42 Endometriosis

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Key Concepts

- Endometriosis is a common cause of young women having major surgery.
- Endometriosis causes infertility, pelvic pain, and dyschezia.
- Laparoscopy has revolutionized the diagnosis of endometriosis.
- Symptomatic endometriosis usually requires surgery.
- Excision of deep pelvic endometriosis is often a combined procedure with gynecologists and urologists.

Introduction

Endometriosis is a disease characterized by the presence of endometrial glands and stroma outside the uterine cavity. It is one of the most common conditions requiring surgery for women during their reproductive years. Endometriosis, while not fatal, may be associated with disabling pain and intractable infertility. The degree of symptoms varies widely and does not always correspond to the extent of pathology encountered at surgery. Small lesions may cause severe pain and infertility, while larger lesions may be asymptomatic and be found only incidentally during surgery for other diagnoses. Diagnosis is typically made or confirmed at laparoscopy or during laparotomy. Colon and rectal surgeons often become involved in the management of patients with intestinal endometriosis. This involvement may occur as a result of a combined procedure with a gynecologist or in management of an endometrioma masquerading as a neoplastic or inflammatory lesion. Treatment for endometriosis is usually multimodal and may require surgery in those patients with infertility, pelvic pain, obstruction, or a poor response to hormonal suppression. While advances in diagnostic tests and therapy have been made, endometriosis remains a frustrating and incompletely understood disease for both the patient and her physicians.

Epidemiology

The true prevalence of endometriosis is unknown. There is no noninvasive screening test for endometriosis, and its diagnosis depends on the visual or pathologic identification of implants during laparoscopy or laparotomy. Various authors have estimated that up to 15% of all women of reproductive age and one-third of infertile women have endometriosis [1, 2]. A study by Houston et al. is the only population-based study of endometriosis [3]. After reviewing the medical records for Caucasian women in Rochester, Minnesota, during the 1970s, they estimated that 6.2% of premenopausal women have endometriosis. The potential economic and societal cost of endometriosis was illustrated by the US Health Interview Survey. It found that 50% of women with endometriosis were unable to work at some time during the prior 12 months, losing an average of 17.8 days [4].

While endometriosis is primarily a disease of the reproductive years, the widespread use of exogenous estrogens and increasing obesity in our society have made it more prevalent in postmenopausal women. Conversely, there is a decrease in the incidence of the disease when women use oral contraceptives or experience multiple pregnancies [5]. These observations, coupled with the fact that the incidence of endometriosis increases over time after a woman's last childbirth, suggest that uninterrupted menstrual cycles predispose susceptible individuals to the development of endometrial implants [6]. An inverse relation with smoking and exercise is most likely due to diminished estrogen levels. There is no racial predilection for endometriosis other than in Japanese women who have double the incidence of the disease than do Caucasian women [7].

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Etiology

The precise etiology that completely explains the cause and pathogenesis of endometriosis is unknown. The two most popular theories as to its etiology are coelomic metaplasia and the implantation of viable endometrial cells from retrograde menstruation through the fallopian tubes. Coelomic metaplasia, postulated by Meyers, suggests that under the correct hormonal milieu, the coelomic epithelium will undergo metaplastic changes and transform into endometrial tissue [8]. He bases his theory on studies demonstrating that the peritoneum and uterine endometrium both originate from embryonic coelomic epithelium. While this theory offers a good explanation for endometriosis in men and non-menstruating women, it does not adequately address the anatomical distribution and clinical pattern of endometriosis. The vast majority of endometriosis occurs in the pelvis, but the peritoneum at risk with this theory is evenly distributed throughout the abdominal cavity. In addition, metaplasia should worsen with age, and endometriosis clearly does not.

Retrograde menstruation, first proposed by Sampson in 1921, remains the most plausible explanation for the distribution of endometrial implants [9]. This theory postulates that endometriosis arises from retrograde menstruation through the fallopian tubes and into the peritoneal cavity. Viable endometrial tissue has been demonstrated in menstrual effluent, and endometriosis has been induced both in primates, with artificially produced retrograde menstruation [10], and in women volunteers who permitted injection of menstrual tissue into their peritoneum [11]. This theory, however, is probably only part of the answer.

While retrograde menstruation is very common, occurring in virtually all women, endometriosis affects only a small minority. Clearly other factors must be involved to permit the implantation and growth of endometrial tissue. Several studies indicate a possible genetic aspect to endometriosis. Simpson et al. demonstrated that the disease appears to occur more commonly within families. He found a 7% relative risk for blood relatives of affected individuals as opposed to a 1% relative risk for non-blood controls [12]. Additionally, the clinical manifestations of the disease were more severe among the related group. It appears that the inheritance pattern is polygenic or a combination of genetic and environmental factors. This conclusion is consistent with the clinical associations with delayed childbearing and uninterrupted cyclic menstruation.

Dmowski et al. have theorized that the genetic factor may involve the immune system [13]. They demonstrated depressed cellular immunity in monkeys with spontaneous endometriosis. Other investigators have confirmed alterations in both cellular and humoral immunity in humans [14, 15]. The most striking change observed in cellular immunity is the high concentration of activated macrophages and decreased functional capacity of natural killer cells. The most significant abnormality in humoral immunity is the presence of autoantibodies against different cellular components. These changes have been observed in both the peritoneal cavity and the systemic circulation, suggesting that endometriosis may be a systemic disease. It is still unclear whether these changes represent manifestations of the disease or a subsequent reaction to it. This research, however, suggests that mild subclinical immunosuppression may subsequently lead to endometriosis many years later.

Table 42-1. Sites and incidence of endometriosis

Common	Less common
Ovaries 60–75%	Appendix 2%
Uterosacral ligaments 30–65%	Ureter 1–2%
Cul-de-sac 20–30%	Terminal ileum 1%
Uterus 4–20%	Bladder < 1%
Rectosigmoid colon 3–10%	Abdominal scars < 1%

Rare, the diaphragm, inguinal canal, liver, spleen, kidney

Clinical Manifestations

The most common sites where endometriosis occurs are summarized in Table 42-1. The most frequent of these are in the pelvis. Potential sites of implantation in the abdomen include the appendix, small bowel, and diaphragm. Rarely, implantation may occur in the inguinal canal (in patients with hernias), surgical incisions, the vulva, vagina, cervix, or systemically in the lungs, bronchi, or kidneys.

As the majority of women have disease confined to the pelvis, the most common presenting complaints relate to menstrual irregularities, pelvic pain, and infertility. Many women with endometriosis may be completely asymptomatic, and the natural history of the disease in these patients has never been well defined. In studies with placebo arms, a few interesting observations have been made. A trial involving infertile women with otherwise asymptomatic endometriosis revealed that laparoscopic scoring of the severity of the disease increased over the length of the study in almost 50% of the placebo group [16]. Another study compared pain scores in women receiving placebo versus gonadotropin-releasing hormone (GnRH) analogs [17]. The cumulative dysmenorrhea rate and severity of pain were significantly lower in the treatment group suggesting a progressive course of the disease. Other studies on infertile women revealed that mild endometriosis can spontaneously resolve and that medical therapy may only suppress the disease until hormonal stimulation resumes [18].

Pelvic Pain and Dysmenorrhea

Pain is the most common symptom of endometriosis, affecting up to 80% of patients subsequently diagnosed with the disease. Endometriosis has been discovered in 30–50% of women undergoing laparoscopy for pelvic pain [19].

Pelvic pain associated with endometriosis presents as dysmenorrhea, dyspareunia, or chronic noncyclic pelvic pain. There are women, however, with extensive endometriosis and little or no pain. Total lesion volume does appear to correlate directly to the degree of pain [20]. Symptoms are related to the depth of penetration of the lesion, the type of lesion, and its location. Implants involving the uterosacral ligaments and rectovaginal septum are most often implicated. The pain is typically most intense just prior to menstruation and lasts for the duration of menstruation. The pain is often associated with back pain, dyschezia, and levator muscle spasm and is more severe with advanced stages of endometriosis.

Dysmenorrhea occurs in most women with endometriosis. The association is not well understood, and some have hypothesized that high uterine pressures cause dysmenorrhea with retrograde menstruation a consequence of these elevated pressures [21]. Other investigators, however, have failed to show an increase in the prevalence of dysmenorrhea with early stage endometriosis [22].

Dyspareunia, deep pelvic pain with vaginal penetration, is usually a symptom of advanced endometriosis. Dyspareunia is most pronounced just prior to menstruation and is associated with specific coital positions. The presence of dyspareunia is often indicative of the degree of fixation of the pelvic organs, especially in the cul-de-sac of Douglas and the rectovaginal septum.

