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## Deeply Infiltrating Endometriosis: Implications, Diagnosis, and Management

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**Deeply infiltrating endometriosis was described in the early part of the last century. Only recently, has there become a greater awareness and understanding of this form of endometriosis aided in part by advances in laparoscopic surgical technology in techniques. The clinical implications of the disease as well as diagnosis and current management are reviewed.**

**Target Audience:** Obstetricians & Gynecologists, Family Physicians

**Learning Objectives:** After completion of this article, the reader will be able to describe the pathologic features of deeply invasive endometriosis, to list the implications of deeply invasive endometriosis, and to outline treatment options for deeply invasive endometriosis.

### INTRODUCTION

The enigma of endometriosis continues to present a puzzle. It is a benign disease, yet it may be locally invasive, have widespread disseminated foci, and proliferate in pelvic lymph nodes (1). It is a condition where macroscopically minimal disease may be associated with severe pain and yet extensive disease may be clinically silent.

Endometriosis is defined histologically as the presence of endometrial glands and stroma outside the cavity of the uterus. The macroscopic appearance is protean and can be described as black and puckered, red, vesicular, or flame-like to name a few (2, 3). This has led some to believe it is a relatively normal occurrence in most women (4). Others have suggested a more clinically oriented definition—the

presence of ectopic endometrium, in association with evidence of cellular activity in the lesions and of progression, such as the formation of adhesions, or by its interference with normal physiological processes (5).

Infiltrating forms of endometriosis have been described as early as 1913 (6). In this form of the disease, the endometriosis penetrates below the surface of the peritoneum and, possibly, may not be visible. Endometriotic implants that invade more than 5 mm are defined as deeply invasive (7). Although it is hard to know the true incidence of deeply invasive disease, one series reporting the depth of infiltration in 132 consecutive patients requiring resection of disease found the incidence of deep disease (5 mm depth or more) to be as high as 33% (8). The significance of deeply invading lesions is that they are usually very active and strongly related to pelvic pain and deep dyspareunia (7). In addition, because of its subperitoneal location the diagnosis is often unrecognized, even at laparoscopy.

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Deeply invasive endometriosis seems to be concentrated at several sites in the pelvis; 55% of lesions in the pouch of Douglas, 35% on the uterosacral ligaments, and 11% in the uterovesical fold (9). Together with cystic ovarian endometriosis, deeply infiltrating endometriosis is considered the most severe form of the disease (10).

### Pathology

Cornillie et al. (9) studied the relationship of depth of infiltration and the relationship to histology and symptoms. In their series based on a tertiary referral population of 179 patients undergoing laparoscopies for pain, infertility or both, they classified infiltrating implants into several groups: superficial ( $\leq 1$  mm), intermediate (2–4 mm), and deep ( $\geq 5$  mm).

They suggested that patients with a diagnosis of deeply infiltrating endometriosis formed a distinct group. The sites of involvement within this group seemed to include predominantly the rectovaginal septum, uterosacral ligaments, and the uterovesical fold (9). In addition, the disease activity seemed to bear relation to the depth of invasion. Contrary to former belief, deep disease was found not to be inactive scar tissue, but instead, highly active in terms of glandular and stromal mitoses.

Koninckx and Martin (11) describe three morphological patterns of infiltrating lesions. Type I is conical with the flat base facing onto the peritoneum and the tail pointing beneath the surface. This was also the most common lesion in their tertiary referral population. Type II is a form of infiltrating endometriosis where the lesion tethers adjacent bowel or bladder. Type III is a spherical nodule and may be completely buried beneath the surface of the peritoneum. This third type is the most difficult to diagnose and on laparoscopic inspection may be unnoticed. It has also been suggested that this form is the deepest and most severe (12).

Koninckx et al. (7) speculated that because the depth of infiltration was biphasic with the nadir around 5 to 6 mm and because the deep lesions were found to be very active, they were separate entities. They postulated that superficial pelvic endometriosis was under the influence of peritoneal fluid hormones and that plasma hormones regulated deep endometriosis.

The work of Donnez et al. (14) suggests that there may be two histological forms and pathogenesis of deep nodular endometriosis. One form is a deep infiltrating endometriosis in which there is invasion of very active peritoneal lesions into deeper tissues.

