Volume 62, Number 7
OBSTETRICAL AND GYNECOLOGICAL SURVEY

CME REVIEW ARTICLE 19

CHIEF EDITOR'S NOTE: This article is part of a series of continuing education activities in this Journal through which a total of 36 *AMA/PRA Category 1 Credits™* can be earned in 2007. Instructions for how CME credits can be earned appear on the last page of the Table of Contents.

Bowel Endometriosis: Presentation, Diagnosis, and Treatment

Valentino Remorgida, MD,* Simone Ferrero, MD,* Ezio Fulcheri, MD,† Nicola Ragni, MD,‡ and Dan C. Martin, MD§

*Consultant and ‡Professor, Department of Obstetrics and Gynaecology, San Martino Hospital and University of Genoa, Genoa, Italy; †Professor, Di.C.M.I., Unit of Anatomy and Histopathology, San Martino Hospital and University of Genoa, Genoa, Italy; and §Professor, Health Sciences Center, University of Tennessee, Memphis, Tennessee

Bowel endometriosis opens a new frontier for the gynecologist, as it forces the understanding of a new anatomy, a new physiology, and a new pathology. Although some women with bowel endometriosis may be asymptomatic, the majority of them develop a variety of gastrointestinal complains. No clear guideline exists for the evaluation of patients with suspected bowel endometriosis. Given the fact that, besides rectal nodules, bowel endometriosis can not be diagnosed by physical examination, imaging techniques should be used. Several techniques have been proposed for the diagnosis of bowel endometriosis including double-contrast barium enema, transvaginal ultrasonography, rectal endoscopic ultrasonography, magnetic resonance imaging, and multislice computed tomography enteroclysis. Medical management of bowel endometriosis is currently speculative; expectant management should be carefully balanced with the severity of symptoms and the feasibility of prolonged follow-up. Several studies demonstrated an improvement in quality of life after extensive surgical excision of the disease. Bowel endometriotic nodules can be removed by various techniques: mucosal skinning, nodulectomy, full thickness disc resection, and segmental resection. Although the indications for colorectal resection are controversial, recent data suggest that aggressive surgery improves symptoms and quality of life.

Target Audience: Obstetricians & Gynecologists, Family Physicians

Learning Objectives: After completion of this article, the reader should be able to describe the varied appearance of bowel endometriosis, recall that it is difficult to diagnose preoperatively, and explain that surgical treatment offers the best treatment in symptomatic patients through a variety of surgical techniques which is best accomplished with a team approach.

Since the original report by Sampson (1) in 1922, our understanding of bowel endometriosis has remained largely unchanged. In the last decade, an increasing number of publications have provided new insights in the understanding of this disease. Bowel endometriosis is typically associated with genital endometriosis, and, therefore, the physician handling this condition is usually a gynecologist, who often does not have expertise in the management of bowel disease. Although bowel endometriosis may cause severe gastrointestinal symptoms and pain, frequently these disturbances are not adequately investigated at the time of gynecologic evaluation. Therefore, bowel endometriosis may be an unexpected finding at surgery, with the result that these lesions may be either neglected or not treated due to a lack of preoperative

The authors have disclosed that they have no financial relationships with or interests in any commercial companies pertaining to this educational activity.

Lippincott Continuing Medical Education Institute, Inc. has identified and resolved all faculty conflicts of interest regarding this educational activity.

Reprint requests to: Simone Ferrero, MD, Department of Obstetrics and Gynecology, San Martino Hospital and University of Genoa, Largo R. Benzi 1, 16132 Genoa, Italy. E-mail: dr@simoneferrero.com.

informed consent or surgical expertise of the gynecologist. Furthermore, intraoperative consultation with a general surgeon might be frustrating due to the lack of experience of general surgeons with the management of colorectal endometriosis. Finally, in the rare case of a patient with bowel endometriosis narrowing the intestinal lumen and causing obstructive symptoms in absence of evident gynecologic disease, an emergent laparotomy with extensive radical surgery may be performed because endometriosis is mistaken for cancer.

The current article aims to review the available data on presentation, diagnosis, and treatment of bowel endometriosis.

WHAT IS BOWEL ENDOMETRIOSIS?

The term "bowel endometriosis" should be used when endometrial-like glands and stroma infiltrate the bowel wall reaching at least the subserous fat tissue or adjacent to the neurovascular branches (subserous plexus). As initially suggested by Chapron et al (2), endometriotic foci located on the bowel serosa should be considered peritoneal and not bowel endometriosis.

PREVALENCE OF BOWEL ENDOMETRIOSIS

The exact prevalence of bowel endometriosis is unknown, but in a retrospective review of 3037 laparotomies for endometriosis, Weed and Ray (3) found that histologically confirmed bowel lesions were removed in 163 cases (5.4%). Unfortunately, a precise description of depth of infiltration of endometriosis in the bowel wall was not provided. Redwine (4) reported a much higher 25.4% incidence of histologically proven bowel endometriosis among 1785 women operated in a tertiary referral center for the surgical treatment of endometriosis. In general, it can be estimated that bowel endometriosis affects between 3.8% and 37% of the patients with a diagnosis of endometriosis. The most frequent location of bowel involvement with endometriosis is the sigmoid colon (over 65% of the cases), followed by the rectum, the ileum, the appendix, and the cecum (5,6). Case reports of gastric endometriosis (7) and transverse colonic disease (3,8,9) attest the possibility of gut involvement within the upper abdomen. Bowel endometriosis is typically associated with other pelvic disease. Among 453 women with histologically proven bowel endometriosis, Redwine (4) found only 4 cases with intestinal endometriosis without any other pelvic involvement.

