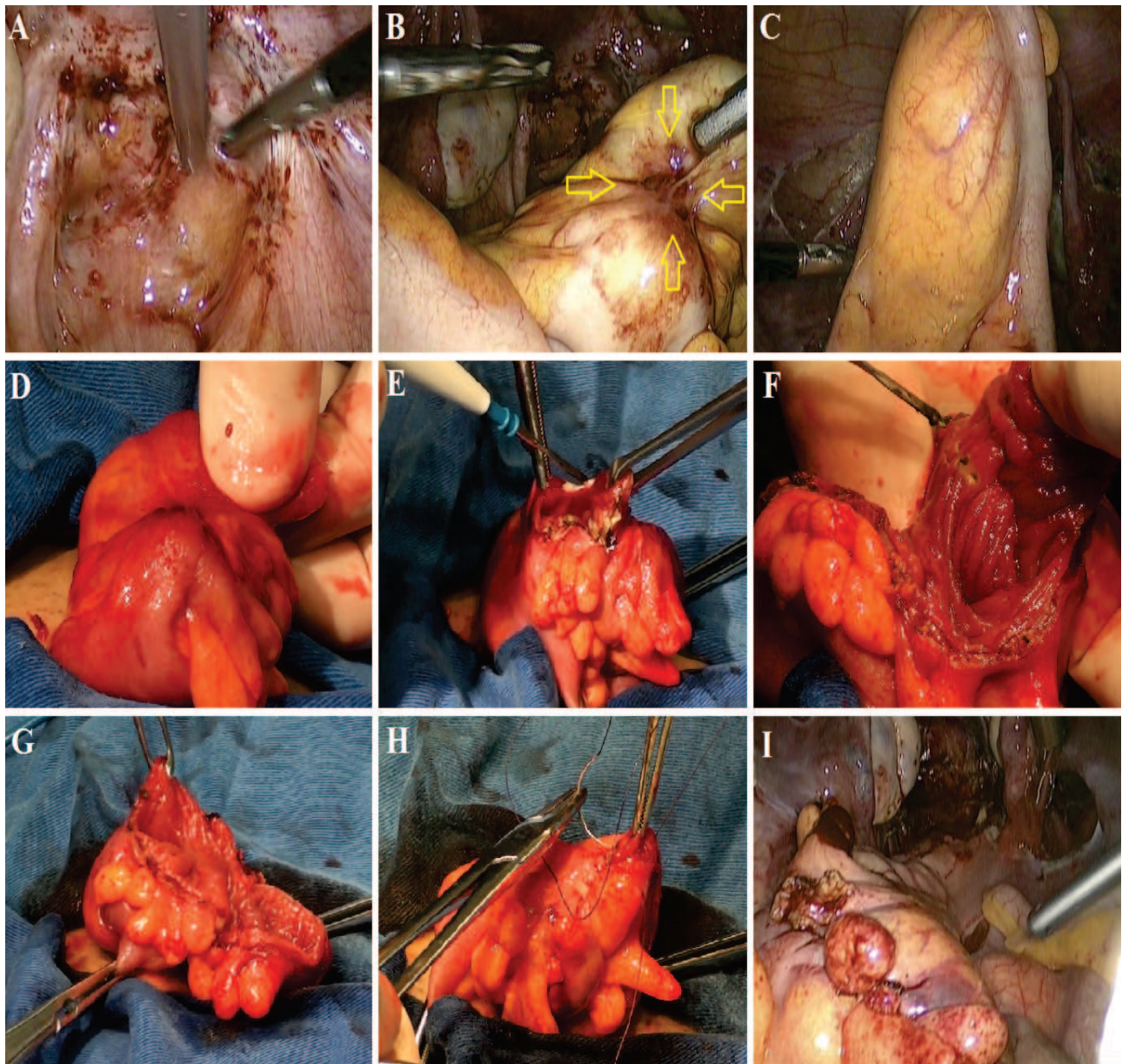


Figure 10 - (A) Presence of several endometriosis implants in the posterior fornix and uterosacral ligaments. (B) Intestinal DIE lesion involving the sigmoid colon. (C) Mobility test of the sigmoid to evaluate the possibility extraction through Pfannenstiel incision. (D) Transperitoneal extraction of sigmoid colon. (E and F) Resection of the lesion from the anterior and lateral walls of the sigmoid colon. (G) Appearance of the sigmoid wall defect created after resection of an intestinal DIE implant. (H) Suture of the sigmoid colon in the transverse direction. (I) Appearance after returning the sigmoid colon inside the abdominal cavity.