It can lead to retraction of rectosigmoid bowel and obliteration of the Pouch of Douglas. Another form of pseudoinfiltrating endometriosis has been suggested as a form of adenomyosis. This extrauterine adenomyosis is thought to originate *de novo* from mullerian remnants (13). This type of lesion is well circumscribed, consisting largely of smooth muscle, very active glandular tissue, and scanty stroma. Secretory changes often are absent from these nodules. In some cases, there is invasion of the muscle by very active glandular epithelium, which indicates that is not necessary for invasion. This indicates that these nodules histologically are distinct from peritoneal endometriosis. This group also studied the estrogen and progesterone receptor levels in the nodules and compared them with eutopic endometrium throughout the cycle (14). They surmised that the variations in the estrogen and progesterone receptor content of the nodules indicated that they were less influenced by steroid hormones. They concluded that peritoneal endometriosis and rectovaginal nodules are two separate disease entities with different pathophysiologies.

### DIAGNOSIS

#### History, Examination, and Laparoscopic Findings

The diagnosis of deeply infiltrating disease requires awareness and vigilance for this entity. It may be missed on cursory vaginal examination and even at laparoscopy because the lesions may be hidden completely beneath the peritoneum. Paradoxically, there is poor correlation between depth of infiltration and the appearance of the overlying peritoneum. In one study, the patients with the most severe type III infiltrating lesions were most often scored as Revised American Fertility Society (R-AFS) stage I (11). In addition, in that same series, the authors resected deep endometriosis in three patients in whom there was no visible evidence of the disease. Hence, severe, deeply infiltrating disease may occur with no other signs of pelvic endometriosis and hence, laparoscopy may be incorrectly considered to be normal.

The diagnosis of deeply infiltrating endometriosis begins, as always, with an accurate and detailed history. Specific questioning should be directed toward the complaints of severe dysmenorrhea, deep dyspareunia, and dyschezia. Invasion of endometriosis into the rectal lumen and subsequent rectal bleeding at the time of menstruation is uncommon (15) but still a well-described phenomenon. After a complete medical history has been obtained, exami-

nation of the pelvis should be performed. The rectovaginal septum, uterosacral ligaments and the cul-de-sac should be carefully palpated. Nodules may be felt as rubbery, discrete lumps with varying levels of tenderness and may be best identified by rectal examination. Ripps and Martin (16) found that there was poor correlation between focal tenderness on examination and the R-AFS stage. They found, however, a relationship between focal tenderness and endometriosis affecting the cul-de-sac and uterosacral ligaments. Tenderness was also related to the depth and the volume of disease. Vercellini et al. (17) found that presence of vaginal nodules of deeply infiltrating disease corresponded with the frequency and severity of deep dyspareunia.

Examination for pelvic tenderness and nodularities performed at the time of menstruation is more sensitive in detecting deep endometriosis than at other times in the cycle (18). Routine clinical examination for pelvic nodularities detected only 36% of cases of deep endometriosis; however, examination at the time of menstruation detected 10 of the 13 cases of deep endometriosis confirmed at laparoscopy. Such an examination during menstruation has been found to increase the clinical detection of deep endometriosis, endometriomas, and cul-de-sac adhesions by more than five times that compared with examination outside the time of menses (18). However, examination at such a time may be less well accepted by the patient, and should be reserved for those patients in whom the diagnosis remains uncertain. A decision to perform laparoscopic assessment of the pelvis is based on the severity of symptoms and clinical suspicion. Diagnosis of deeply infiltrating disease is confirmed ultimately by resection of the disease for histology and assessment for depth of infiltration.

Before surgery, a repeat pelvic examination under general anesthesia should be performed. A combined vaginal and rectal examination may reveal areas of fibrosis in the rectovaginal septum. Laparoscopically, the lesions may sometimes be observed as white scarring, and palpation with a probe during the concurrent vaginal examination will also aid in detection of infiltrating disease. Cul-de-sac obliteration may be deceptive. The rectum is pulled up and forward and attached to the back of the uterus. Placing sponge-holding forceps into the posterior fornix and a large Hegar dilator or a bowel sizer into the rectum will aid in defining the margins of the rectum. With obliteration of the pouch, the tips of the sponge-holding forceps will not be seen to tent the posterior fornix. There will be palpable firmness in this area and the cul-de-sac will have lost its normal pliability.