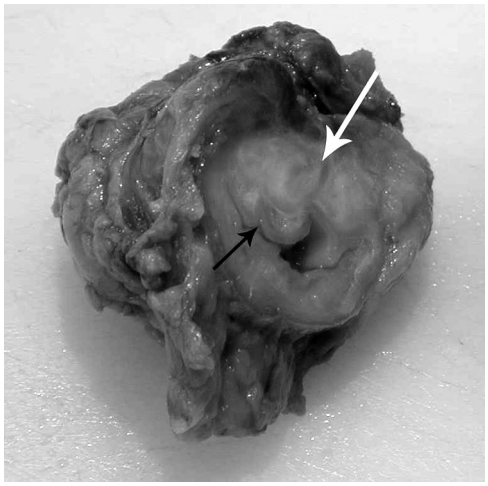

Fig. 1. Typical endometriotic bowel nodule located on the antimesenteric edge of the bowel (white arrow), fibrosis results in mural thickening and associated luminal stenosis. The bowel mucosa (black arrow) is not infiltrated.

HISTOPATHOLOGY OF BOWEL ENDOMETRIOSIS

Endometrial implants are typically located in the antimesenteric edge of the bowel. Macroscopically, they appear as small pigmented nodules on the peritoneum or as larger lesions which infiltrate the muscular layer and narrow the bowel lumen. On microscopic sections, endometrial gland and stroma are seen to invade the bowel wall from the serosa inward. In the muscularis, endometriotic nodules may be surrounded by smooth muscle hyperplasia and fibrosis, which may produce mural thickening and associated luminal stenosis (10,11) (Fig. 1). However, not all deep endometriotic bowel nodules are surrounded by extensive fibrosis (11) (Fig. 2). Auerbach's plexus and the submucosal Meissner plexus may be disrupted by endometriotic glands (12). Not only the enteric nervous system but also the interstitial cells of Cajal are functionally damaged around bowel endometriotic nodules (12). The submucosa may be involved by endometriosis, but the infiltration of the lesion into the mucosa is quite rare.

Multiple endometriotic lesions of the bowel can be divided into 2 different categories: small satellite lesions located around the main one and isolated nodules located at some distance from each other (i.e., the sigmoid and cecum). Although the former pattern is very common (13), true "multiple" loca-

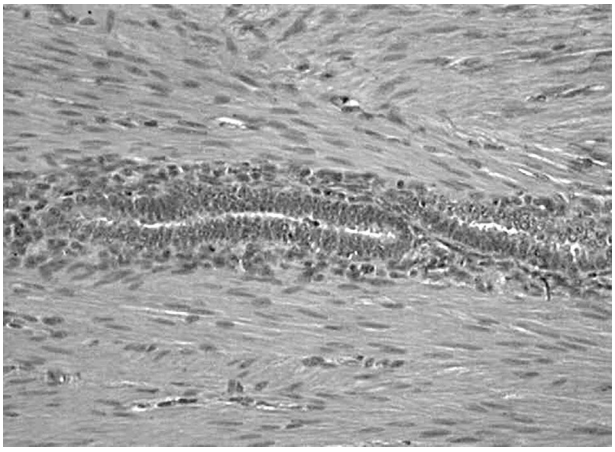

Fig. 2. Endometriotic lesions of the bowel completely surrounded by smooth muscle cells, no fibrosis can be observed in the muscular layer.

tions have been observed in 15%–35% of cases. Redwine (4) observed more than 1 intestinal area of endometriosis in 154 (34%) out of 453 women with histologically proven bowel endometriosis. In a series of more than 200 patients, Keckstein and Wiesinger (6) observed multifocal involvement of the bowel wall in 25% of the cases.

SYMPTOMS

The extent of bowel endometriosis is variable; consequently, there is a wide range of symptoms. Small endometriotic nodules on the serosal surface rarely cause symptoms (12). Larger nodules may cause pain and a wide range of gastrointestinal symptoms (including diarrhea, constipation, abdominal bloating, and pain) which mimic irritable bowel syndrome (12,14,15). Defecation typically relieves the symptoms of patients with irritable bowel syndrome (16) but not those of women with endometriosis (17). Cyclical rectal bleeding is rarely observed because the mucosa is infrequently infiltrated by endometriosis. The differential diagnosis of bowel endometriosis includes irritable bowel syndrome, inflammatory bowel disease, diverticulitis, and bowel carcinoma.

DIAGNOSIS

The diagnosis is particularly difficult, as patients with intestinal endometriosis often have lesions in multiple pelvic locations and it is not easy to locate the precise source of complains; therefore, imaging techniques are mandatory. A diagnosis in the preoperative workup gives the opportunity to plan the surgical strategy with the colorectal surgeon, if necessary, and discuss the possible complications with the patient. Although several radiologic techniques have been proposed for the diagnosis of bowel endometriosis, no gold standard is currently available.

Transvaginal Ultrasonography

With transvaginal ultrasonography, bowel endometriosis appears as an irregular hypoechoic mass, with or without hypoechoic or hyperechoic foci, penetrating into the intestinal wall (18). By using transvaginal ultrasonography, Bazot et al (19) reported a sensitivity of 95%, a specificity of 100%, and accuracy of 97% in diagnosing colorectal involvement. Relevant limitations of transvaginal ultrasonography include the impossibility of determining the exact distance of rectal lesions from the anal margin and of evaluating precisely the depth of rectal wall involvement. In addition, locations above the rectosigmoid junction are beyond the field of view of a transvaginal approach.