Chronic noncyclic pelvic pain is pain present for longer than 6 months and may be intermittent or continuous. The pain is often associated with both perineural inflammation and uterosacral ligament involvement with endometriosis [23]. Gastrointestinal and urinary complaints may accompany the pain.

Pain in the shoulder during or just preceding menstruation may be due to endometrial implants involving the diaphragm. The diaphragm should always be viewed during laparoscopy, so these diaphragmatic deposits can possibly be treated with laser vaporization. Differentiation from adhesions associated with pelvic inflammatory disease (Fitz-Hugh-Curtis syndrome) is usually not difficult unless the two pathologies coexist.

The pathophysiology of pain arising from endometriosis is not completely clear. Pain may occur from the cyclic growth and subsequent increase in pressure within the capsule surrounding the implant. Alternatively, extravasation of menstrual debris into the surrounding tissue may occur with subsequent edema and release of inflammatory mediators. As the implant matures with surrounding unyielding scar tissue, the stretching of this scar by the products of the endometrial glands may produce pain. This scenario is probably particularly true for deeper implants. A study by Cornille discovered that all women with implants deeper than 1 cm experienced severe pelvic pain [23].

Adhesions, very common in endometriosis, may be associated with pain. Adherence of the colon and small bowel along with retroflexion of the uterus from extensive posterior adhesions may occur. Such retroflexion and fixation of the rectosigmoid can result in pressure on the sacrum with consequent back and rectal pain.

Since the 1960s, multiple investigators have attempted to define the role of prostaglandins in the pathogenesis of pelvic pain [24, 25]. Macrophages are responsible for the removal of foreign material such as the endometrial implants. They are present around the endometrial implants and are potent producers of inflammatory mediators such as the prostaglandins. Both prostacyclin (PGI-2) and prostaglandin E-2 are able to sensitize pain receptors to chemical mediators. Leukotriene B-4, another macrophage product, is a potent chemotactic agent and leukocyte activator. These factors are thought to explain some of the pelvic pain, but not all the studies agree [25]. The relative transient nature of prostaglandin action and the inherent difficulty in measuring pain complicate attempts to quantify the impact of chemical mediators.

Infertility

The relationship between endometriosis and infertility is also unclear. Some studies have demonstrated a high percentage of infertile patients with endometriosis [26]. Certainly, those reports comparing rates of endometriosis for women undergoing elective laparoscopic sterilization versus laparoscopy for infertility have demonstrated a fourfold or greater increase in the infertile group. In women with known endometriosis, the infertility rate is 30–50%. Whether endometriosis causes infertility or is the product of uninterrupted menstruation is still hotly debated.

There is little disagreement that moderate to severe disease with mechanical distortion of the fallopian tubes, ovaries, and peritoneum can potentiate infertility. Pelvic endometriosis and the resulting inflammatory response can produce dense, fibrotic adhesions that may significantly interfere with both the oocyte release from the ovary and the ability of the fallopian tube to pick up and transmit the oocyte to the uterus. Blockage of the tube may produce a hydrosalpinx, and in one recent study, endometriosis was the etiology in 14% of patients undergoing tubal reconstruction for occlusion [27]. In moderate or severe endometriosis, the pregnancy rates following surgery are 50% and 40%, respectively, compared to only 7% when expectant management is practiced [28, 29]. Surgical treatment of these patients is clearly beneficial.

Treatment of infertile patients with mild endometriosis is more problematic. A study by Inoue on 2000 infertile women with mild endometriosis did not reveal any improvement in fertility with either medical or surgical therapy when compared to expectant management [30]. Other studies have demonstrated a lower pregnancy per cycle rate in patients with endometriosis compared to those free of the disease [31].

Intestinal Symptoms

Although some women with intestinal endometriosis may be asymptomatic, some degree of intestinal complaints is found in those women with moderate to severe disease.

Bowel involvement occurs in 12–37% of cases of endometriosis. Depending on the site of involvement, the symptoms of endometriosis may vary somewhat. In patients with intestinal endometriosis, the rectosigmoid is involved in over 70%, followed by the small bowel and appendix. Rectosigmoid disease often results in alterations in bowel habits such as constipation, diarrhea, a decreased caliber of the stool, tenesmus, or, rarely, rectal bleeding. Such symptoms appear more often around the time of menses and are most likely due to the inflammatory nidus of the endometrial implant. Anal physiology performed between menses does not reveal any evidence of motility or neural disorders except an increase in the resting pressure of the internal anal sphincter [32]. Colonic endometriosis can present with obstruction and may be difficult to differentiate from other causes of large bowel obstruction, such as Crohn's disease or neoplasm. This difficulty is of particular concern in the postmenopausal woman on hormone replacement therapy.

Intestinal perforation may occur with endometriosis. Colonic perforation has been reported during pregnancy from endometriosis [33]. Perforation also occurs with transmural appendiceal endometriosis. For those patients with asymptomatic intestinal endometriosis, the natural history appears to be benign. Prystowsky and Stryker, who followed 44 patients with known intestinal endometriosis for a period of 1–12 years, found that only one patient developed clinically significant gastrointestinal symptoms [34]. Consequently, intestinal resection in these asymptomatic patients is probably unwarranted.

Confusion between small bowel endometriosis and Crohn's disease is common, as both can produce similar laparoscopic, endoscopic, and even histologic findings (Figure 42-1). Small bowel implants involving the terminal ileum are often noted incidentally at the time of laparoscopy and may often be asymptomatic. When symptoms occur, they are usually nonspecific such as recurrent abdominal pain and bloating. Occasionally, acute or chronic small bowel obstruction develops from extensive fibrotic adhesions which are due to endometriosis.

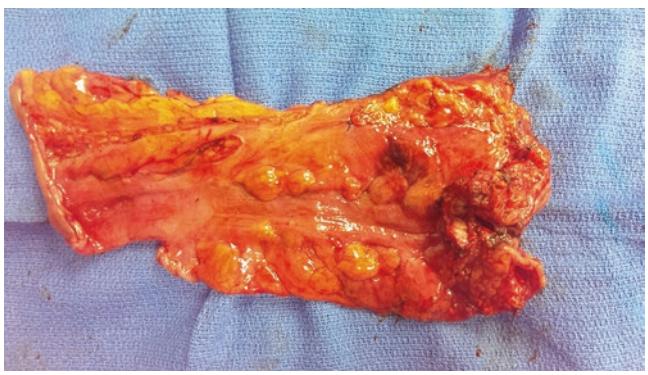


FIGURE 42-1. Gross pathologic specimen of endometriosis involving the small intestine. The specimen cut open with the typical appearance of an endometrioma after hormonal therapy inducing diminished vascularity.

The next most frequent site of intestinal endometriosis is the appendix. Endometrial implants are not infrequently found when the appendix is removed incidentally. The clinical significance of appendiceal endometriosis is less than that involving the small bowel and colon. Although endometrial implants may produce acute appendicitis with right lower quadrant abdominal pain, nausea, fever, and leukocytosis, historically most abdominal explorations for presumed acute appendicitis with a subsequent diagnosis of endometriosis have been due to ruptured endometrial cystic implants involving the ovary. Endometriosis of the appendix may also produce a chronic obstruction of the intestinal lumen with formation of a mucocele or peri-appendiceal inflammatory mass that is difficult to distinguish from a neoplasm. Finally, endometrial implants of the appendix and cecum may serve as lead points for an intussusception.

Malignant Transformation

Malignant transformation of endometriosis was previously considered an uncommon complication of the disease. Almost 80% of the tumors are ovarian, and two-thirds are endometrial carcinomas. An increase in the incidence of ovarian cancer in women with endometriosis has been reported in multiple studies [35, 36]. The histiotypes involved are endometrioid and clear cell tumors. Endometriosis and ovarian cancer are both seen in hyperestrogenic states, and patients with ovarian neoplasms arising from endometriosis are younger than the typical ovarian cancer patient with most tumors occurring in the fourth decade of life [37]. Symptoms of pelvic pain and an enlarging pelvic mass are the most common symptoms. In women with known endometriosis, a cyst larger than 10 cm, cyst rupture, or a change in the nature of the chronic pelvic pain are potential signs of malignancy. Interestingly, while oral contraceptive use decreases the risk of ovarian cancer in general, the effect is exaggerated in those tumors associated with endometriosis [38]. As endometrioid and clear cell ovarian cancers carry a poor prognosis, the long-term use of oral contraceptives is recommended by some to decrease the risk of malignant degeneration [38].