The disease may extend along the rectovaginal septum and may infiltrate and extend into the uterosacral ligaments, posteriorly into rectum and sigmoid and also laterally involving the sidewall of the pelvis to surround the iliac vessels and ureter. The uterus may be pulled posteriorly and fixed by adhesions and disease in the pouch of Douglas (fixed retroversion).

### SERUM MARKERS

Supplementary investigations generally lack sensitivity and specificity to be clinically useful in most settings. Of serum tests, CA-125 has been evaluated at most intensely. Levels are elevated in serum and peritoneal fluid in patients with endometriosis. It is also elevated in other conditions, notably certain forms of ovarian cancer. Even in advanced disease, there is a large overlap with levels in healthy women. With deep infiltrating endometriosis and endometriomas, Koninckx et al. (18) reported that CA-125 taken from the follicular phase was most reliable for predicting deep endometriosis and cystic ovarian endometriosis. They proposed that superficial subtle lesions (red or white vesicle, or polypoid lesion) secreted CA-125 mainly into the peritoneal fluid and that deep lesions secrete CA-125 into the plasma (19). In their study of laparoscopies for pelvic pain or infertility, they found that CA-125 levels had a high specificity (sensitivity of 24% and a specificity of 97%) in the diagnosis of deeply infiltrating endometriosis using a cutoff of 35 U/ml.

CA-125 levels lack the sensitivity to be an effective screening test, but it may be a more useful tool for following the success of treatment and recurrence. Levels of plasma CA-125 correspond to the total volume and depth of the endometriosis (19) and not to the total surface area of endometriosis or to the area of subtle or typical lesions (black, puckered lesions). Pittaway and colleagues (20) showed that the CA-125 levels after surgical treatment significantly correlated with fertility levels. In this series of 342 women, the preoperative levels of CA-125 were not significantly different; however, levels after surgical treatment were lower in those subsequently achieving pregnancy. The authors suggested elevated postoperative levels may correlate with lower fertility rates because of untreated subperitoneal disease. Other proteins released by endometrium have been investigated including CA-72, CA-19-9, and PP-14. However, they are used primarily at the research level.

## IMAGING

### Ultrasound

Imaging techniques are of limited value in diagnosis of infiltrating lesions in the clinical setting, particularly with small lesions. Advances in technology, especially in magnetic resonance imaging (MRI), may provide more useful tool in the future. Overall, ultrasound is not very useful in the diagnosis of endometriosis. Friedman et al. (21) found that ultrasound had a 10.8% sensitivity for predicting endometriosis in patients with infertility. It is perhaps more accurate when confined to looking at the ovaries for endometriomas (22, 23) with up to 83% sensitivity and 98% specificity. Less work has been done regarding the infiltrating endometriosis.

Recently, Chapron et al. (24) reported on the role of rectal ultrasound in deep pelvic endometriosis. Their primary goal was to assess this tool in diagnosing rectal wall infiltration. In this retrospective survey, 38 patients had preoperative rectal ultrasound and subsequent laparoscopy, which revealed deep infiltrating disease. Seventeen patients were found to have ultrasonic evidence of rectal infiltration. Sixteen patients underwent laparotomy and bowel resection and colorectal anastomosis. In all 16 cases, infiltration into the rectum was confirmed histologically. Bowel infiltration was suspected clinically in 67% of these women. In 12 patients, ultrasound revealed infiltration of the uterosacral lesions and/or the rectovaginal septum. These patients underwent laparoscopic resection of the lesions and histology confirmed endometriosis in the tissues examined. The authors believed that laparotomy as opposed to laparoscopic means of resection of deep bowel infiltration was preferred and used rectal ultrasound to decide which patients should be treated by these means.

Ohba et al. (25) performed rectal ultrasound on 93 women and observed that those with laparoscopically confirmed endometriosis had significantly thicker uterosacral ligaments than the 64 controls with a history of pain or infertility, but no endometriosis. They also found that patients with endometriosis had more nodular and irregular-appearing uterosacral ligaments. Although histological confirmation of ligamentous endometriosis was not sought, thickened uterosacral ligaments (>14 mm) were frequently associated with tenderness at that site.

### MRI

MRI provided a more successful detection of plaque-like disease and infiltrating disease. Again,

the detection rates are higher for endometriomata than that of implants. Initially, by the standard view, results were not impressive. With T1 and T2 weighted imaging, Arrive et al. (26) found only a 13% sensitivity for implants. In particular, there were 13 cul-de-sac lesions ranging from small implants to partial cul-de-sac obliteration. None of these were detected.

