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Laparoscopic treatment of infiltrative rectosigmoid colon and rectovaginal septum endometriosis by the technique of videolaparoscopy and the CO₂ laser

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ABSTRACT

Objective To present the technique and results of videolaparoscopy and the CO₂ laser as a treatment for deep, infiltrative endometriosis of the rectovaginal septum, uterosacral ligaments, pouch of Douglas and anterior wall of the rectosigmoid colon.

Design Observational study with 1-5 year follow up.

Setting Sub-specialty practice: Endometriosis clinic and centre for special pelvic surgery.

Subjects 185 women, ages 25-41 years. All had pelvic endometriosis and were referred because of the failure of previous medical and/or surgical treatment.

Interventions Vaporization and excision of endometriotic implants and nodules, ureterolysis, ureteric stents, laparoscopic anterior rectal wall resection and reanastomosis, presacral neurectomy, laparoscopic hysterectomy, salpingo-oophorectomy and appendectomy using the CO₂ laser.

Main outcome measures 174 patients were followed for 1-5 years after surgery by office visit questionnaire or telephone interview. Eleven were lost to follow-up.

Results 175 patients were discharged within 24 h. Nine with bowel perforations and one with a partial bowel resection were discharged 2-4 days postoperatively. Two patients required ureteric stents, which were removed 6 weeks postoperatively without sequelae. 162 women reported moderate to complete pain relief (145 after one procedure, 13 after two and four after three). 12 reported persistent or worse pain following the surgery. Seven eventually underwent total hysterectomy, four had bowel resections and one had a salpingo-oophorectomy. Of 61 with infertility, 25 achieved pregnancy. Postoperative complications included shoulder pain, anterior abdominal wall ecchymosis, urine retention and dyschezia for one to two weeks.

Conclusions Our experience suggests that rectosigmoid colon and infiltrative rectovaginal septum endometriosis can be effectively treated via videolaparoscopy in the hands of experienced endoscopic gynaecologists.

Severe endometriosis commonly involves the uterosacral ligaments, rectovaginal septum and the rectosigmoid colon with partial or complete obliteration of the pouch of Douglas. This extensive degree of disease causes low pelvic pain, back pain, dysmenorrhoea, dyspareunia with diarrhoea, constipation, and dyschezia, but rarely rectal bleeding. Numerous investigators have explored the origin, pathology and treatment of this condition (Sampson 1940; Cornille *et al.* 1990). Medical approaches are unsatisfactory. Correction and dissection by laparotomy are the usual surgical treatments, and have been reported to provide satisfactory pain relief and an acceptable pregnancy rate (Coronado *et al.* 1990). Endoscopic laser surgery has recently been used but its application has been limited in extensive disease because of lack of training in the technique and the perceived inability to palpate endometriotic nodules in order to facilitate safe removal.

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Videolaparoscopy, using the CO₂ laser through the operating channel of the laparoscope as a 'long knife' (Nezhat *et al.* 1991a), has considerable advantages, particularly when combined with the laparoscopic magnification and control consequent on video monitor observation. It is an effective treatment for advanced endometriosis in the hands of experienced endoscopic gynaecologists. We report our experience in treating deep colorectal endometriosis with this technique.

Subjects and methods

A total of 185 patients, ages 25 to 41, were managed between January 1985 and January 1990. These women had endometriosis of the lower colon, the rectum, uterosacral ligaments or the rectovaginal septum. All were referred for treatment because previous surgical or hormonal management had failed to relieve their discomfort. In 154 women, the presenting symptoms were chronic pelvic pain with dysmenorrhoea, dyspar-

eunia, back pain, dyschezia, constipation or diarrhoea. Sixty one had infertility and pelvic pain. Thirty nine patients with histories of rectal bleeding were also investigated by sigmoidoscopy and 144 had a barium enema before laparoscopy. Eighteen women had previously undergone hysterectomy with or without salpingo-oophorectomy.