The rectosigmoid colon is the most common site for extragonadal tumors arising from endometriosis. Prolonged unopposed estrogen exposure is a significant risk factor, and rectal bleeding is the most common symptom. Recurrent symptoms of pelvic endometriosis following hysterectomy and bilateral salpingo-oophorectomy can be possible signs of malignant degeneration. Endometrial carcinoma is the most common tumor type. Histologically, the tumor must be shown to arise from the colon rather than invading it from another source. The diagnosis also requires that endometriosis or premalignant changes in endometrial glands be found contiguous with the invasive neoplasm [39].

Treatment of both ovarian and extragonadal tumors is based on the particular stage of the tumor. The prognosis is generally good with tumors confined to the ovary or an extragonadal site having 5-year survivals greater than 60%. Even if a locally extensive tumor is encountered, there may be a benefit from aggressive local resection.

Diagnosis

Physical Examination

Patients with mild cases of endometriosis may have a normal physical examination, and the diagnosis may not even be suspected unless the patient undergoes laparoscopy. For patients with pelvic pain, careful bimanual and rectal examination may reveal nodularity or induration especially in the uterosacral ligaments or cul-de-sac of Douglas. Fixed tender retroversion of the uterus in a patient without previous pelvic surgery may raise suspicion for endometriosis. Palpation of the ovaries may reveal an ovarian mass. As these ovarian masses are generally soft and cystic, those less than 5 cm in diameter may be difficult to palpate. Cyclical pain or bleeding from any location, especially coinciding with menses, should be adequately investigated for endometriosis. The inguinal canal, previous incisions, umbilicus, and lungs can all be potentially involved with endometrial implants.

Laboratory Evaluation

CA-125, an antigen expressed on tissues derived from human coelomic epithelium, is elevated in women with moderate to severe endometriosis. However, the sensitivity and specificity of this test are poor as the antigen may be mildly elevated in other diseases and within the normal range in women with mild endometriosis. The concentration of CA-125 does correlate with the severity of the disease and is probably most useful in gauging response to medical therapy. It may also be of value in following women postresection who had elevated levels preoperatively and are again exhibiting symptoms of endometriosis. No other serum markers are commercially available, but assays of antiendometrial antibodies and endometrial secretory protein PP14 are currently being evaluated for clinical relevance [40].

Endoscopy

As the lesions begin on the outside of the intestine, endoscopic evaluation of the large bowel is often normal except in severe disease or infiltrating nodular endometrial implants. Occasionally, serosal involvement with adhesions can lead to obstruction. Endoscopically, the mucosa is generally intact, occasionally associated with significant luminal narrowing. Infiltration of the submucosa, while uncommon, may produce

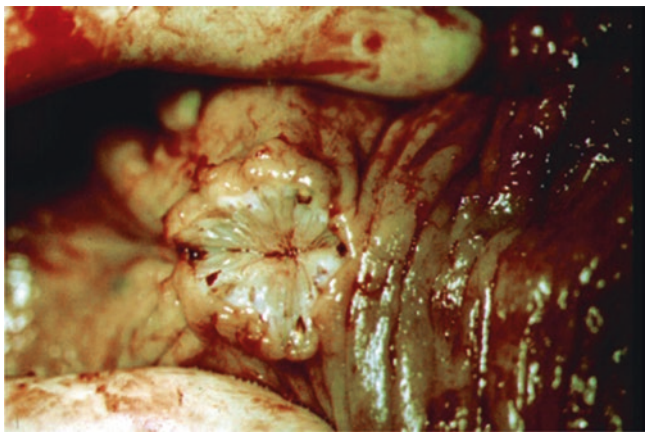


FIGURE 42-2. Polypoid endometrial implant of the colon causing mucosal abnormalities.

nodularity and distortion of the overlying mucosa (Figure 42-2). These findings may be difficult to visually differentiate from Crohn's disease, ischemia, or malignancy. Pressure against these areas of distorted bowel may produce pain that suggests the diagnosis of endometriosis. In addition, biopsies of the mucosa, taken in areas of endometriosis, can resemble solitary rectal ulcer or prolapse syndromes. Rarely is the diagnosis of endometriosis definitively confirmed by endoscopy or from endoscopic biopsies. Colonoscopy is, however, useful in excluding colon cancer from the differential diagnosis, especially in older patients presenting with a rectosigmoid mass while on hormone replacement.

Rigid proctoscopy is very helpful in predicting the depth of rectosigmoid involvement in patients with severe endometriosis of the cul-de-sac of Douglas. After two enemas are given to remove any fecal debris, the rigid proctoscope is deployed above the rectosigmoid and slowly withdrawn with care to maintain adequate insufflation. The mucosa is often fixed over an area of submucosal or deep muscular involvement with tethering or puckering and loss of the normal mucosal mobility. In our experience, these mucosal findings have correlated with significant intestinal wall invasion by the endometrial implant and often a need for intestinal resection.

Imaging Techniques

Imaging techniques used to facilitate the diagnosis of endometriosis include ultrasonography, barium enema, computerized tomography (CT), magnetic resonance imaging (MRI), and immunoscintigraphy. Many of these tests are obtained for the evaluation of chronic pelvic pain and/or bleeding from the reproductive tract or colon. They are primarily utilized to rule out more common conditions, but there are some findings that may strongly suggest the diagnosis of endometriosis before visual or pathologic confirmation by laparoscopy or laparotomy.

Transvaginal ultrasound has been used for several years to evaluate ovarian endometriomas. It is a sensitive test and in experienced hands provides specificity greater than 90% for ovarian endometriosis. Ultrasound of the pelvis, however, is not very sensitive in detecting focal non-ovarian endometrial implants. Endometriosis has been termed "the great mimicker" because the appearance on ultrasound is highly variable with some lesions being nearly sonolucent and others quite echogenic.

Endorectal ultrasound is a potentially valuable tool to determine rectal wall invasion by endometrial implants in the cul-de-sac. Chapron and colleagues studied the reliability of endorectal ultrasound in assessing the depth of bowel invasion with rectovaginal endometriosis [41]. In seventeen patients with proven deep pelvic endometriosis, the ultrasound revealed infiltration of the bowel wall and suggested the need for intestinal resection. The ultrasound findings were subsequently confirmed at laparoscopy and evaluation of the pathologic specimen in sixteen patients. Twenty-one other patients with endometriosis of the cul-de-sac of Douglas whose ultrasounds did not show infiltration of the rectal wall did not require intestinal resection and were able to have complete removal of the endometriosis with laparoscopic techniques without complications. The accuracy of ultrasound was confirmed by Doniec and colleagues who determined both the sensitivity and specificity of preoperative staging of rectal wall involvement by endometriosis to be 97% [42]. The only real concern in evaluating patients having cul-de-sac endometriosis by endorectal ultrasound is the significant discomfort experienced by the patient when rectal distention from the balloon probe compresses the endometrial implant.

Barium enema examination is another imaging technique often obtained by gynecologists for the intestinal complaints associated with deep pelvic endometriosis. The lateral and prone cross table views of the rectum offer excellent evaluation of the cul-de-sac of Douglas as long as care is taken in ensuring that the balloon is kept in the distal rectum (Figure 42-3). Studies in patients without bowel wall involvement are either normal or reveal smooth extrinsic compression with normal mucosa. Deep invasion of the bowel wall by endometriosis produces a variety of appearances on barium enema. Irregularities of the rectal wall such as tethering or even polypoid lesions may be difficult to distinguish from inflammatory bowel disease or neoplasm. Strictures of the rectosigmoid may also be identified on barium enema.

Computerized tomography is the imaging technique probably used most frequently for the evaluation of abdominal and pelvic pain. Unfortunately, there is no standard CT appearance for a mass cause by endometriosis to clearly differentiate it from pelvic masses due to other causes. Cystic lesions are more commonly seen on the ovaries, while deeper pelvic disease usually consists of either solid lesions or mixed cystic/solid lesions. CT evaluation of the pelvic sidewall for endometrial implants is better than ultrasound, but there is still significant overlap between infectious and malignant pathology. CT scanning is probably most useful for patients with pelvic pain and a negative ultrasound to assess the musculoskeletal boundaries of the pelvis and the rectosigmoid colon.