Subsequent reports were more favorable. Using fat-suppressed images, better clarity of these lesions was achieved. Ha et al. (27) found 27% and 61% sensitivity for conventional images and fat suppressed images, respectively in detecting peritoneal implants. The specificity was 98% and 87%. The authors felt that MRI could have a role as a complementary tool in diagnosing infiltrating endometriosis.

Similarly, using thinner sections (6 mm as opposed to 10 mm) by Arrivé et al. (26) and fat saturation techniques to more clearly define implants from surrounding fat, Takahashi et al. (28) found significantly greater sensitivity in detecting smaller implants. Of the 122 implants, fat saturation techniques diagnosed 84% of the lesions compared with only 58% using conventional techniques. The detection rate was 100% for lesions 4 mm or over. With the smallest implants of 2 to 3 mm, they detected 44.1% with fat saturation. With conventional MRI, only 2.9% of these lesions were detected. Considering these results, only the very small lesions were undetected and MRI may have a role in follow-up treatment after resection or for recurrence.

### Implications of Deep Infiltrating Endometriosis and Pain

Traditional teachings would suggest that there is little correlation between symptoms of pain and severity of the endometriosis. It seems that infiltrating endometriosis may be a significant cause of pelvic pain (7), and because the specific depth of infiltration is not addressed in the R-AFS score, it may explain the discrepancy between pain and severity as gauged by this method. Concerning infertility, the relationship is less clear.

Studies have yielded conflicting results when pain is correlated with stage. Buttram (29) reported little correlation between dysmenorrhea and dyspareunia and the original American Fertility Society (AFS) classification (30). Others have also showed similar findings (17, 31).

Fedele and co-workers (32) compared 124 infertile women with endometriosis to 67 infertile women with normal pelves, and observed a rough correlation

with pain and stage if they subdivided the stages into two groups, I-II and III-IV. By grouping R-AFS stages III and IV, they noted more severe pelvic pain than the control group. Deep dyspareunia was more common in the endometriosis group regardless of stage, and there was a trend between stages I-II and III-IV. The frequency of dysmenorrhea was similar in patients and controls. When grouped, stages III and IV had greater pelvic pain compared with stages I and II. These authors explained their seemingly conflicting results with their prior study (31) by bias in the recruitment. In a prospective study of 65 women with no prior treatment for endometriosis, Muzii et al. (33) found that the levels of dysmenorrhea were significantly related with the R-AFS score, the partial score for deep endometriosis and the partial score for adhesions. Interestingly, again there was no statistical difference in pain scores between patients with endometriosis and the 15 controls who had a normal pelvis on laparoscopic examination for infertility only.

Stovall et al. (34) reviewed the histories of women who had medically or endoscopically treated endometriosis with chronic pelvic pain. They used pain scoring according to the AFS (35). Although they found that there was no correlation between stage of disease at initial diagnosis and severity of pain, a greater stage of disease was associated with an increased risk for persistent pelvic pain. There was a correlation of lateral pain in women with primarily ovarian disease. Otherwise, there seemed to be no relationship between sites of the lesion and location of the pain.

The severity of endometriosis is most often graded according to the R-AFA classification. It provides a means of documenting the extent and the location of the disease. Many classifications have been proposed for endometriosis (36); however, the AFS classification (30) and now the R-AFS (37) are the most widely accepted. This classification is primarily designed for women with infertility. However, even considering fertility, it does not support a dose-response relationship between severity and pregnancy after treatment (38).

Later reports indicated that pain might be better correlated to deep infiltrating lesions rather than the R-AFS classification. Cornillie and colleagues (9) demonstrated that level of pain is strongly correlated to the depth of invasion and that all patients with very deep infiltration (>10 mm) all had severe pelvic pain. Vercellini et al. (17) also found that vaginal endometriosis, the most advanced form of endometriosis, was correlated with the frequency and severity of deep dyspareunia.

Koninckx et al. (7) studied 643 consecutive patients having laparoscopies for pelvic pain, infertility, or both. They found the depth of infiltration was the most important discriminator for pelvic pain. The presence of pain did not correlate well with the total area of pelvic endometriosis, the total volume of subtle endometriosis, or the volume of endometriomas. However, pain did correlate with the presence of an endometrioma and the total volume of typical endometriosis (black puckered spots in white plaques). Once they controlled for depth of invasion, no other factors were significant predictors of pain. Their data suggested that the main cause of endometriosis-related pelvic pain is infiltrating forms, and that this was more significant than the presence of endometriomas or adhesions.