postoperative period with segmental resection of the intestine than with isolated shaving (92% vs. 80%, respectively; $p < 0.04$). Shaving, however, was associated with a lower complication rate: 6% compared to 23% for discoid resection ($p < 0.007$), and 38% with intestinal resection ($p < 0.001$), and a higher pregnancy rate. These findings were confirmed by the study published by the Clermont-Ferrand group³⁴ which demonstrated a postoperative

complication rate of 6.7% in women who underwent rectal shaving and a 24% rate in those who underwent segmental resection of the intestine.

In a case-control study by the experienced Negrar group³² comparing discoid resection and segmental resection of the intestine, this was associated with increased operative time, and higher rates of temporary ileostomy, postoperative fever, and long-term bladder dysfunction. The rate of early

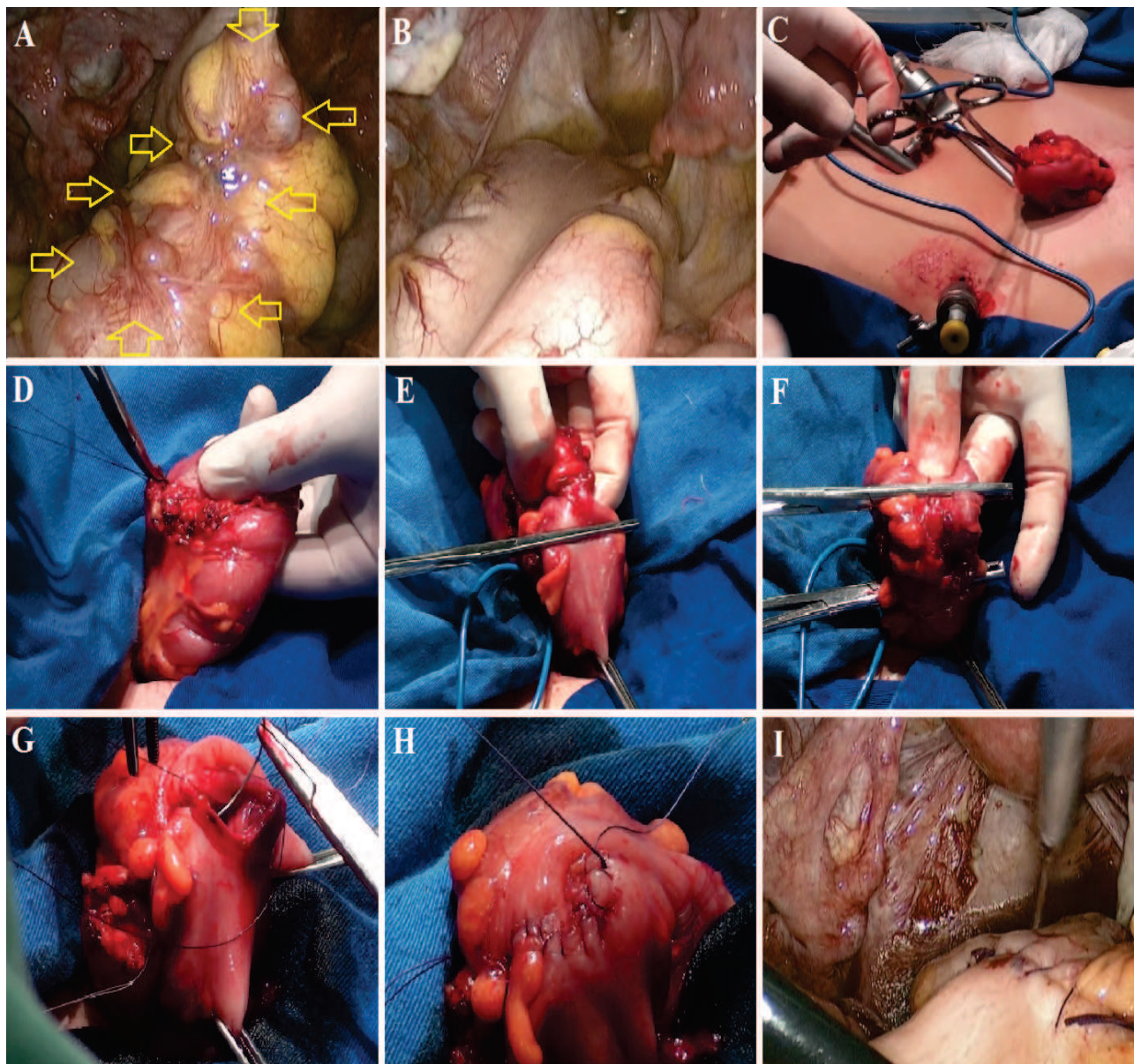


Figure 11 - (A) Large intestinal DIE lesion involving the sigmoid colon. (B) The rectum and the rectosigmoid transition do not have other DIE lesions. (C) Extraction of the sigmoid colon through Pfannenstiel incision. (D) Ligation of the vessels of the meso-sigmoid. (E and F) Clamping proximal and distal to the sigmoid colon in preparation for the resection of the area affected by intestinal DIE. (G and H) End-to-end anastomosis in two planes. (I) Laparoscopic appearance of the suturing after the repositioning of the sigmoid colon inside the abdominal cavity.

postoperative complications requiring surgical intervention in the discoid resection group was 4.16% and the recurrence rate at 33 months of median follow-up was 10.4%.

Recently, two other studies^{44,53} compared intra- and post-operative nodulectomy outcomes and results of segmental resection for the treatment of intestinal DIE. In the first study,⁵³ “nodulectomy” was performed by discoid resection using a circular stapler. The mean operative time was shorter, blood loss was

less, hospital stays shorter, and the anastomosis stenosis rate was lower. In the second study,⁴⁴ the “nodulectomy” was performed with an Ultracision harmonic scalpel (Ethicon Endosurgery, Cincinnati, OH, USA). Resulting partial or full thickness defects in the rectal wall were sutured laparoscopically. In the group that underwent segmental resection 18% had bladder atony, 24% experienced chronic constipation, 6% developed an anastomotic fistula, and 13% had acute compartment syndrome with a