Each patient had the following outpatient bowel preparation: two days preoperatively, the patient consumed clear liquids. The evening before surgery, each drank a gallon of Go-Lytely (Braintree Laboratories, Braintree, MA) during 3-4 h (GoLytely contains polyethylene glycol, Na_2SO_4 , NaHCO_3 , NaCl and KCl); at approximately 2300 hours, she took 1 g of metronidazole orally. Two grams of cefoxitin sodium were administered 30 min before the scheduled procedure. All the women were counselled regarding the possibility of a laparotomy, colostomy or bowel resection.

The procedures were performed at an outpatient service under endotracheal general anesthesia in the modified dorsolithotomy position as described in the previous article (Nezhat & Nezhat 1992). After the induction of the pneumoperitoneum and insertion of the operating laser laparoscope (Karl Storz, Culver City, California) two or three suprapubic punctures were made for the insertion of the ancillary instruments (Nezhat 1986, Nezhat *et al.* 1991g; Nezhat & Nezhat 1992). A miniature camera was attached to the laparoscope (Circon ACMI, Stamford, Connecticut). The CO_2 laser (Lasersonic, Milpitas, California or Coherent, Palo Alto, California) was connected to the laparoscope via the direct lens. The power of the CO_2 laser was between 40 and 100 W. The assistant stood between the patient's legs performing rectovaginal examination with one hand. The assistant's other hand held the uterus up with a curette, a dilator or the Humi rigid uterine elevator while both the assistant and surgeon observed the monitor. For rectovaginal septum and uterosacral ligament endometriosis, 5-8 ml of diluted vasopressin (10 units in 100-200 ml of lactated Ringer's solution) were injected into an uninvolved area with a 16 gauge laparoscopic needle. An opening was then made in the peritoneum with the CO_2 laser. A Nezhat (Cabot Medical) or a Nezhat-Dorsey (American Surgical Instruments, Inc., Delray Beach, Florida) probe was used to perform hydrodissection by means of pressurized lactated Ringer's solution forming a plane in the rectovaginal septum (Nezhat *et al.* 1989c).

While the assistant examined the rectum, the area of involvement was completely excised or vaporized until the loose areolar tissue of the rectovaginal space or normal muscularis layers of the rectum were reached. For patients whose rectum was pulled up and attached behind the cervix between the uterosacral ligaments, the uterus was first anteflexed sharply, then an incision was made at the right or left pararectal area and extended to the junction of the cervix and the rectum. For cases in which the involvement of the rectum was more extensive and the assistant's finger was not long enough, a sigmoidoscope, a sponge on forceps or a rectal probe was used. Two advantages to using the sigmoidoscope are: (i) it helps the surgeon identify the rectum and (ii) it aids in identifying or ruling out bowel perforation as this results in air bubbles passing from the air-inflated rectum into the pouch of Douglas which has been filled with irrigation fluid. While the assistant guided the surgeon by rectovaginal exam, the rectum was completely

freed from the back of the cervix. At times, generalized oozing and bleeding occurred. This was controlled with an injection of 3-5 ml diluted vasopressin solution (1 ampule in 100 ml), laser or bipolar electrocoagulator. Occasional bleeding from the stalk vessels caused by dissection or vaporization of the fibrotic uterosacral ligaments and pararectal areas was controlled with bipolar electrocoagulator. Almost all patients had some bleeding but this was always controlled by the techniques described above.

Location and assessment of the ureters before proceeding with this procedure is of paramount importance, especially when they are infiltrated by endometriosis. Any alteration in the direction of the ureters should be identified in advance. Because ureters are lateral to the uterosacral ligaments, we try to stay between the ligaments as much as possible. Using hydrodissection and making a relaxing incision lateral to the uterosacral ligament allows the ureters to retract laterally. This affords increased protection of the ureters. Different degrees of ureterolysis were often necessary to free the ureters from the surrounding fibrotic, endometriotic tissue and from ovarian endometriomas. Endometriomas (in this group, up to 25 cm in diameter) were often densely attached to the bowel and ureter, and had to be freed. Hydrodissection (Nezhat *et al.* 1989c) along with the CO_2 laser and blunt dissection were used for ureterolysis, enterolysis and ovarian cystectomy. We rarely use sharp scissors, fibre lasers, unipolar electrode or hot scissors for these dissections.