Besides depth, some clinicians have suggested that the number, site, and type of visible lesion correlate with symptom severity. Perper et al. (39) found that intensity of pain was related to number of implants. Vercellini et al. (40) found deep dyspareunia was associated with typical lesion (black nodules, stellate scars) but not atypical lesions (clear vesicles, clear or red papules, red polypoid lesions).

In summary, the R-AFS classification has been primarily designed for infertility scoring. It seems to be a poor predictor of pain. This is not surprising as the mechanism by which endometriosis causes pain is not altogether clear. Endometriosis, in all probability, causes infertility and pain via different pathogenic mechanisms. Although the classification does distinguish between superficial and deep implants, it does not quantify the depth. Also, it does not distinguish between the sites of different lesions, which also may influence pain. If, indeed, deep infiltrating disease is largely responsible for pain as some reports suggest, a separate classification incorporating this would seem to be reasonable. A subcommittee of the endometriosis classification committee of the AFS was formed to examine this option. As a result of this option, Rock (41) reinforced the need for a new classification and produced a form for recording types, sites, volume and location of endometriosis and adhesions as well as an assessment of the degree of pelvic pain (35). With these data, it was hoped that an international collaborative could progress further toward a classification for endometriosis in women with pelvic pain.

### Treatment of Infiltrating Endometriosis

Evaluation of the efficacy of treatments in endometriosis is difficult as the natural history of the

disease is not altogether clear, and some patients have shown natural regression (42, 43). Furthermore, most surgical series are uncontrolled or retrospective. The measurement of pain is problematic because of its subjective nature and lack of uniformity in scales for measuring it. In addition, chronic pelvic pain may have many different organic and protean origins including gynecological, urologic, and musculoskeletal. The pain may also be influenced or compounded by many other factors including personality (44), psychiatric disorders (e.g., bipolar disorder, depression), sexual dysfunction, psychosocial factors, and sexual abuse (45).

Medical therapy undoubtedly does have a role in managing pain associated with endometriosis. But no drug has been shown to be curative, nor have studies looked at medication specifically in deep infiltrating disease. Medical treatment leads to regression rather than elimination of the disease and pain often recurs after cessation of the therapy (46). Most modern drugs, including GnRH analogues and danazol, are of similar efficacy. In the review by Cirkel (47) of trials on danazol and GnRH analogues, objective improvement at second-look laparoscopy at approximately 6 months follow-up in terms of R-AFS score ranged from 20.8% to 82.2% and subjective improvement in symptoms ranged between 40% and 100%. In a long-term follow-up to GnRH analogues, Waller and Shaw (48) report a cumulative recurrence by the fifth year of 53.4%. Recurrence rates were higher (74.4%) for severe disease.

Because infiltrating lesions respond poorly to medical therapy (49), it may be necessary to require surgical treatment for a more definitive management (10, 24). In the past, the surgical approach to severe endometriosis was a total abdominal hysterectomy and bilateral salpingo-oophorectomy. But, pelvic clearance is not always a reasonable option, especially in the younger patient. Now there is a trend toward more conservative surgery by resection of the disease alone, leaving the healthy uterus intact. It seems that the degree of pain relief correlates with completeness of disease resection (49–51). Indeed, a hysterectomy alone without removal of the endometriosis may do little good.

Of surgical approaches, the question of laparoscopy or laparotomy as the primary approach remains controversial. There are no good randomized, prospective trials comparing the two modalities, so we must draw on retrospective and often uncontrolled series. Most studies do not look specifically at deeply infiltrating disease.

Regarding fertility, there is no clear evidence favoring either modality of surgery. A meta-analysis by Adamson and Pasta (52) suggests that there is little difference in pregnancy rates when severe disease is managed laparoscopically or by laparotomy. They looked at the four studies comparing laparoscopy versus laparotomy in the treatment of endometriosis-related infertility. Two were considered too small. In the third, Paulson et al. (53) compared 178 patients treated with laparotomy between 1979 and 1983 to 296 laparoscopy patients between 1983 and 1986. There were no statistically significant differences in pregnancy rates. In a prospective comparative study, Adamson et al. (54) found that in patients with endometriosis as the only infertility factor, the analysis of the pregnancy rates indicated no differences between the two modalities. Crosignani et al. (55), in a prospective, nonrandomized study of 216 patients with severe endometriosis, found that both laparotomy and laparoscopy were comparable considering fertility at median the follow-up of 24 months.