Rectal Endoscopic Ultrasonography

Using rectal endoscopic ultrasonography (REU), the involvement of the muscularis propria of the bowel (Fig. 3), the largest diameter of the lesions,

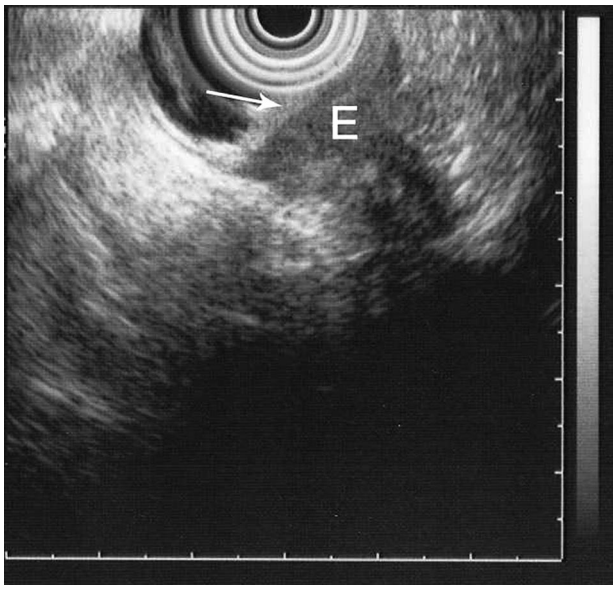

Fig. 3. Rectal endoscopic ultrasonography demonstrating a rectal endometriotic nodule (E) which infiltrates the muscularis propria of the bowel. The submucosa (white arrow) is preserved.

their distance from the anus, and infiltration of adjacent pelvic organs can be determined (18). The usefulness of REU for the evaluation of the infiltration of the intestinal wall by endometriosis has been proved by several studies (19–23). The main limitation of REU is that it does not provide information on the upper part of the colon. If large nodules are present, it may be difficult to fully visualize the depth of colorectal infiltration by endometriosis (24). Furthermore, the quality of the examination may be variable depending on the experience of the sonographer. A final disadvantage of REU is that anesthesia has been required in several studies (21).

Double-Contrast Barium Enema

Since the 1980s, double-contrast barium enema (DCBE) has been used for the diagnosis of bowel endometriosis (25). Colonic nodules may appear as extrinsic mass impressions associated with fine mucosal crenulation (25,26). In a retrospective study, Landi et al (26) reported that DCBE detects colonic endometriosis requiring surgery with 99% accuracy and 100% negative predictive value. However, this degree of accuracy has not been confirmed by other authors; Squifflet et al (27) observed a mass effect in only 54% of cases of bowel endometriosis. There are several other limitations to the use of DCBE. It has low specificity and it is difficult to distinguish bowel endometriosis from other pathologies (i.e., diverticulitis, pelvic abscess, benign and malign colonic neoplasms) (25). DCBE does not investigate the full thickness of the bowel wall and it is not possible to estimate the depth of infiltration of the lesion in the bowel wall.

Colonoscopy

Bowel endometriosis can occasionally be diagnosed by colonoscopy, and the diagnosis may be confirmed by biopsies. However, in general, colonoscopy offers little assistance in the diagnosis of bowel endometriotic nodules because these lesions are typically submucosal and usually are not visible during this examination (28,29).

Magnetic Resonance Imaging

The use of magnetic resonance imaging (MRI) in the diagnosis of endometriosis is based on the presence of hemorrhagic content within the lesion. The presence of methemoglobin markedly shortens the T1 of fluids, resulting in hyperintensity on T1-weighted images and hypointensity on T2-weighted images. The endoluminal coil positioned in the rectum optimizes the evaluation of endometriotic lesions infiltrating the rectal muscularis propria (30). However, in women with rectovaginal endometriosis, the movements of the endorectal coil are limited because of pain induced by pressure on the endometriotic lesions. It is also difficult to identify any endometriotic nodule located more than 8 cm above the anal margin due to the length of the rectal probe (30). In case of low rectal nodules, the distance between the lower limit of the endometriotic lesions and the rectal-anal junction can be determined (31). A limit of MRI in the diagnosis of bowel endometriosis consists in the fact that these lesions may contain fibrosis (which has signal intensity close to that of the muscle on T1- and T2-weighted images) without any blood-filled cyst that can be picked up by this technique. In addition, while the rectum is anatomically fixed, the remaining colon can move and the length of the procedure may cause artifacts due to bowel peristalsis. Finally, MRI lacks sensitivity for diagnosing the depth of infiltration of endometriotic lesions in the rectal wall (23,32). Bazot et al (31) evaluated MRI findings in 60 patients with surgically proved bowel endometriosis. The sensitivity, specificity, and accuracy of MRI for the diagnosis of rectosigmoid involvement were 88.3%, 97.8%, and 94.9%, respectively. Rectal nodules were accurately diagnosed, but it was difficult to differentiate lesions limited to the serosa from those invading the muscularis, particularly when endometriotic lesions of the cul de sac or the uterosacral ligaments were juxtaposed to the rectal wall. These observations are in line with the findings of Chapron et al (23), who compared the effectiveness of MRI and REU in the diagnosis of rectal involvement in 81 patients with histologically proven deep infiltrating endometriosis. For the diagnosis of rectal involvement, sensitivity and specificity for REU were 97.1% and 89.4%, respectively, while for MRI they were 76.5% and 97.9%, respectively. A combination of REU and MRI has been proposed to reduce the rate of false-negative results (24).