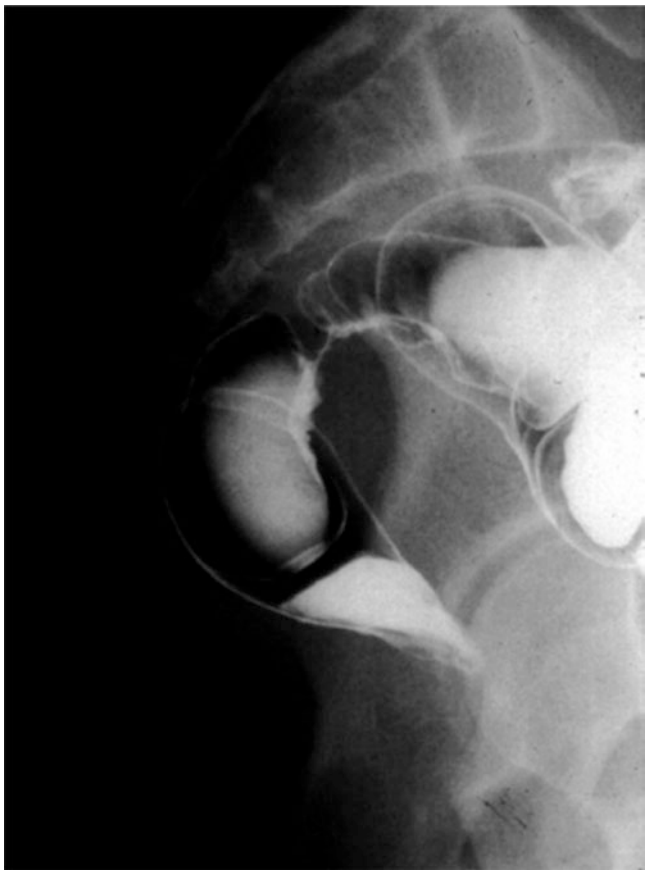


FIGURE 42-3. Barium enema demonstrating a rectosigmoid stricture from endometriosis.

When pelvic endometriosis is strongly suspected, magnetic resonance imaging (MRI) is more useful than CT scanning because of the benefit of imaging in multiple planes and the lack of ionizing radiation. MRI may be the best noninvasive modality for imaging suspected endometriosis. Colorectal involvement on MRI is strongly suggested when there is disappearance of the fat plane between the rectum and the vagina, loss of the hypointense signal of the anterior bowel wall on T2-weighted images, and a contrast-enhanced mass on T1-weighted images involving the bowel wall [43]. Sagittal images are particularly valuable in imaging the cul-de-sac of Douglas. MRI is superior to CT scanning for extraperitoneal lesions and the evaluation of pelvic masses [44]. Identification of endometrial implants is dependent on the hemorrhage that occurs in these lesions. The time between imaging and the most recent hemorrhage may determine in which weighted images the masses are most intensely seen. The sensitivity and specificity of MRI for detecting and adequately evaluating colorectal endometriosis are approximately 78% and 98%, respectively [44].

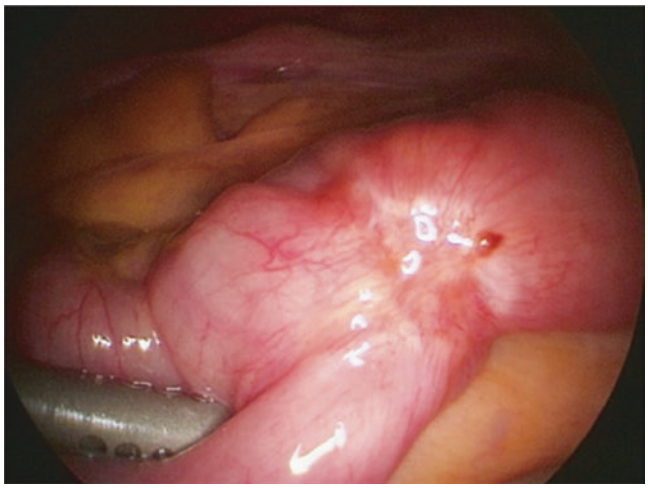


FIGURE 42-4. Laparoscopic view of an endometrial implant on the small intestine.

Immunoscintigraphy with radioactive iodine-labeled CA-125 monoclonal antibodies has been studied to clarify the extent of pelvic endometriosis, particularly in the face of severe pelvic adhesive disease [45]. In such a study of 28 women, 22 had a positive test with 16 confirmed to have endometriosis. Two of five women had a negative test despite having histologically confirmed endometriosis. As such, immunoscintigraphy is not currently recommended for screening and remains primarily a research tool.

Laparoscopy

The diagnosis of endometriosis usually requires direct visual and/or tactile assessment of the abdomen and pelvis. Laparoscopy is currently the initial approach to many patients suspected of having endometriosis and has revolutionized both its diagnosis and treatment (Figure 42-4). In experienced hands, laparoscopic evaluation is 97% sensitive and 77% specific diagnosing endometriosis [46]. Obtaining a biopsy to confirm the visual diagnosis is strongly recommended for at least one lesion and is especially critical for deep disease and endometriomas greater than 3 cm in diameter to exclude malignancy [47]. Most patients with severe pelvic pain and many patients with refractory infertility undergo laparoscopy. The timing of laparoscopy in relation to the menstrual cycle is unimportant except in patients being evaluated for infertility. In these patients, the procedure is performed in the luteal phase to provide additional valuable information concerning ovarian function.

The technique of diagnostic laparoscopy has become widespread in both the surgical and gynecologic literature. A camera, often attached to a video monitoring system with photographic and recording capabilities, is introduced at the level of the umbilicus or upper abdomen, while a second instrument is placed in a suprapubic location to allow manipulation of the pelvic and abdominal viscera. A thorough examination of the entire abdomen and especially the pelvis is critical to enable complete assessment of the disease. Both ovaries should be mobilized to evaluate the pelvic peritoneum, and the uterus should be manipulated to allow complete visualization of the cul-de-sac of Douglas, uterosacral ligaments, sigmoid colon, and ureters. It is important to view the base of the appendix as well as the distal small bowel.

Obtaining a complete assessment of the abdominal and pelvic viscera can be technically demanding. The accuracy of laparoscopy is completely dependent on the surgeon's visual evaluation of the abdomen and pelvis. The findings of endometriosis can be very subtle, and several studies have demonstrated that visually normal peritoneum may have microscopic evidence of endometriosis [48]. The extent of endometriosis should be carefully documented and staged. The current staging system has been formulated primarily for infertility and was revised by the American Society for Reproductive Medicine in 1998 (Figure 42-5) [49]. This revision is certainly an improvement over previous staging systems that were more concerned with adhesions than with implants. Virtually all patients with intestinal lesions requiring resection are stage 4 especially if they have cul-de-sac involvement.

The current classification system, however, is often not useful for the gastrointestinal surgeon. The more critical information for the surgeon is the identification and location of intestinal lesions. There is no uniform type of endometrial lesion. The classic implant is nodular with a variable degree of fibrosis and pigmentation. The color may be black, white, brown, blue, or even red. The appearance of the lesion may be vesicular, papular, or hemorrhagic (Figure 42.5). Glandular tissue is found in the great majority of these lesions. Lesions may change color or consistency over time, with red lesions noted early in the course of the disease and blue/black ones typical of older implants. Healed implants appear as fibrotic nodules. There are also a wide variety of atypical lesions occasionally associated with positive biopsies. The inability to definitively identify endometriosis through purely visual means necessitates pathologic confirmation of the disease before a definitive diagnosis can be made, especially in mild disease.

Implants in the cul-de-sac of Douglas, which occur in nearly 20% of women with endometriosis, were initially described by Cullen in 1920. Ninety percent of these represent an important variant that is especially relevant for the intestinal surgeon. Histologically, these lesions are characterized by desmoplastic tissue composed of fibrous and smooth muscle cells with strands of endometrial glands and stroma. The major component of the lesion is the fibromuscular tissue and not the endometrial tissue typical of other locations. These implants are both proliferative and infiltrating, and more than 25% extend at least five millimeters in

Patient's Name _____ Date _____

Stage I (Minimal) - 1–5
Stage II (Mild) - 6–15
Stage III (Moderate) - 16–40
Stage IV (Severe) - > 40
Total _____

Laparoscopy _____ Laparotomy _____ Photography _____
Recommended Treatment _____
_____
Prognosis _____

PERITONEUM	ENDOMETRIOSIS	< 1cm	1–3cm	> 3cm
	Superficial	1	2	4
	Deep	2	4	6
OVARY	R Superficial	1	2	4
	Deep	6	16	20
	L Superficial	1	2	4
	Deep	4	16	20

POSTERIOR CUL-DE-SAC OBLITERATION	Partial	Complete
	4	40

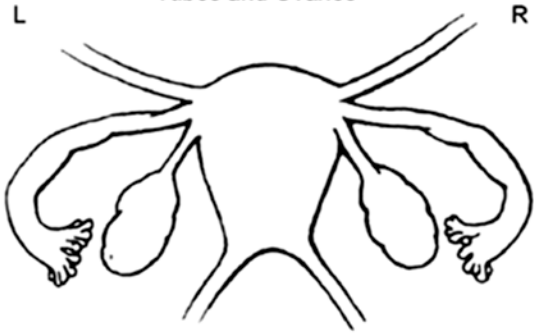
OVARY	**ADHESIONS**	< 1/3 Enclosure	1/3–2/3 Enclosure	<2/3 Enclosure
	R Filmy	1	2	4
	Dense	4	8	16
	L Filmy	1	2	4
	Dense	4	8	16
TUBE	R Filmy	1	2	4
	Dense	4•	8•	16
	L Filmy	1	2	4
	Dense	4•	8•	16

•If the fimbriated end of the fallopian tube is completely enclosed, change the point assignment to 16.
Denote appearance of superficial implant types as red [(R), red, red-pink, flamelike, vesicular blobs, clear vesicles], white [(W), opacifications, peritoneal defects, yellow-brown], or black [(B) black, hemosiderin deposits, blue]. Denote percent of total described as R___ %,W___ % and B___%. Total should equal 100%.