For pain control, resection of endometriosis by both laparoscopy and laparotomy has been shown to be a highly effective management (51, 56). Similarly, the data regarding recurrence after conservative surgery by both laparotomy and laparoscopy seem similar with approximately 19% recurrence after 5 years (51, 56, 57). Crosignani et al. (55) published a retrospective analysis of conservative surgical laparoscopy versus laparotomy in the management of severe (grade IV) endometriosis. They found no difference in the two methods in the outcome of pain and fertility.

Laparoscopy, however, may enjoy several advantages over laparotomy, despite the paucity of good comparative trials. It offers better visualization under magnification and has the advantage of less postoperative pain and earlier discharge. Compared with traditional methods, it offers superior access and visualization to areas such as the rectovaginal septum. Although palpation is less direct, tissue firmness can be gauged indirectly with the laparoscopic instruments. Although techniques such as suturing are more difficult, these skills are gained in time, especially within good teaching programs and preceptorships.

Different methods of laparoscopic removal of infiltrating endometriosis have been described. These include laser vaporization (49), laser resection (11, 58), and electrosurgical resection (50). Although vaporization is possible, excisional techniques have the advantage of producing a histological specimen and

therefore, provide better evaluation of the dimensions of a lesion.

Several series in the literature address the results from surgical management of deep disease specifically. Donnez et al. (14) reported good success rates in pain control in their large series. The series consisted of 500 patients who had rectovaginal nodules resected. Of these, 497 were done by laparoscopy. Good results were obtained in the 242 patients with follow-up of 2 years or more. Severe recurrent pelvic pain was noted in 3.7% of patients, and only 1.2% had recurrent dyspareunia. They reported that most patients were far better in terms of relief from pain.

Chapron et al. (59), in a retrospective study of 21 patients whom had deep lesions treated in the uterosacral ligaments, also reported favorable results. Follow-up for at least a year revealed 84.2% of those presenting with dysmenorrhea improved. Sixteen of the 17 patients who had deep dyspareunia (94.1%) improved, and 7 of the 9 patients (77.7%) with chronic pain improved.

Redwine (15) supports an en-bloc resection in cases of obliteration of the cul-de-sac. He argues that merely separating the rectum from the uterus does not remove the underlying disease. Using monopolar diathermy scissors, he recommends resection of the posterior cervix, cul-de-sac and, if necessary, the rectal wall.

Our group prefers to excise the endometriosis with electrosurgery and scissors. Routinely, all patients have their bowels prepared for surgery the day before. A four-puncture technique with 1-cm umbilical incision and three 5-mm incisions is used. If necessary, adhesiolysis and freeing of bowel is performed first to gain access. Intraoperative inspection and palpation, both laparoscopically and by rectal and vaginal examination, is performed to locate the hard deposits of infiltrating endometriosis. Nodules can usually be differentiated from the softer surrounding tissue; however, this may be difficult when the endometriosis encroaches on the cervix. The disease is sometimes extensive and encases the ureters and uterine artery or invades into rectum and rectovaginal septum. Slow, meticulous resection is required so that as much of the disease is resected as possible. Occasionally, part of the rectal wall or vaginal wall needs to be resected to remove the disease. Lesions often involve rectum, and they can be resected usually without entering the lumen. The serosal defect is closed with interrupted sutures. Similarly, lesions may invade into the vagina, and segments of vagina may need to be removed. Dissection into the rectovaginal septum is sometimes necessary. As the rec-

tum is dissected away from the posterior wall of the vagina, we find that a bowel sizer is an ideal instrument for delineating the margins of the rectum and use it to move the rectum when dissecting into the pararectal space. At the completion of the procedure, the integrity of the rectal wall is checked. The pouch of Douglas is filled with saline solution and 100 ml of air or methylene blue is insufflated into the rectum. Ureters are identified and endometriotic implants are dissected using the principle of pulling the implant away from the pelvic sidewall and vital structures, toward the safety of the central pouch of Douglas where careful dissection is less hazardous. Cystoscopy is performed after the administration of intravenous methylene blue or indigo carmine. Dye spillage from the ureteral orifices is observed. Ureteral stenting is performed if there is any concern.