Nodularity in the pouch of Douglas and infiltration of the endometriosis towards the vagina was dealt with by vaporization and dissection while the assistant checked the nodule by palpation until it completely disappeared (Nezhat *et al.* 1991b). There is a possibility of a perforation in the vagina, which can be left alone as long as the perforation is less than 1 cm. For cases in which the involvement was more severe, partial vaginectomy and repair were required. Endometriosis rarely penetrates the mucosa of the colon; but commonly involves the serosa, subserosa and muscularis. When significant portions of both muscularis layers have been excised or vaporized and the mucosa is reached, the bowel wall may be reinforced by one to three 4.0 polydioxanone sutures. This disease can be excised or vaporized very thoroughly by an experienced videolaparoscopist. The procedure is very demanding and maximum cooperation between the assistant and surgeon is necessary.

We search for possible rectal perforations with the sigmoidoscope (Nezhat *et al.* 1991b; Nezhat *et al.* 1992b), as described before, or by injecting indigo carmine or sterile milk into the rectum with a Foley catheter. Small perforations can be repaired laparoscopically with three to four interrupted 3-0 silk or 4-0 polydioxanone sutures (PDS) (Ethicon) (Nezhat *et al.* 1991b; Nezhat *et al.* 1992b). Consultation with a colorectal surgeon is always recommended. Most patients had involvement of other pelvic organs which were treated at the same time.

Results

Excluding nine patients with bowel perforation and one with a partial bowel resection (Nezhat *et al.* 1991b) all were discharged within 24 h. The procedures (from initial laparoscopy

to termination) lasted from 55 to 245 minutes. All patients were instructed to have nothing by mouth for 24 h post-operatively, except for sips of water, and if no complications were noted, the diet was gradually increased. Patients with bowel perforation or resection were allowed nothing by mouth until they had passed flatus and, otherwise, were instructed to avoid constipation by eating a high fibre diet. The patients were examined at one and six weeks after the operation.

Of 185 patients, 33 had rectovaginal septum involvement only, 22 had fibrotic and nodular uterosacral ligaments, 50 had partial and 80 had complete pouch of Douglas obliteration. During the procedure (Nezhat & Nezhat 1991b), 11 patients with severe nodularity of the rectovaginal septum had small, vaginal perforations. No sutures were applied. In nine patients, the rectosigmoid colon was entered while removing or vaporizing endometrial nodules. Five patients had partial vaginectomy and repair. In eight patients, the bowel was repaired via the laparoscope in one layer using interrupted 3-0 silk or 4-0 PDS (Ethicon) (Nezhat *et al.* 1991b). In the ninth, whose bowel was involved with endometriosis, laparoscopic anterior rectal wall resection and reanastomosis were performed after prolapsing the bowel via the anus (Nezhat *et al.* 1991b). A patient in an earlier year underwent laparotomy for severe bowel stricture and was discharged on the fourth postoperative day (Nezhat *et al.* 1989c).

Ten patients underwent left ureterolysis, three had bilateral ureterolysis and four right ureterolysis. Two patients with hydroureter and mild hydronephrosis required ureteric stents for 6 weeks. There were no major complications. Six patients experienced bleeding from the 5 mm lower abdominal incisions and this was controlled by bipolar electrocoagulator or by one figure-of-eight suture with Tevdek No.5 (Fall River, MD). Eleven patients also had presacral neurectomy (Nezhat & Nezhat 1992). Four had laparoscopic hysterectomy and bilateral salpingo-oophorectomy (Nezhat *et al.* 1991f; Nezhat *et al.* 1992a). Eight had unilateral oophorectomy and four had bilateral oophorectomy (Nezhat *et al.* 1991f). Thirteen patients had an appendectomy (Nezhat & Nezhat 1991a). Seventeen women underwent myomectomy to remove leiomyomas up to 7 cm in diameter. Minor complications were shoulder pain, abdominal wall ecchymosis, urine retention and dyschezia for 1-2 weeks. The post operative use of hormonal therapy is prescribed on a case-by-case basis.