Additional Endometriosis: _____

Associated Pathology: _____

To Be Used with Normal Tubes and Ovaries



To Be Used with Abnormal Tubes and/or Ovaries

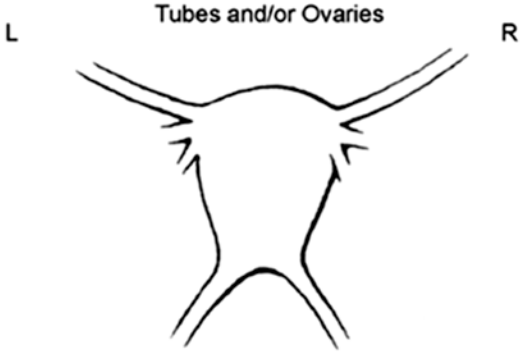


FIGURE 42-5. Revised American Society for Reproductive Medicine 1996 classification of endometriosis.

depth [50]. The depth of invasion may be difficult to assess laparoscopically, and the full extent of the implant may not be appreciated until laparotomy. The progressive fibrosis leads to narrowing of the intestinal lumen and occasionally to bowel obstruction.

These rectovaginal implants also behave differently during the menstrual cycle. There is poor to absent secretory changes during the luteal phase. Vasodilatation and not necrosis and bleeding occur at menstruation. Resistance to medical therapy is common with several studies demonstrating no significant decrease in mitotic activity in rectovaginal endometriosis after GnRH agonist treatment [51]. This resistance is felt to be due to estrogen receptor inactivity, inadequate drug access, or genetic programming that is only secondarily affected by estrogen.

Treatment

Treatment options for women with endometriosis are currently based upon the severity and type of symptoms. Currently, prevention of endometriosis is not yet possible, and therefore treatment is primarily begun to ameliorate symptoms. Some women with endometriosis are completely asymptomatic, and the implants are found incidentally at the time of surgery for other reasons. A study by Martin in 1989 revealed that 25% of women undergoing elective tubal ligation had asymptomatic endometrial implants [52]. This finding strongly suggests that not all women with endometriosis require treatment. Other authors have analyzed the prevalence of endometriosis in these asymptomatic women with regard to the time from their last pregnancy. They discovered that the odds of having endometrial implants increased significantly at 10 years following the last pregnancy [6, 53]. Consequently, as the natural history appears unclear, long-term follow-up of these patient cohorts may demonstrate late development of symptoms and the need for more aggressive medical or surgical management.

Before the introduction of diagnostic laparoscopy in the 1960s, exploratory laparotomy was the only modality available for the diagnosis and treatment of endometriosis. Laparoscopy revolutionized the diagnostic evaluation of these women and allowed patients with limited disease to undergo medical therapy. With improvements in laparoscopic techniques and equipment in the past decade, notably the development of laparoscopic laser techniques, many if not most early endometrial lesions can now be ablated or excised at the time of diagnosis. Even complex excisional surgery involving the bowel and ureter can be performed safely via a laparoscopic approach in many patients especially with mild and moderate disease. As advanced laparoscopic techniques have become more widespread, the indications and use of medical therapy are also evolving.

Medical Management

Medical therapy is designed to treat the symptoms of endometriosis, notably pelvic pain. As pelvic pain may have causes other than the endometriosis seen during laparoscopy, a trial of ovarian suppression is often used to help determine the contribution of the pain from the endometrial implants. In those patients with infertility, with or without pelvic pain, the primary goal is an intrauterine pregnancy. After other causes of infertility have been excluded, ovarian suppression may allow for laparoscopic removal of smaller endometrial lesions with optimal preservation of ovarian tissue.

Despite the many advances in the surgical treatment of endometriosis, there are still some significant advantages to medical therapy. Surgery can remove only lesions that are both visible and accessible. Microscopic disease or disease on vital structures is often left behind. Subsequent recurrence is not surprising. Additionally, there are complications associated with ablative surgery in the pelvis, especially if the woman requires multiple attempts at control of her disease. For infertile women, the adhesions that can form following any pelvic surgery may further impair the ability to conceive. In addition, laser destruction of ovarian implants may destroy germinal tissue and conceivably limit the reproductive potential from the involved ovary. In limited disease, medical therapy is comparable with surgery in terms of relief of symptoms, recurrence of disease, and subsequent pregnancy rates. Finally, medical therapy does not require specialized training or equipment and is much less costly than surgery.

Medical therapy alone also has significant potential disadvantages. All the hormonal therapies subsequently discussed have side effects and often require prolonged treatment. For example, medical therapies manipulate the hormonal environment to suppress the cyclic secretion of ovarian estrogen and progesterone, and this suppression induces atrophy of the ectopic endometrium so that over several months the implants regress. Advanced lesions, especially those with a nodular, proliferative histology, will often only partially regress. No current hormonal regimen can completely eradicate these lesions, and upon cessation of therapy, the lesions may again become symptomatic.

Oral Contraceptives

The first effective medical therapy for endometriosis was introduced by Kistner. He proposed the administration of high-dose, continuous estrogen/progestogens in 1958. These agents result in the induction of pseudopregnancy with hyperhormonal amenorrhea. Pituitary and ovarian function is thereby suppressed, and in the later stages of the treatment regimen, endometrial implants resorb and resolve. The usual treatment regimen consists of daily administration of a tablet for 6–9 months. When Vercellini and colleagues compared

oral contraceptives with GnRH agonists, they found that deep dyspareunia and pelvic pain were reduced in both groups with fewer side effects experienced by the oral contraceptive women. Pain relief appeared similar in the two groups at 1 year [54]. Side effects rarely cause cessation of treatment, but exacerbation of endometriotic symptoms may occur early in the course of treatment.

Another drug regimen used for the treatment of endometriosis involves administration of synthetic progestogens alone. This may induce a pseudopregnancy by acting in concert with endogenous estrogens. Ovarian suppression is often inconsistent. Both oral and depot preparations are available. In patients who do not desire pregnancy and in whom surgery is contraindicated, depot progestogens have been effective in ameliorating pelvic pain with equivalent efficacy to danazol [55]. Side effects include breakthrough vaginal bleeding, weight gain, and fluid retention.

Danazol

Danazol was first used extensively for endometriosis in the mid-1970s and, until the introduction of GnRH agonists (GnRH-a), was the most widely used drug for suppression of the ectopic endometrium. Danazol lowers peripheral estrogen and progesterone levels by a direct effect on ovarian steroidogenesis and pituitary production of FSH and LH. Danazol also binds directly to endometrial cellular receptors leading to atrophy and suppression of proliferation. In addition, danazol is a potent immunomodulator with beneficial effects on both humoral and cellular immunity [56].

The side effects of danazol necessitate discontinuation in less than 5% of patients for short courses [57] but are poorly tolerated for long-term suppression. Predictable manifestations of menopause are most common. Danazol also raises free testosterone levels and produces a hyperandrogenic state, especially at lower doses. Hirsutism, acne weight gain, and deepening voice changes may occur. In addition, since danazol alters lipid metabolism and liver function, it should not be used in women with elevated liver enzymes, liver disease, or complications of atherosclerosis.