disturbance of peripheral nerve sensation. In the group that underwent excision of the nodule, 4% experienced transient motor paralysis of the right obturator nerve. The improvement of pain symptoms appeared to be equivalent in the two groups.⁵⁴

These complication rates notwithstanding, at centers with extensive experience in segmental resection for the treatment of intestinal DIE, complication rates tend to decrease. RUFFO and cols.,³⁶ report a case series of 750 women underwent laparoscopic resection of the mid or lower rectum for DIE. The median operative time was 255 minutes, with intraoperative blood loss of 150 ml. A blood transfusion was required in 7% of cases; conversion to laparotomy occurred in 1.6% of cases. The rate of temporary ileostomy was 14.5%. The rate of

anastomotic fistula, rectovaginal fistula and intra-abdominal bleeding was 3%, 2% and 1.2%, respectively. Re-operation was required in 5.5% of patients.

FINAL CONSIDERATIONS

With improvements in imaging techniques, deep infiltrating endometriosis with involving the intestine has been increasingly diagnosed worldwide. There is a global trend to approach this disease as conservatively as possible, because it is a benign disease. Regardless of the technique used, the ultimate goal of treatment is to improve the quality of life of patients. Prospective randomized studies are still needed to define the ideal surgical technique to address DIE of the intestine.

RESUMO

A cirurgia permanece o melhor tratamento a longo prazo para a endometriose profunda infiltrativa com comprometimento intestinal. Várias técnicas cirúrgicas têm sido aplicadas (*shaving* retal, *mucosal skinning*, ressecção em disco e ressecção segmentar) com resultados variados. Neste artigo abordamos as indicações de cada procedimento bem como os detalhes técnicos das mesmas.

Palavras chave: Endometriose profunda infiltrativa. Laparoscopia. Cirurgia. Colo-retal. Intestino.

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