Multislice Computerized Tomography Enteroclysis

Recently multislice computerized tomography combined with water enteroclysis (MSCTe) has been proposed for the study of bowel endometriosis (33). Following retrograde colonic distension by water enteroclysis and intravenous injection of iodinated con-

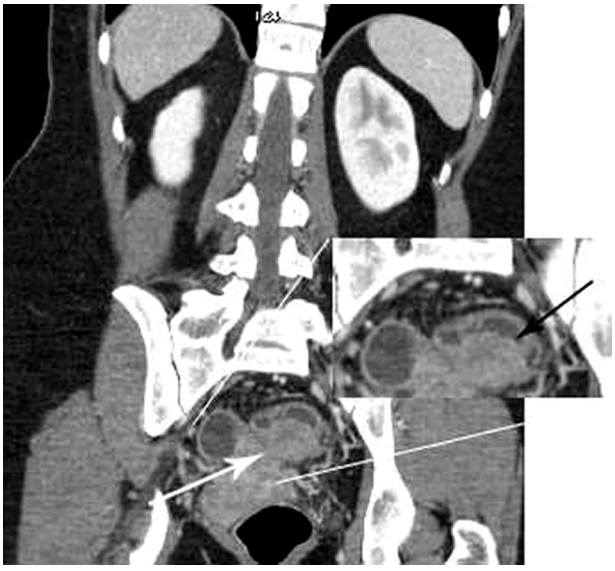

Fig. 4. Coronal reconstruction of multislice spiral computerized tomography demonstrating a bowel endometriotic nodule (indicated by the white arrow) infiltrating the muscular layer; the mucosa (indicated by the black arrow) is not infiltrated.

trast medium, multislice computerized tomography allows the evaluation of the colon in very thin slices. Bowel endometriotic lesions appear as solid nodules with positive enhancement, contiguous or penetrating the thickened colonic wall (Fig. 4). The distension of the lumen and the thin axial scan analysis allow estimating the depth of endometriosis invasion in the large bowel wall.

CLINICAL MANAGEMENT

When evaluating a patient with endometriosis, the clinician should spend some minutes investigating bowel habits. Whenever the presence of bowel endometriosis is suspected, an imaging technique should be used to evaluate this possible diagnosis. Once the diagnosis of bowel endometriosis has been made, counseling with the patient is mandatory and 3 options are theoretically available: expectant management, medical treatment, and surgery. Patients should be informed on the advantages and disadvantages of each choice.

Expectant Management

Expectant management can be proposed whenever subocclusive symptoms are not present; however, the clinician and the patient should weigh the absence of surgical risks against the persistency of gastrointestinal symptoms and pain. Unfortunately, the natural history of bowel endometriotic lesions is unknown, and therefore, patients undergoing expectant management must be informed on the theoretical possibility of bowel occlusion in the future. Not all small asymptomatic lesions will inexorably progress into large lesions, and the occurrence of bowel obstruction in women with endometriosis is considered a rare event (34). However, with an increasing awareness of bowel endometriosis, bowel obstruction due to endometriosis seems more frequent than previously thought. There are some reports of patients with bowel obstruction secondary to endometriosis requiring emergent surgery (34–36), but it is not possible to derive the incidence of such events from the number of case reports published in the literature. These reports suggest that, at least in some cases, digestive endometriosis may be a progressive disease. If possible, it is desirable to avoid emergent surgery for colorectal endometriosis because its appearance may be difficult to distinguish from that of malignant neoplasia, and the true diagnosis may not be discovered until radical surgical procedures and a histopathologic diagnosis have been obtained.

Medical Treatment

Up to now, no study has specifically investigated the effects of medical treatment on bowel endometriosis. Gonadotropin-releasing hormone agonist have been used with success in selected cases (37,38), but in general, bowel symptoms persist or recur when medical therapy is interrupted (24,39). It seems unlikely that patients with large bowel lesions may benefit from medical therapy because endometriosis is associated with fibrosis and sclerosis in the bowel wall, which are unresponsive to hormonal manipulation.

Surgery

Surgical treatment of bowel endometriosis remains controversial. Obviously, when obstructive symptoms are present, surgery is mandatory. However, in the absence of this obstruction, it remains unclear whether surgery should be performed, and if so, how extensive. At the present time, the surgical removal of bowel endometriosis appears to be the most effective treatment in severely symptomatic patients. Several studies have demonstrated that the surgical removal of all endometriotic lesions including those on the bowel is associated with a significant improvement in gastrointestinal symptoms and quality of life (12,24,40). However, surgical treatment of bowel endometriosis is associated

with a significant rate of complications. Therefore, any patient undergoing this type of surgery must be fully informed of the possible risks and complications, and the surgeons should be appropriately trained and experienced.

When surgery is judged to be required, several surgical approaches and techniques can be used. The surgical approach (laparoscopic, abdominal, vaginal, or combined) is determined by the location and extent of endometriotic bowel lesions and by surgeons' training.

Surgical Techniques

Laparoscopic Treatment of Superficial Bowel Lesions

Superficial lesions involving the serosa or the adventitia can be easily removed by cutting with scissor the normal bowel wall adjacent to the lesion; the lesion is then lifted with grasping forceps and is simultaneously excised using sharp and blunt dissection at the junction of white fibrosis with yellow and pink soft tissue (5,6). CO_2 laser should be used at low power; diathermy excision should be used with caution, as thermal damage to the bowel may result in a delayed postoperative fistula. Once the lesion has been completely undermined, it is resected from the bowel wall. The defect of bowel wall can be repaired by interrupted silk sutures.

Laparoscopic Full Thickness Disc Resection

Full thickness disc resection of bowel wall is used when submucosal fibrosis is present and entry into the lumen of the bowel is inevitable (5,41). Two traction (stay) sutures can be applied to each side of the bowel defect, transforming it into a transverse opening (41). The bowel lumen is then closed in 2 layers using an intracorporeal technique. The mucosa is closed with continuous 3-0 Vicryl and the submuscularis with interrupted 2-0 silk suture every 0.3–0.6 cm.