Gonadotropin-Releasing Hormone Agonists

The introduction of GnRH-a as a new treatment modality for endometriosis has improved results primarily by a reduction in side effects. GnRH-a is a synthetic molecule derived from the ten-peptide-long GnRH. Continuous administration of GnRH-a completely suppresses pituitary release of FSH and LH. Administered either by injection or intranasally beginning in the mid-luteal phase of the menstrual cycle, the current recommended length of therapy is 6 months. Pain relief is complete in over 50% of women and significantly decreased in over 90%. Laparoscopic evaluation after 6 months of treatment indicates resolution or a significant decrease in size of the lesions in the majority of patients. Studies comparing danazol and GnRH-a indicate similar clinical efficacy [58].

Side effects of GnRH-a are predictably due to the sometimes profound hypoestrogenic state many of these women experience. Cessation of therapy for side effects is uncommon. The degree of bone mineral density loss that can occur with the typical 6-month treatment regimen is 5–6%. This limits the use of GnRH-a to 6 months. The bone mineral loss usually recovers 6–12 months after discontinuation and can be significantly prevented by the daily administration of tibolone [59]. Obviously, GnRH-a is not recommended for women with preexisting osteoporosis. Interestingly, a potentially serious complication can result when GnRH-a is inadvertently administered at the wrong point in the menstrual cycle, and a brief period of hypersecretion of FSH and LH occurs. Rarely, this upsurge in gonadotropin activity may precipitate an acute exacerbation in endometriotic symptoms, occasionally necessitating emergency surgical intervention [54].

A frequent use of GnRH-a is as a neo-adjuvant or adjuvant therapy for surgery. Benefits to include a reduction in postoperative adhesion formation and recurrence in the pelvis from lesions not visualized or removed at the time of surgery have been theorized [55]. Studies evaluating postoperative GnRH-a administration have failed to establish efficacy although ongoing investigation may still show a benefit [60]. Using the GnRH-a for a preoperative course clearly shrinks many of the nodules of endometriosis especially on the pelvic sidewalls, ovaries, and small intestine. It is important to document the location of these lesions as they may significantly change morphology. After a 3-month course of GnRH-a, the lesions have often lost much of their mass and may appear white. They can be difficult to see and may extend much deeper than appear initially. Unfortunately, the deep infiltrating lesions of the cul-de-sac and rectovaginal septum do not shrink as much, although the patient often has relief of her severe pelvic pain during the course of treatment. Most importantly, the dissection of the pelvic sidewalls is technically less challenging, facilitating removal of the peritoneal implants and better pelvic hemostasis and allowing careful preservation of the gonadal vessels in patients desiring children.

Future Drugs

Aromatase is an enzyme that catalyzes the conversion of androgens to estrogens. It is the rate-limiting step in the production of estrogen and endometriotic implants that express high levels of aromatase. There are currently two kinds of inhibitors, steroidal and nonsteroidal. Both classes of inhibitors reduce circulating estrogen to less than 10% of pretreatment levels in postmenopausal women or premenopausal women with nonfunctioning ovaries [61]. Consequently, as they do not block estrogen production completely, they are primarily indicated for postmenopausal women or in

conjunction with other agents to reduce the toxicity of the therapy. In a randomized trial, patients with severe endometriosis received either a combination of GnRH-a and an aromatase inhibitor or a GnRh-a alone. The combination therapy was effective in alleviating pelvic pain without concomitant bone mineral density changes and may become an alternative to extirpative surgery in some patients [61].

Another avenue of investigation has been with immunomodulators and anti-inflammatory drugs. As mentioned earlier, defects in the immune system may play a role in the development of endometriosis. Peritoneal macrophages are increased in both number and activity. Whether the elevated cytokines and other inflammatory agents are causing the disease or are the result of the lesions, the cascade of agents amplifies the response and appears to assist the progression of the disease [62]. Cyclooxygenase inhibitors have been studied in a prospective randomized trial compared to a placebo. Pelvic pain and dyspareunia were reduced in patients with stage 4 endometriosis [62]. While tumor necrosis factor (TNF) is elevated in the peritoneal fluid of patients with endometriosis, none of the TNF inhibitors have shown any efficacy although studies are ongoing [62].

Surgical Management

Surgical treatment of endometriosis has evolved significantly over time. Before the advent of laparoscopy and suppressive medical therapy, most operations were performed for advanced disease and consisted of radical removal of the uterus and ovaries. While the most effective treatment of pelvic pain still consists of surgical castration along with resection of the endometrial implants, many of these young patients strongly desire to maintain their options for pregnancy. Currently, surgery is considered conservative only when reproductive potential is preserved. Therefore, the major goal of surgical therapy for endometriosis is to completely excise or ablate the endometrial implants. Secondary goals include preservation of ovarian function and minimizing postoperative adhesion formation. Currently, we approach these patients in concert with gynecologists experienced with treating ovarian endometriosis to completely remove all gross disease, restore normal anatomy, and optimize fertility.

General Principles

Endometriosis is an invasive disease that can extend deeply into the retroperitoneum and is often surrounded by a rim of fibrosis that may make it difficult to completely assess the true extent of the implant. Removal of the lesions requires sharp excision or vaporization with electrocautery and/or the CO_2 laser. Both techniques have the potential for iatrogenic injury to the intestinal or urinary tracts. Recognizing when a lesion is completely ablated is highly dependent on surgical technique and the expertise of the surgeon. Utilizing techniques that minimize injury to the surrounding tissue, such as a cutting current to outline lesions to be removed by electrocautery and high-power density settings with the CO_2 laser, is desirable. Laparoscopic hydrodissection is also very useful in identifying normal surrounding tissue.

Meticulous hemostasis and frequent irrigation are critical to maintaining good visualization of the operative field in both open and laparoscopic surgery. Tissue planes are often distorted, especially in the cul-de-sac of Douglas, and intraoperative instrumentation of the vagina or proctoscopic evaluation of the rectum may help avoid iatrogenic injury to these structures. Finally, minimizing tissue trauma with gentle handling will decrease adhesions and maximize potential fertility.

All patients undergoing surgery for advanced endometriosis, either by an open or laparoscopic approach, should have a full mechanical and antibiotic bowel preparation. Prophylactic antibiotics and other appropriate practices for patients undergoing major abdominal or pelvic surgery are standard. Patients are positioned in the low lithotomy position with access to both the vagina and rectum for instrumentation. Ureteral stents are liberally used and are especially useful in women with severe obliterative disease in the cul-de-sac and in reoperative pelvic surgical procedures.

Provided that complete removal of the endometriosis is performed, no specific technique or approach has been proven to be superior. With endometriosis, the surgeon's experience and skill are paramount. In experienced hands, laparoscopic removal of extensive endometriosis can be accomplished. However, removal of deep lesions in the rectovaginal septum necessitating bowel resection still often requires open laparotomy to safely and completely excise the endometrial implant with restoration of intestinal continuity.

The management and techniques concerning the surgical treatment of ovarian and ureteral endometriosis are extensively discussed in the appropriate gynecologic and urologic literature. This discussion on surgical therapy will concentrate on management of intestinal lesions (Figure 42-6).

Rectovaginal Endometriosis

Endometriosis of the cul-de-sac of Douglas that extends into the rectovaginal septum is the most common site of intestinal involvement and may require intestinal resection. These lesions are often deep fibrotic nodules that extend from the posterior vagina and anterior rectum to the uterosacral ligaments (Figure 42-7a–d). Small superficial lesions involving the intraperitoneal rectum may be vaporized with the CO_2 laser or electrocautery. When using either technique, it is critical to initially outline the lesion to be removed to ensure complete extirpation as distortion of the planes, and tissue can otherwise make it difficult to assess the completeness of excision. Cutting current as opposed to coagulating current is preferred. The former technique minimizes carbonization

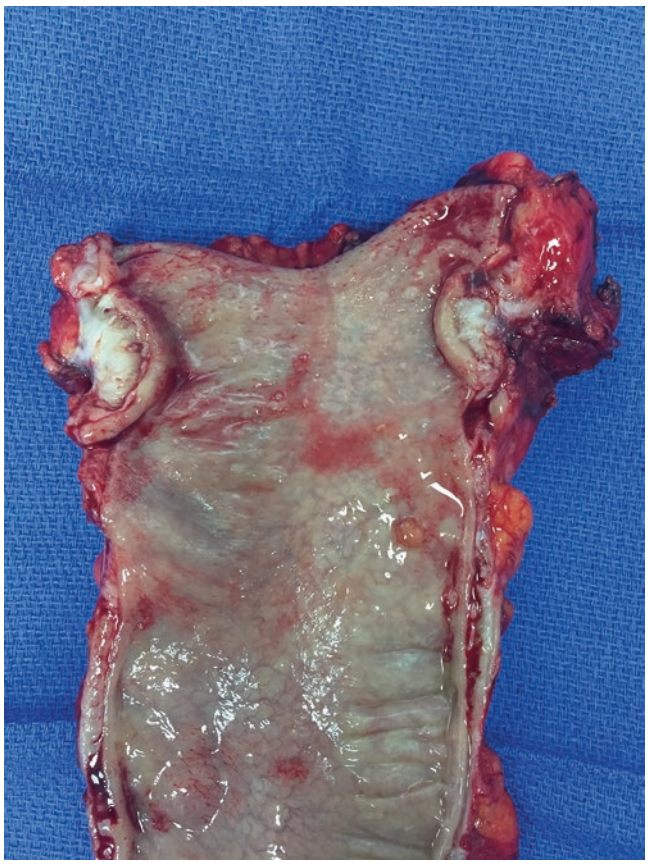


FIGURE 42-6. Opened specimen demonstrating the endometrial implant into the bowel wall.

that can make it challenging to recognize when an adequate depth has been achieved by the appearance of normal tissue. After the lesion is removed, the bowel wall is carefully assessed. Since most of these superficial lesions can be removed without entering the mucosa, the defects can be closed with interrupted transversely placed Lembert stitches.