Needless to say, when surgery is performed in such a challenging anatomical area, complications can arise. Koninckx et al. (60) reviewed the complications in their series of 212 patients who had CO<sub>2</sub> laser excision of deep endometriosis. He reported six late bowel perforations, an injured ureter, and transection of the uterine artery in two patients.

### Preoperative Medical Therapy

Will medical therapy before surgery make the procedure easier? There is no question that medical therapy does reduce the size of implants. Shaw (61) reported a 59% reduction in the R-AFS score after 24 weeks of goserelin. Only 2% of patients failed to gain more than 50% improvement in severity. Reduction in volume of disease should make the surgery less difficult. To some surgeons, the reduction in vascularity and inflammation of lesions after hormonal suppression aided their surgery (62). However, others have observed that the hypoestrogenic effect makes tissue more friable. This may make the surgery more difficult (63).

Another form of severe endometriosis is ovarian endometriomas. Endometriomas and deep implants are distinct entities of the same disease, but tend not to occur in the same women (10, 11). There has been some dispute whether medical therapy does reduce the size of endometriomas, and various reports have been reviewed by Schenken (64). More recently, Rana and co-workers (65), in a prospective nonrandomized study, showed that the size of endometriomas decreased with preoperative danazol or GnRH analogues. Although they felt that the size of the endometriomas decreased in all cases, they noted that only lesions >3 cm could be accurately evaluated

using ultrasound. Hence, in the 41 women with endometriomas >3 cm, the size decreased on average by 51% after 24 weeks of treatment. They also found less pelvic vascular congestion and less inflammatory response. They commented that this made their ablation or resection easier. It is probably also true that infiltrating plaques shrink with such therapy.

Koninckx et al. (60), who are well recognized for their valuable work in infiltrating endometriosis, also strongly recommend 3 months of pretreatment with GnRH analogues in women with severe deep endometriosis. However, in practice, many cases are treated at the time of diagnostic laparoscopy, and there may not be the opportunity to give preoperative medications.

### Postoperative Treatment

The use of medication after laparoscopic surgery is the more common scenario. The use of GnRH analogues after resection of endometriosis should depend on the initial complaint and the completeness of the surgical resection. Two studies suggest benefit from medical therapy in the control of pain after conservative surgery. Telima et al. (66) in a study of 60 patients randomized to 6 months of placebo or danazol, found that the treatment group had less endometriosis on second-look laparoscopy and also fewer symptoms. Recently, Hornstein et al. (67) has demonstrated good evidence in the support of postoperative GnRH analogues in the control of pain. In a randomized, placebo-controlled multicenter trial of 105 patients, they found significant improvement in the treatment group compared with the placebo group 18 months after cessation of treatment. The treatment group had lower pain scores at the end of the 6-month treatment period, lower drop out rate due to symptoms, and a greater median time to alternative treatment. This supports the use of postoperative GnRH analogues if pain is the main complaint, especially if the resection is considered incomplete.

### CONCLUSION

There is increasing evidence that deeply infiltrating endometriosis is a specific entity and a significant cause of pelvic pain. The AFS score is primarily a staging instrument for infertility, and because it does not take into consideration deep infiltrating disease, it is an inappropriate tool to gauge endometriotic severity in the context of pain. This may be the reason why previous studies have found a poor correlation between pain and severity of disease. Deeply

infiltrating endometriosis represents severe disease and new classifications need to be devised.

Infiltrating endometriosis may be diagnosed by careful history, through clinical examination and expert laparoscopic assessment. Surgical excision of the disease may be required to relieve symptoms if medical therapy fails. There are no randomized trials assessing the efficacy of laparoscopic surgical treatment of severe endometriosis, and such trials are difficult to organize. Patients and ethics committees are unlikely to be willing to have the surgeon or the type of operation decided at the flip of a coin. Sutton (68), in the follow-up review of his randomized, controlled trial of laser laparoscopy, outlines the difficulty of obtaining approval for such trials. However, in experienced hands, laparoscopic surgery seems to be as effective as open surgery in relieving pain and preserving fertility in women with endometriosis. Yet, there exists a need for prospective controlled trials and objective assessment of pain to define the optimum management protocols for this very significant women's health problem.

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