Table 1. Pain relief after surgery in 174 women

Pain relief	No of patients (n=174)
Moderate to complete after	
One procedure	145
Two procedures	13
Three procedures	4
Total	162
Persistent or worse	12
Subsequent surgery	
TAH/SO	5
TAH/SO/bowel resection	2
Bowel resection	2
Further medical treatment	3

Abbreviations: TAH = Total abdominal hysterectomy, SO = salpingo-oophorectomy.

Eleven of the 185 patients were lost to follow-up. The remainder have been followed for 1-5 years. Thus far, 31 patients (16%) have undergone second-look laparoscopies for persistent or recurrent infertility or recurrent pain. Of these 31 women, 12 (38%) had complete healing of the rectovaginal septum with few filmy adhesions; one in this group had persistent endometriosis. Nineteen (61%) had dense, vascular adhesions and seven in this group had persistent endometriosis.

Moderate to complete pain relief was observed in 162 of the 174 patients (93%), with 13 (8%) of these requiring two procedures, and four requiring three procedures. Twelve (7%) had persistent or worse pain following surgery. Nine of these 12 underwent subsequent surgery (Table 1).

Out of 61 patients with infertility, five were lost to follow-up and 25 (41%) achieved pregnancy. Table 2 details the AFS scores (American Fertility Society 1985) and other factors affecting the women who achieved pregnancy after surgery.

Discussion

This report describes a special group of women with advanced endometriosis that is difficult to treat by conventional medical or surgical means. Results regarding pain relief and fertility following videolaseroscopic treatment of all stages of endometriosis were reported previously (Nezhat *et al.* 1986; Nezhat *et al.* 1989abcd; Nezhat *et al.* 1991e). Pouch of Douglas nodularity and involvement of the rectum can cause attachment of the rectum to the posterior aspect of the vagina and cervix, and the lower portions of the ureters. These conditions are associated with scarring, do not respond to medical therapy and should be treated surgically in most instances. Laparoscopic resection and vaporization have the advantages of enhanced visualization and precise control, both critical when operating deep in the pelvis.

Martin (1988) has reported five cases in which a combined laparoscopic and vaginal approach was used for the excision of infiltrating endometriosis of the pouch of Douglas. Coronado *et al.* (1990) have reported their experience with the surgical management of symptomatic colorectal endometriosis by laparotomy and bowel resection. Most of these lesions can be treated adequately and safely by videolaseroscopy. Using the video monitor, the assistant can guide the surgeon in locating the disease in the pouch of Douglas and identify the rectum and vagina, thus minimizing rectal damage (Nezhat *et al.* 1989c; 1991e, 1989b, 1989d). By using a high-power CO₂ laser, the

Table 2. The severity of the endometriosis in the women treated laparoscopically

AFS score*	No. of women	No. of pregnancies	Other contributing factors
10-40	19	14 (73%)	No tubal involvement
40-110	30	10 (33%)	Tubal adhesions, 14 patients had one or more endometriomas
> 116	12	1(8%)	Tubal adhesions, previous laparotomies, nine patients had one or more endometriomas
Total	61	25 (41%)	

*American Fertility Society (1985).

surgeon can safely cut and vaporize hard nodules which are very difficult to treat with other lasers or other methods. An experienced laparoscopist who is familiar with endometriosis should be able to detect a nodule with the probe.

Diluted vasopressin, the laser and bipolar forceps adequately control bleeding in these patients. Cautious and patient dissection of severe fibrosis and infiltrating endometriosis will ensure complete removal of the disease down to the normal areolar tissue of the pararectal area or the muscularis of the bowel. Constant irrigation is necessary to remove debris and charcoal. Hydrodissection will help differentiate between fibrosis and normal areolar tissue. Thorough understanding of the pelvic anatomy is critical to avoid damage to the ureter or rectum. To obtain optimum results, especially with regard to pain relief, endometriosis must be completely vaporized or excised. We believe that if a significant portion of bowel is involved and deeply invaded, segmental bowel resection is necessary. All the patients must have preoperative bowel preparation in case of possible entry into the rectum, and be emotionally and physically prepared for possible laparotomy. The surgeon should advance his technique gradually to ensure that videolaparoscopy is used effectively and safely, without unnecessary complications. An inexperienced surgeon will have an unacceptable level of complications which would slow the progress of therapeutic laparoscopy.

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