The technique of removing superficial lesions is modified somewhat when it is performed laparoscopically. It is termed "shaving" and consists of meticulous removal of the lesion without entering the rectal mucosa. The endometriotic nodule is carefully dissected from the bowel wall, and any exposed mucosa is carefully sutured close. A series by Donnez and Squifflet of 500 patients undergoing "shaving" reported a 1.4% rate of rectal perforation and a recurrence rate of 7%. They felt that this superficial resection resulted in better postoperative intestinal function as opposed to segmental resection [63].

Surgical treatment of the deeper lesions is more controversial. Removal of the rectosigmoid with reanastomosis is technically demanding and should be performed by skilled intestinal surgeons to minimize complications in these young patients. As experience has grown, there has been a shift to more aggressive therapy, usually in conjunction with gynecologists who remove endometrial deposits on the ovaries and fallopian tubes. Medical treatment has not proven adequate for these infiltrating lesions, so it is no surprise that castration alone has also proven ineffective [64]. Many of these women suffer from chronic pain or partial colonic obstructive symptoms following bilateral salpingo-oophorectomy when the endometrial implant is not resected. As a result, excision of the implant either with a disk of rectal wall (Figure 42-8) or a formal anterior resection is recommended for women with symptoms related to the endometriosis. Both procedures can occasionally be performed laparoscopically if the endometriosis is completely removed. Unfortunately, laparoscopy often misses lesions that are not visually apparent and discernible only by palpation. It should be noted, however, that for severe disease, laparoscopic ablation, when possible, had similar crude pregnancy rates in comparison to laparotomy, and both techniques were clearly superior to medical management alone [65].

Indeed, the most appropriate surgical therapy for infertility complicating severe endometriosis is unknown. There are no randomized controlled trials demonstrating an improvement in fertility after segmental bowel resection. However, an observational study by Stepniewska and colleagues comparing a group of patients undergoing segmental bowel resection, with a group of patients having resection of endometriosis without a bowel resection, revealed an improved pregnancy rate when patients underwent resection [66]. Proponents of bowel resection also note the decrease in recurrence with bowel resection for severe endometriosis compared to more conservative options. Recurrent endometriosis has a significant negative impact in the pregnancy rate for women undergoing repeat surgery for endometriosis [67]. Achieving pregnancy was reduced almost 50% with recurrent endometriosis, and in vitro fertilization may be considered instead of another surgery for recurrent disease.

The infiltrating nodular endometrial implants involving the rectovaginal portion of the cul-de-sac often invade both the vagina and rectum (Figure 42-7a–d). Since removal of the implant will require resection of a portion of the rectal wall, dissection of the lesion from the vagina allows for en bloc removal of the lesion with the rectal wall. There is often no discernible plane between these lesions and the walls of the rectum or vagina. Care must be taken to avoid penetration of the vaginal wall with possible injury to the cervix, especially in women desiring eventual pregnancy. Often it is advantageous to mobilize the rectum in the posterior and lateral tissue planes to adequately define the lesion before attempting the anterior dissection. Blunt dissection of the rectovaginal plane below the area of involvement may help clarify the distorted anatomy and avoid inadvertent entry into the bowel lumen. After careful dissection of the lesion from the vagina, the normal rectovaginal plane is reached, and the fixed, hard mass may suddenly become mobile and amenable to resection.

Disk excision of the anterior rectal wall, by either laparoscopic or open technique, is performed for single lesions

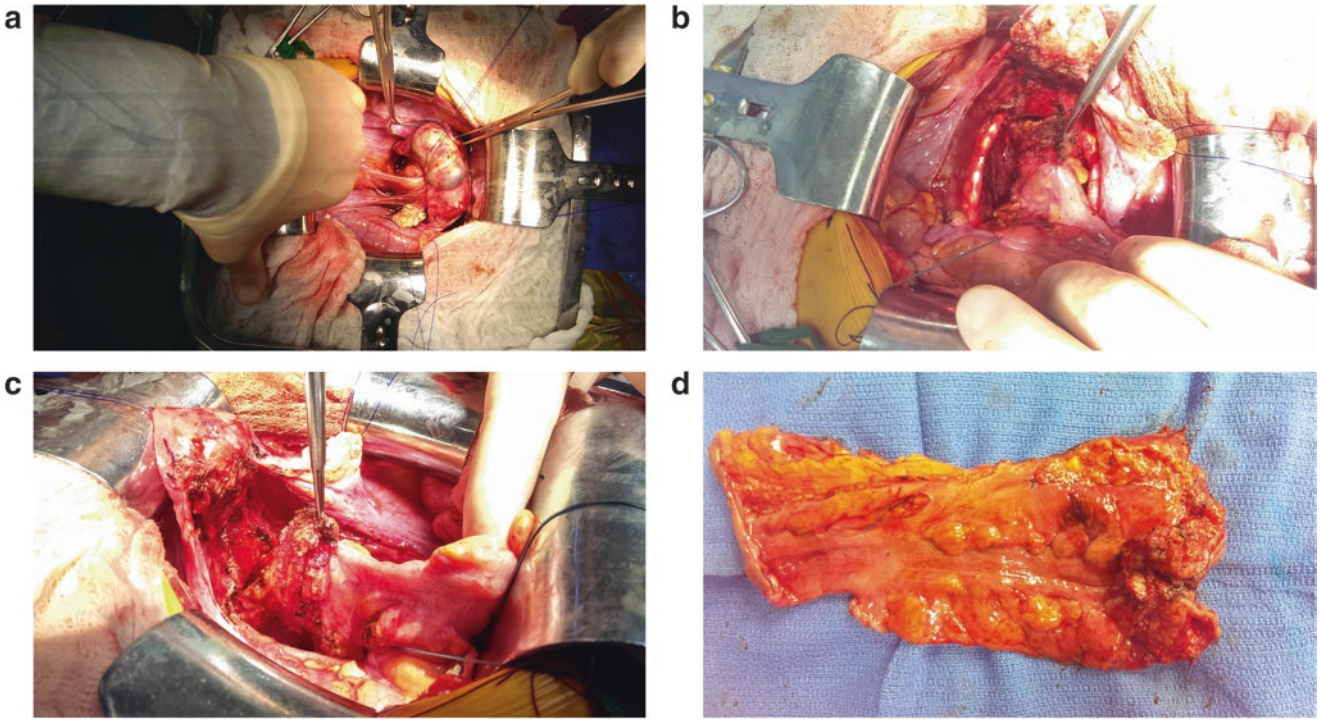
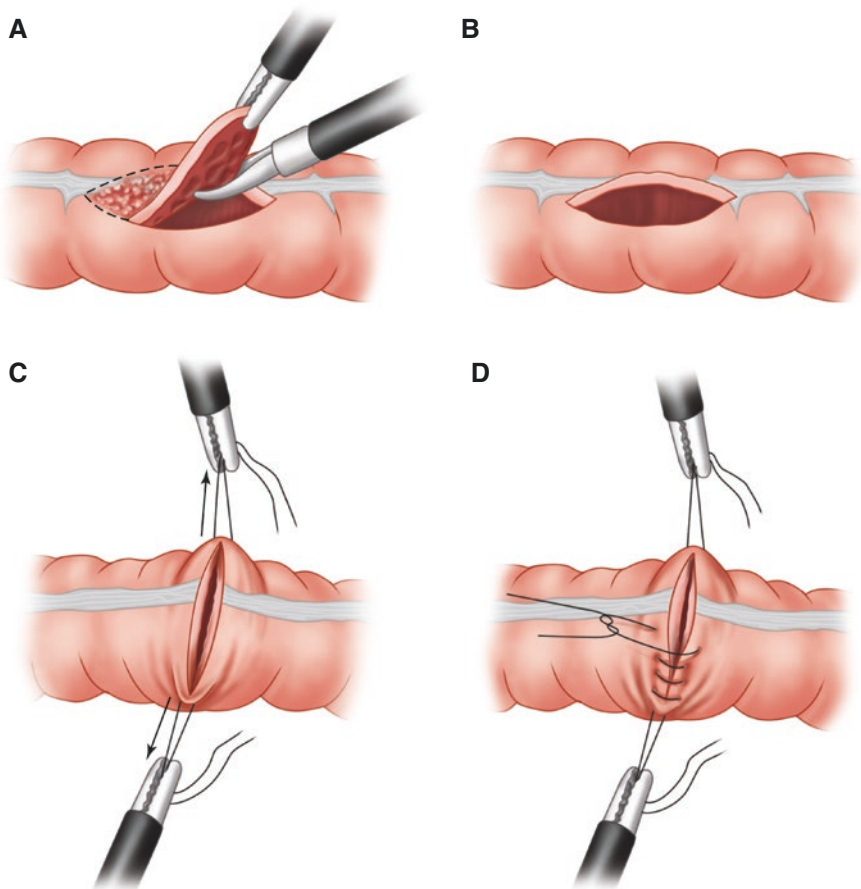