Full Thickness Disc Resection Using the Circular Stapler

This technique has been proposed to excise low rectal lesions when the disease is not greater than one-third of the circumference of the rectum and no greater than 2 cm in length (42,43). After mobilizing the rectum around the lesion, the stapler is inserted trasanally and carefully opened 1–2 cm with the area to be excised lying in the hollow between the anvil and the stapler. A suture can be placed in a Z fashion to further ensure imbrication of the area to be excised. The entire defect must be enclosed in the stapler jaws without incorporating apparently unaffected rectum; the instrument must be held high to avoid the posterior rectal wall. The instrument is fired, and then removed through the anus. The result is an anterior discoid resection of a wedge of anterior rectum containing the nodule and the cut suture (43,44).

Segmental Bowel Resection (Laparoscopy or Laparotomy)

Segmental bowel resection has been used for decades by general surgeons for the treatment of sigmoid and rectal cancer. The same technique is used for the treatment of bowel endometriosis; the only difference is that endometriosis does not require the degree of radical surgery used in oncologic procedures. The resection can be performed either by laparoscopy or by open laparotomy. Laparoscopic segmental resection and anastomosis of the lower colon for endometriosis was firstly described in the 1990s by Redwine and Sharpe (8,45). Since then, this technique has been proved to be feasible and safe by several authors (46–48). Bowel resection is usually performed in the case of a single lesion $\geq$3 cm in diameter, single lesion infiltrating $\geq$50% of the bowel wall, and if more than 3 lesions infiltrating the muscular layer are present (12).

Bowel preparation requires opening the pararectal spaces to obtain mobilization of the bowel. The procedure is usually started laparoscopically; however, an initial vaginal approach has been proposed by Possover et al (49). Because the goal of the operation is to remove the disease in bloc, no attempt is made to dissect the endometriotic nodule from the rectosigmoid. In case of deep lateral preparation, a nerve sparing technique should be used to avoid postoperative urinary complications. As we are not dealing with a malignancy, separation of the fibrofatty tissue attached to the bowel is best performed immediately adjacent to the bowel wall because the vessels are smaller and easy to coagulate before transaction. The mesentery is dissected no more than 2 cm past the nodular mass deforming the bowel wall to maintain adequate blood supply to the edges of the anastomosis. The exposed bowel is transacted caudal to the endometriotic lesions using Endo GIA. Complete laparoscopic mobilization of the rectum allows extraction of its cephalic portion through a small suprapubic incision (3–5 cm) which might be obtained expanding the midline trocar incision site. The affected bowel segment is resected after extra-abdominal in-

spection and palpation. Rectal nodules are typically removed by using the Knight-Griffen technique (50,51). After dilatation of the bowel, the anvil of a transanal circular stapler is inserted into the proximal bowel stump and fixed by a purse-string suture. The bowel stump is returned back into the peritoneal cavity before closing the suprapubic abdominal incision. The stapler is inserted into the rectal stump transanally and an end-to-end anastomosis is performed by closing the device. Whenever the bowel lumen is entered, after suturing, the presence of leaks must be checked. Other techniques for delivering the affected bowel out of the abdominal cavity have been proposed.

Transanal Intussusception

After complete mobilization of the rectum, the bowel is divided proximal to the endometriotic lesion. The proximal end of the bowel is pulled through the rectal stamp out of the anus; the anvil is secured with purse-string suture, and then replaced transanally into the pelvis along with the proximal bowel. The rectal stump containing the endometriotic lesion is then prolapsed out of the anus by grasping the transacted end of the rectal stump with Babcock clamps. The endometriotic lesion is resected before reintroducing the rectal sump inside the pelvis. The stapler is then inserted into the rectal stump transanally and an end-to-end anastomosis is performed. This technique was described to be technically feasible and associated with low complication rates by Nezhat et al (52,53), but it was never reproduced by other groups.

Transvaginal Resection

Redwine et al (54) described a transvaginal resection of the diseased bowel segment, which has also been used with modifications by other authors (55,56). After laparoscopic isolation of the endometriotic nodule on the anterior bowel wall, the bowel segment is delivered vaginally to the introitus through a posterior culdotomy. The affected loop of the bowel is excised and the anastomosis is completed before returning the bowel to the pelvis.

IS THERE A NEED FOR RADICAL BOWEL SURGERY FOR ENDOMETRIOSIS?

Although we are not dealing with a malignancy, a critical aspect of the removal of bowel endometriotic nodules is represented by the choice between limiting the resection to the edges of the fibrosis or to extend it more widely. Remorgida et al demonstrated that simple nodulectomy does not remove all bowel endometriosis in at least 40% of the cases (11). The proper indications for bowel surgery in women with endometriosis and the clinical effect of radical surgery on effectiveness of cure still remain controversial. Incomplete resection of deep bowel endometriosis may be associated with persistence of symptoms which may require further surgical treatment. It has been demonstrated that bowel endometriosis damages the enteric nervous system even at a distance (up to 5 cm) from the endometriotic nodule (12). However, it remains unclear what is the length if the bowel segment with nerve changes adjacent to an endometriotic nodule. On the other hand, segmental bowel resection may not be routinely justified in patients without a malignancy because of the rate of significant postoperative complications even in the hands of experienced surgeons.

COMPLICATIONS OF SURGERY

When surgery is performed because of extensive endometriosis, the complication rate is often determined by the size and the extent of the tissue removed. Although small endometriotic nodules can be easily removed with low risk, larger nodules involving the muscular layer of the bowel, the ovaries, and the vagina may have a greater risk of complications. Besides the typical complication of any laparoscopic procedure, 2 main complications are frequent during surgical treatment of bowel endometriosis: inadvertent ureteral damage and dehiscence of the suture. Ureteral damage can be reduced with careful identification of the ureter when endometriotic lesions affect the pelvic sidewall. The ureter should be identified far away from the lesion (usually at the pelvic brim over the external iliac artery) and its course should be followed down past the lesion. The rate of intestinal anastomotic dehiscence ranges form 3% to 7% increasing up to 20% for low rectal anastomosis. Additional complications include transient bowel strictures (which are common following bowel resection), perineal abscess, and rectovaginal fistulae.

