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Complications of CO_2-laser endoscopic excision of deep endometriosis

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The complications during and following endoscopic excision of deep endometriosis were analysed. The data of 225 excisions performed in 212 women had been collected prospectively into a database immediately following surgery and during the follow-up visit. The data confirmed the association of severe pelvic pain and deep endometriosis, severe pelvic pain being the only indication for surgery in 67, 78 and 76% of women with type I (n = 99), type II (n = 55) and type III (n = 71) lesions respectively. They confirmed that type II and type III were the largest lesions and that they were found predominantly in revised American Fertility Society (AFS) class II. The duration of surgery decreased with expertise ($P < 0.01$), but increased when deeper or larger lesions were excised ($P < 0.0001$) and when cystic ovarian endometriosis was also present ($P < 0.001$). Excision was clinically judged to be complete in 94, 96 and 85% of women with type I, II or III lesions respectively. In order to achieve this, part of the bowel wall had to be resected in 6.3% and part of the posterior vaginal fornix in 13.6% of cases. This risk was associated mainly with type II or III lesions and with larger lesions (P = 0.001). This was not considered as a complication, since all lesions could be repaired endoscopically and since follow-up was uneventful. Complications were one ureter lesion and seven late bowel perforations with peritonitis. Our data did not permit the evaluation as to whether medical pretreatment could improve completeness of surgery or decrease the risk. They revealed, however, that in six of seven women with type III lesions – in whom excision was judged to be incomplete – no pretreatment had been given and that luteinizing hormone releasing hormone (LHRH) agonist treatment decreased the volume of type II lesions (P = 0.04). In conclusion, complete endoscopic excision could be performed in over 90% of women with deep endometriosis, but required bowel surgery in over 6% of cases. Ureter lesions were rare, but postoperative bowel perforations with peritonitis occurred in 2–3% of cases. Medical pretreatment is advocated since LHRH agonist treatment was shown to shrink the deep endometriotic lesion.

Key words: danatrol/deep complications/endometriosis/LHRH agonist

Introduction

Deep endometriosis is, together with cystic ovarian endometriosis, a most severe form of endometriosis. It has been defined as endometriosis infiltrating deeper than 5–6 mm under the peritoneum (Koninckx and Martin, 1994); it is strongly associated with pelvic pain (Cornillie *et al.*, 1990; Koninckx *et al.*, 1991; Koninckx and Martin, 1994), especially the deeper lesions, and probably also with infertility (Koninckx *et al.*, 1993). Three types can be distinguished and these were suggested to reflect the aetiology (Koninckx and Martin, 1992): infiltration (type I), retraction of bowel (type II) and adenomyosis externa or rectovaginal endometriosis (type III).

Surgical excision is the treatment of choice for deep endometriosis with excellent results for subsequent fertility and pelvic pain (Coronado *et al.*, 1990; Reich *et al.*, 1991; Candiani *et al.*, 1992; Nezhat *et al*, 1992a; Koninckx and Martin, 1994, 1995). Although no specific data are available for medical treatment of deep endometriosis, circumstantial evidence strongly suggests that medical treatment is useful since it effectively treats pelvic pain. Moreover, many women remain pain-free for longer periods after treatment has been stopped (Fedele *et al.*, 1993; Shaw, 1993).

Surgical excision of deep endometriosis is difficult surgery because of the proximity of and frequent infiltration in and around the bowel, the ureter and the uterine artery There is still some debate as to whether excision of deep endometriosis should be performed endoscopically or whether in some women a laparotomy should be preferred (Koninckx and Martin, 1995). Three bowel perforations with peritonitis prompted us to review our data to evaluate the complications during and after endoscopic excision of deep endometriosis.

Materials and methods

Patients

All women (225 procedures in 212 women) treated for deeply infiltrating endometriosis between 01 01 1987 and 01.07.1994 were retrospectively reviewed for complications of CO_2-laser endoscopic excision.

During surgery endometriosis was scored according to the revised American Fertility Society classification (AFS). Deep lesions were classified during surgery (Koninckx and Martin, 1992) as type I, when they were conically shaped, i.e. with a larger area on the peritoneum becoming smaller with penetration Type II lesions were characterized by bowel retraction over the lesion which thus was

deeply situated (Koninckx *et al.*, 1994). Type III lesions were spherically shaped with their largest diameter deep under the peritoneum. These lesions extended mainly into the rectovaginal septum, some extending up to the vaginal wall (Koninckx and Martin, 1992). Our records unfortunately do not permit accurate identification of those women in whom endometriotic lesions had been identified in the posterior vaginal fornix by clinical inspection, since in these women excision of the posterior vaginal fornix is unavoidable and necessary During the years 1987–1988, 1989–1990, 1991–1992 and 1993–1994, 10, 50, 20 and 19 women were operated with type I lesions (n = 99); 2, 21, 8 and 24 with type II lesions (n = 55) and 4, 20, 31 and 16 with type III lesions (n = 71) respectively.