FIGURE 42-7. (**a**) Demonstrates the view of the endometrial implants obliterating the pouch of Douglas and an associated large endometrioma on the left ovary at the start of the procedure; (**b**) the large nodule of endometriosis has been dissected from the ureters and posterior vagina (note the lighted ureteral catheters that facilitate the dissection); (**c**) demonstrates visualization of the normal fat within the rectovaginal plane after fully dissecting cul-de-sac of Douglas and mobilizing the lesion rostrally out of the pelvis to allow resection; (**d**) demonstrates sectioning of the specimen to show the typical appearance of an endometrioma after hormonal therapy which induces diminished vascularity of the lesion.

FIGURE 42-8. (**a**)–(**d**) Disk excision of an endometrial implant.



usually less than 3 cm in diameter. Contraindications to disk excision performed laparoscopically include sigmoid involvement; bowel stenosis, more than 50% circumference involvement; and multicentric disease [68]. After marking the lesions circumferentially with electrocautery, stay sutures are placed on either side of the endometrial implant. Full-thickness bowel wall excision is then performed with the cutting current electrocautery. Interrupted transverse absorbable sutures are subsequently placed to close the resulting defect. When performing the disk excision laparoscopically, the technique can be very similar to open surgery or may be done using a transanal stapler. An initial "shaving" may be performed to debulk the lesion. After placing a guide suture at the level of the lesion, a circular stapler is deployed, and the bowel lesion is sandwiched in the groove anteriorly between the stapler and the anvil by pulling gently on the guide suture. A full-thickness, partial circumference of the bowel wall is excised with the firing of the stapler [69]. The major complication of this laparoscopic technique is bleeding with significant bleeding requiring blood transfusion in about 10% of patients in two series [70, 71].

Segmental resection of the rectosigmoid is performed for larger lesions or when neoplasia is a concern. Margins are to grossly normal colon, and unless there are multiple lesions, a large colonic resection is not required. High ligation of the sigmoid vessels is also unnecessary, and the anastomosis may be either hand-sewn or stapled. When resection is performed laparoscopically, the involved segment may be removed by extending one of the port sites. Nezhat and Pennington have described a technique of prolapsing the lesion outside the anus for resection [72]. Redwine has described a transvaginal approach for specimen removal [73]. Open or laparoscopic excision of these deeply infiltrating rectovaginal lesions is very technically demanding. The lack of discernible tissue planes, the intimate association of the rectum and vagina, and the frequent occurrence of distal infiltration of endometriosis down to the mid- to lower rectum make laparoscopic resection possible only by surgeons very experienced in complex intestinal laparoscopy. A series by Senagore had eighteen patients with stage 4 endometriosis treated by laparoscopic intestinal resection. While they concluded that laparoscopic resection was technically possible, complications included a ureteral injury and an anastomotic leak requiring an ileostomy for diversion [74]. Even in the hands of experienced laparoscopists, rectovaginal fistula requiring ileostomy has been reported to occur following these resections [75]. Proctoscopic insufflation to assess for leak is practiced routinely by the authors with all rectal anastomoses, whether performed open or laparoscopically.

Small Bowel and Appendiceal Endometriosis

While endometriosis involving the small bowel or appendix is much less common than rectosigmoid disease, careful inspection of these organs is critical in patients with advanced endometriosis to ensure complete removal of all gross disease and to minimize recurrence. Superficial small bowel implants may be treated with sharp excision, electrocautery, or the laser, as described above. Deeper implants may require small bowel resection and, if within 5 cm of the ileocecal valve, may need an ileocecectomy. Appendiceal endometriosis is treated with appendectomy. Occasionally, a surgeon will encounter a patient with an endometrial implant while operating for another condition. While the lesion may exhibit a classic visual appearance consistent with endometriosis, a biopsy to confirm the diagnosis and exclude malignancy is important. Several studies have suggested that few patients with small asymptomatic endometrial implants of the appendix will become symptomatic, but no study has yet defined the natural history of these lesions. As a result, for those patients with asymptomatic endometriosis, observation is probably sufficient, but hormone replacement therapy should be avoided.

Results After Surgical Therapy

Recurrence of endometriosis after surgical excision is difficult to assess because of a wide variability in the operative approach to endometriosis by various authors and the obvious need for postoperative laparoscopy to document asymptomatic recurrence. While there are no long-term prospective studies to date, the larger studies suggest a histologically confirmed rate of recurrent endometriosis of approximately 19% [76]. Gauging the response to surgery by the resolution of preoperative pelvic pain or infertility is easier to measure. The largest series of intestinal resections for advanced intestinal endometriosis by Bailey et al. found that 86% of patients had complete or near complete relief of their preoperative pelvic pain. In addition, a 50% crude pregnancy rate was achieved which was comparable with rates found when treating much lower stages of disease [77]. These results in over 130 cases with a median follow-up of 5 years were achieved with minimal morbidity, no anastomotic leaks, and no documented instance of recurrent colorectal endometriosis. Laparoscopic series of intestinal resections performed for extensive endometriosis have reported similar pregnancy rates albeit with smaller number of cases, higher complication rates, and shorter long-term follow-up.

Combined Medical and Surgical Therapy

Both medical and surgical therapies for endometriosis have potential reasons why each treatment alone may not be successful in eradicating the disease and minimizing recurrence. Medical therapy affects endometrial implants variably, and there is a high instance of recurrence following cessation of therapy. Surgery may not remove microscopic disease, and postsurgical adhesions may contribute to postoperative

pelvic pain and infertility. For these reasons, combination therapy either pre- or postoperatively has been used for several years, although with a paucity of prospective randomized data to conclusively prove long-term improvement in recurrence and symptoms.

The rationale for preoperative medical therapy conducted over a period of 3–6 months is principally to decrease the inflammation and possibly the size of the endometrial implants. Presumably, this therapy will allow easier excision with diminished adhesion formation. Medical therapy may also reduce the vascularity of endometrial implants. A prospective study by Buttram in 1985 revealed an improvement in pregnancy rates with 6 months of danazol given preoperatively with all stages of endometriosis [78]. The optimal length of therapy and long-term (and not just delayed) recurrence rates must still be elucidated. Postoperative treatment with danazol and oral contraceptive pills has not been shown to have durability, and the initial excitement over improved recurrence rates at 12 months has not been duplicated after longer follow-ups. Our current use of combined therapy is a 3–6-month course of a GnRH-a prior to definitive surgery.

Conclusion

The diagnosis and management of intestinal endometriosis have evolved tremendously over the last 20 years with the widespread availability of laparoscopy and a clear understanding of the necessity to remove all endometrial implants in symptomatic patients. With the advent of stapling devices that facilitate low pelvic anastomoses, the intestinal surgeon should be able to resect the endometrial implants and restore bowel continuity in virtually all patients with minimal morbidity and preserved fertility, when desired. Further improvements in outcomes will probably not occur until a better understanding of the precise etiology and growth of the endometrial implant is discovered.

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