Before surgery, patients must be informed that de novo symptoms may appear after colorectal resection for bowel endometriosis. When endometriosis extensively involves the rectosigmoid colon and uterosacral ligaments, structures innervating the bladder may be damaged. As a consequence, transient neurogenic bladder effects can be present in the postop-

erative period, causing urinary retention or dysuria (48,57,58). An areflexic bladder can rarely be a long-term complication. De novo digestive symptoms can be observed, particularly after rectal ampulla resection. These include constipation, difficult defecation, and diarrhea (59,60).

Any patient undergoing surgery for bowel endometriosis should be fully informed of the possible range of procedures that may be performed, and warned of the possibility of temporary protective colostomy particularly in the case of very low rectal lesions. Permanent colostomies have rarely been reported (3).

FOLLOW-UP OF PATIENTS AFTER SURGERY

Although several studies reported the follow-up of women treated for bowel endometriosis, the great majority of these reports are retrospective and/or include a limited number of patients. Bailey et al (57) reported the follow-up of 130 women who underwent aggressive surgical management of colorectal endometriosis. At 60 months from surgery, 86% of the patients reported complete or nearly complete relief of symptoms and no recurrence of colorectal endometriosis was observed. Kavallaris et al (13) followed up 50 patients treated by laparoscopically assisted vaginal resection combined with a minilaparotomic incision. Seventy-two percent of these patients were symptom free at a mean of 32 months from surgery. In this series, 2 patients (4%) had recurrent disease in the bowel which was diagnosed by rectovaginal palpation and sigmoidoscopy; both of them underwent re-resection with histopathologically clean margins. A prospective study by Thomassin et al (24) including 27 women who underwent colorectal resection reported a significant improvement of nonmenstrual pelvic pain, dysmenorrhea, dyspareunia, and pain on defecation; however, no impact on bowel movement pain, lower back pain, or asthenia was reported. The same group has recently reported 22-month follow-up, which shows laparoscopic colorectal resection for endometriosis significantly improved quality of life and gynecologic and digestive symptoms (such as bowel movement pain and cramping, pain on defecation, diarrhea).

MALIGNANT TRANSFORMATION OF BOWEL ENDOMETRIOSIS

The frequency of malignant transformation of endometriosis in unknown and the most documented cases have occurred within ovarian endometriosis. Because of the low prevalence of bowel endometriosis, it has not been possible to estimate the risk of malignant transformation of these endometriotic lesions. However, some authors reported endometriosis associated bowel tumors (61,62). These tumors occur more frequently in the rectosigmoid colon (over 75%) and less frequently in the ileum and cecum. The most common type is endometrioid carcinoma, followed by various mixed Mullerian tumors and stromal sarcoma, with these last 2 types of tumors being more frequent in the ileocecal region (over 80% of the cases) (61).

CONCLUSIONS

Bowel involvement with endometriosis opens a new frontier for the gynecologist, as it forces the understanding of a new anatomy, a new physiology, and a new pathology.

Although some women with bowel endometriosis may remain asymptomatic, the majority of them develop a variety of disease-related complaints. As a consequence, the gynecologist must investigate bowel function during the evaluation of a woman with endometriosis. Given the fact that most bowel endometriosis can not be diagnosed by physical examination, imaging techniques should be used. It is evident that diagnosis and management of bowel endometriosis require the collaboration of different specialists: the gynecologist, colorectal surgeon, gastroenterologist, and radiologist. This team must identify and evaluate each patient trying to correlate symptoms with findings.

Expectant management of bowel endometriosis should be carefully balanced with the severity of symptoms and the feasibility of prolonged follow-up. The value and effectiveness of radical management of endometriosis involving the bowel have not been well studied. Several studies have demonstrated an improvement in quality of life after extensive surgical removal of the bowel endometriosis disease. Unfortunately, there is no universal agreement on the degree of "radicality" which is appropriate when treating bowel lesions.

Pelvic and rectal pain, not bowel obstruction, is the major symptom which leads to colorectal resection in patients with advanced colorectal endometriosis. Surgery remains at the moment, even with all its limitations and possible complications and sequelae, the most successful treatment of bowel endometriosis. When surgeons are extensively trained in laparoscopy, the majority of the patients can be spared a

laparotomy. Many questions still remain unanswered in this diagnosis and treatment of bowel endometriosis, and prospective studies involving large numbers of patients with adequate follow-up are needed.

Acknowledgment—The authors thank Dr. Romano Sassatelli (Department of Surgery, Gastrointestinal Endoscopy Unit, Arcispedale Santa Maria Nuova, Reggio Emilia, Italy), Dr. Ennio Biscaldi, and Prof. Gian Andrea Rollandi (Department of Radiology, Galliera Hospital, Genoa, Italy) for providing the radiologic images used in the current article.

REFERENCES

1. Sampson JA. Intestinal adenomas of endometrial type. Arch Surg 1922;5:217–221.
2. Chapron C, Fauconnier A, Vieira M, et al. Anatomical distribution of deeply infiltrating endometriosis: surgical implications and proposition for a classification. Hum Reprod 2003; 18:157–161.
3. Weed JC, Ray JE. Endometriosis of the bowel. Obstet Gynecol 1987;69:727–730.
4. Redwine DB. Ovarian endometriosis: a marker for more extensive pelvic and intestinal disease. Fertil Steril 1999;72:310–315.
5. Redwine DB. Intestinal endometriosis. In: Redwine DB, ed. Surgical Management of Endometriosis. London: Taylor & Francis, 2004:157–173.
6. Keckstein J, Wiesinger H. The laparoscopic treatment of intestinal endometriosis. In: Sutton C, Jones K, Adamson GD, eds. Modern Management of Endometriosis. Abington: Taylor & Francis, 2005:177–187.
7. Iaroshenko VI, Salokhina MB. [Endometriosis of the stomach] Vestn Khir Im I I Grek 1979;123:82–83.
8. Collier HA, Gonzales LL, Bossert LJ. Cyclic ascites as a manifestation of endometriosis. Report of a case. Obstet Gynecol 1962;19:681–683.
9. Meyers WC, Kelvin FM, Jones RS. Diagnosis and surgical treatment of colonic endometriosis. Arch Surg 1979;114:169–175.
10. Yantiss RK, Clement PB, Young RH. Endometriosis of the intestinal tract: a study of 44 cases of a disease that may cause diverse challenges in clinical and pathologic evaluation. Am J Surg Pathol 2001;25:445–454.
11. Remorgida V, Ragni N, Ferrero S, et al. How complete is full thickness disc resection of bowel endometriotic lesions? A prospective surgical and histological study. Hum Reprod 2005;20:2317–2320.
12. Remorgida V, Ragni N, Ferrero S, et al. The involvement of the interstitial Cajal cells and the enteric nervous system in bowel endometriosis. Hum Reprod 2005;20:264–271.
13. Kavallaris A, Kohler C, Kuhne-Heid R, et al. Histopathological extent of rectal invasion by rectovaginal endometriosis. Hum Reprod 2003;18:1323–1327.
14. Ferrero S, Abbamonte LH, Remorgida V et al. Abdominal pain, bloating, and urgency. Obstet Gynecol 2005;106:195.
15. Ferrero S, Abbamonte LH, Remorgida V et al. Irritable bowel syndrome and endometriosis. Eur J Gastroenterol Hepatol 2005;17:687.
16. Thompson WG, Longstreth GF, Drossman DA, et al. Functional bowel disorders and functional abdominal pain. Gut 1999;45 (Suppl 2):II43–II47.
17. Mathias JR, Franklin R, Quast DC, et al. Relation of endometriosis and neuromuscular disease of the gastrointestinal tract: new insights. Fertil Steril 1988;70:81–88.
18. Bazot M, Darai E. Sonography and MR imaging for the assessment of deep pelvic endometriosis. J Minim Invasive Gynecol 2005;12:178–185.
19. Bazot M, Detchev R, Cortez A, et al. Transvaginal sonography and rectal endoscopic sonography for the assessment of pelvic endometriosis: a preliminary comparison. Hum Reprod 2003;18:1686–1692.
20. Schroder J, Lohnert M, Doniec JM, et al. Endoluminal ultrasound diagnosis and operative management of rectal endometriosis. Dis Colon Rectum 1997;40:614–617.
21. Chapron C, Dumontier I, Dousset B, et al. Results and role of rectal endoscopic ultrasonography for patients with deep pelvic endometriosis. Hum Reprod 1998;13:2266–2270.
22. Abrão MS, Neme RM, Averbach M, et al. Rectal endoscopic ultrasound with a radial probe in the assessment of rectovaginal endometriosis. J Am Assoc Gynecol Laparosc 2004;11: 50–54.
23. Chapron C, Vieira M, Chopin N, et al. Accuracy of rectal endoscopic ultrasonography and magnetic resonance imaging in the diagnosis of rectal involvement for patients presenting with deeply infiltrating endometriosis. Ultrasound Obstet Gynecol 2004;24:175–179.
24. Thomassin I, Bazot M, Detchev R, et al. Symptoms before and after surgical removal of colorectal endometriosis that are assessed by magnetic resonance imaging and rectal endoscopic sonography. Am J Obstet Gynecol 2004;190:1264–1271.
25. Gordon RL, Evers K, Kressel HY, et al. Double-contrast enema in pelvic endometriosis. AJR Am J Roentgenol 1982;138: 549–552.
26. Landi S, Barbieri F, Fiaccavento A, et al. Preoperative double-contrast barium enema in patients with suspected intestinal endometriosis. J Am Assoc Gynecol Laparosc 2004;11:223–228.
27. Squifflet J, Feger C, Donnez J. Diagnosis and imaging of adenomyotic disease of the retroperitoneal space. Gynecol Obstet Invest 2002;54 (Suppl 1):43–51.
28. Redwine DB, Sharpe DR. Laparoscopic surgery for intestinal and urinary endometriosis. Baillieres Clin Obstet Gynaecol 1995;9:775–794.
29. Garry R. Electrosurgical resection of endometriosis. In: Redwine DB, ed. Surgical Management of Endometriosis. London: Taylor & Francis, 2004:71–85.
30. Kinkel K, Chapron C, Balleyguier C, et al. Magnetic resonance imaging characteristics of deep endometriosis. Hum Reprod 1999;14:1080–1086.
31. Bazot M, Darai E, Hourani R, et al. Deep pelvic endometriosis: MR imaging for diagnosis and prediction of extension of disease. Radiology 2004;232:379–389.
32. Bahr A, de Parades V, Gadonneix P, et al. Endorectal ultrasonography in predicting rectal wall infiltration in patients with deep pelvic endometriosis: a modern tool for an ancient disease. Dis Colon Rectum 2006;49:869–875.
33. Biscaldi E, Ferrero S, Fulcheri E, et al. Multislice CT enteroclysis in the diagnosis of bowel endometriosis. Eur Radiol 2007;17:211–219.
34. Chaer R, Sam A 2nd, Teresi M et al. Endometriosis-induced acute small and large bowel obstruction: rare clinical entities. N Z Med J 2005;118:U1521.
35. Wickramasekera D, Hay DJ, Fayz M. Acute small bowel obstruction due to ileal endometriosis: a case report and literature review. J R Coll Surg Edinb 1999;44:59–60.
36. Varras M, Kostopanagiotou E, Katis K, et al. Endometriosis causing extensive intestinal obstruction simulating carcinoma of the sigmoid colon: a case report and review of the literature. Eur J Gynaecol Oncol 2002;23:353–357.
37. Markham SM, Welling DR, Larsen KS, et al. Endometriosis of the rectum treated with a long term GnRH agonist and surgery. N Y State J Med 1991;91:69–71.

38. Porpora MG, Pallante D, Ferro A, et al. Intestinal endometriosis without evident pelvic foci treated with gonadotropin-releasing hormone agonist. Eur J Obstet Gynecol Reprod Biol 2005;125:265–266.
39. Verspyck E, Lefranc JP, Guyard B et al. Treatment of bowel endometriosis: a report of six cases of colorectal endometriosis and a survey of the literature. Eur J Obstet Gynecol Reprod Biol 1997;71:81–84.
40. Ribeiro PA, Rodrigues FC, Kehdi IP, et al. Laparoscopic resection of intestinal endometriosis: a 5-year experience. J Minim Invasive Gynecol 2006;13:442–446.
41. Nezhat C, Nezhat F, Pennington E, et al. Laparoscopic disk excision and primary repair of the anterior rectal wall for the treatment of full-thickness bowel endometriosis. Surg Endosc 1994;8:682–685.
42. Gordon SJ, Maher PJ, Woods R. Use of the CEEA stapler to avoid ultra-low segmental resection of a full-thickness rectal endometriotic nodule. J Am Assoc Gynecol Laparosc 2001; 8:312–316.
43. Woods RJ, Heriot AG, Chen FC. Anterior rectal wall excision for endometriosis using the circular stapler. ANZ J Surg 2003; 73:647–648.
44. Reich H. Laparoscopic hysterectomy for advanced endometriosis. In: Jain N, ed. Atlas of Endoscopic Surgery in Infertility and Gynecology. New York: McGraw-Hill, 2004:298–320.
45. Redwine DB, Sharpe DR. Laparoscopic segmental resection of the sigmoid colon for endometriosis. J Laparoendosc Surg 1991;1:217–220.
46. Jerby BL, Kessler H, Falcone T, et al. Laparoscopic management of colorectal endometriosis. Surg Endosc 1999;13: 1125–1128.
47. Duepree HJ, Senagore AJ, Delaney CP, et al. Laparoscopic resection of deep pelvic endometriosis with rectosigmoid involvement. J Am Coll Surg 2002;195:754–758.
48. Darai E, Thomassin I, Barranger E, et al. Feasibility and clinical outcome of laparoscopic colorectal resection for endometriosis. Am J Obstet Gynecol 2005;192:394–400.
49. Possover M, Diebolder H, Plaul K, et al. Laparascopically assisted vaginal resection of rectovaginal endometriosis. Obstet Gynecol 2000;96:304–307.
50. Knight CD, Griffen FD. An improved technique for low anterior resection of the rectum using the EEA stapler. Surgery 1980; 88:710–714.
51. Griffen FD, Knight CD. Stapling technique for primary and secondary rectal anastomoses. Surg Clin North Am 1984;64: 579–590.
52. Nezhat F, Nezhat C, Pennington E. Laparoscopic proctectomy for infiltrating endometriosis of the rectum. Fertil Steril 1992;57:1129–1132.
53. Nezhat F, Nezhat C, Pennington E, et al. Laparoscopic segmental resection for infiltrating endometriosis of the rectosigmoid colon: a preliminary report. Surg Laparosc Endosc 1992; 2:212–216.
54. Redwine DB, Koning M, Sharpe DR. Laparoscopically assisted transvaginal segmental resection of the rectosigmoid colon for endometriosis. Fertil Steril 1996;65:193–197.
55. Abrão MS, Sagae UE, Gonzales M, et al. Treatment of rectosigmoid endometriosis by laparoscopically assisted vaginal rectosigmoidectomy. Int J Gynaecol Obstet 2005;91:27–31.
56. Landi S, Ceccaroni M, Perutelli A, et al. Laparoscopic nerve-sparing complete excision of deep endometriosis: is it feasible? Hum Reprod 2006;21:774–781.
57. Bailey HR, Ott MT, Hartendorp P. Aggressive surgical management for advanced colorectal endometriosis. Dis Colon Rectum 1994;37:747–753.
58. Fedele L, Bianchi S, Zanconato G, et al. Long-term follow-up after conservative surgery for rectovaginal endometriosis. Am J Obstet Gynecol 2004;190:1020–1024.
59. Dubernard G, Piketty M, Rouzier R, et al. Quality of life after laparoscopic colorectal resection for endometriosis. Hum Reprod 2006;21:1243–1247.
60. Ferrero S, Ragni N, Remorgida V. Post-operative digestive symptoms after colorectal resection for endometriosis. Hum Reprod 2006;21:1941–1942.
61. Slavin RE, Krum R, Van Dinh T. Endometriosis-associated intestinal tumors: a clinical and pathological study of 6 cases with a review of the literature. Hum Pathol 2000;31:456–463.
62. Yantiss RK, Clement PB, Young RH. Neoplastic and preneoplastic changes in gastrointestinal endometriosis: a study of 17 cases. Am J Surg Pathol 2000;24:513–524.