Surgery

Smaller lesions and superficial endometriosis were vaporized whereas larger lesions and deep lesions were excised. Cystic ovarian endometriosis was either excised, or marsupialized with vaporization of all visible endometriosis, according to a cyst size of <5 cm or >5 cm diameter respectively. Together with the treatment of endometriosis a complete adhesiolysis was always performed.

Excision of deep endometriosis was performed laparoscopically with a CO_2-laser (Sharplan 1060: Sharplan, Tel Aviv, Israel) as described previously, using a three-puncture technique (one 12 mm and two 5 mm trocars), an operative endoscope with a 7 mm operating channel (Karl Storz, Tüttlingen, Germany), and a high flow insufflator (Thermoflator: Karl Storz, Tüttlingen, Germany). This insufflator permits the excision of endometriotic lesions with a continuous laser beam (15 W Superpulse) without visible smoke (Koninckx and Vandermeersch, 1991) and without blooming of the laser beam, since the high flow insufflation prevents heating of the CO_2 gas in the laparoscope (Nezhat and Nezhat, 1992). We prefer to use the CO_2 laser, because of its precise and bloodless cutting characteristics (Sutton, 1993) Excision is guided visually, with the endometriosis glowing yellowish under the laser beam, and also by feeling the indurations during the endoscopic excision Care is taken to remain at the border between the endometriotic nodule and normal healthy tissue. Although it can occasionally be difficult to distinguish endometriosis from normal tissue, especially when endometriosis is close to the cervix, the difference between the harder nodule and the soft tissues of the pelvis is generally apparent to the experienced surgeon. To perform a complete excision, endometriosis has to be resected from the bowel wall which will occasionally be opened, dissection of the rectovaginal septum has sometimes to be performed up to 3–4 cm below the posterior vaginal fornix which sometimes has to be excised, and the endometriosis has to be dissected around the ureter and the uterine artery. This latter can be very difficult, since endometriosis has a tendency to infiltrate specifically along the uterine artery. In order to exclude unnoticed accidental ureter lesions, both ureters were always identified at the end of surgery, to ascertain that they were intact. This occasionally required ureter stenting. In order to exclude unnoticed rectum perforations the pouch of Douglas was filled with irrigation fluid and subsequently 120 ml of air was brought into the rectum.

A complete bowel preparation was always performed to permit a complete excision, since the depth and the lateral spread of the endometriosis cannot be evaluated before surgery, by clinical examination, by laparoscopic inspection, or by ultrasound or magnetic resonance imaging (Koninckx and Martin, 1994, 1995). Women with larger lesions also received a preoperative contrast enema, an intravenous pyelography and a rectoscopy. Since a rectoscopy and a contrast enema were not systematically performed, our data did not permit the correlation of these data with the incidence of rectum perforations during surgery. In our series the incidence of endometriotic lesions visible during rectoscopy and/or the incidence of menstrual bleeding per anum was moreover lower than 5%, making statistical comparisons invalid. If gross distortion of the ureter was found, intraoperative ureter stents were used. When part of the rectum wall had to be removed, or when the rectum was accidentally opened, the pelvis was rinsed with a 1% hibitane solution and the wall was sutured endoscopically with two layers of 3.0 Vicryl (Ethicon, Somerville, NJ, USA). A defect in the posterior fornix of the vagina was sutured vaginally, although since 1994 this has been done mainly endoscopically Care was taken to suture these defects water-tight. In the one woman in whom the ureter was hemi-transected, a double J was inserted and the ureter sutured endoscopically as described previously (Neven *et al.*, 1993). Women were normally kept in the hospital for 24 h after surgery. Following bowel lesions, or when excision was performed very close to the bowel, patients were kept in the hospital for 3 days in order to provide them with a low fibre diet. The three women in whom a bowel perforation was sutured at a second laparoscopy, remained in the hospital for 7 days. In all women prophylactic antibiotics have been given.

Data collection and analysis

Data were entered prospectively into a database immediately following surgery and following the postoperative visit. We collected the revised AFS score, and for each endometriotic lesion the macroscopical appearance, the diameter, the depth of infiltration, the surgical excision technique and the immediate result of treatment were determined. Excision was scored clinically as either complete or incomplete because of technical reasons or because of the absence of bowel pretreatment. Similarly, for adhesions the type, localization, area and treatment were obtained Duration of surgery was defined as the time between incision and the final stitch, deducting the time lost for other reasons such as equipment failure, photography, video taping, training of registrars in adhesiolysis, etc. Blood loss was estimated clinically, which is a rough and highly subjective estimation; it should, however, permit identification of those women with 'severe' blood loss, i.e. estimated to be >100 ml

During the follow-up visit, the following items were specifically assessed: postoperative fever, defined as 38°C for >1 day within 7 days after surgery, peritonitis, pulmonary embolism, or other late complications up to 6 weeks after surgery.

Statistical analysis was performed with the SAS (SAS, 1995) system. The following procedures were used: χ^2 Fisher's Exact test, Student's t-test or Wilcoxon test, analysis of variance, correlation analysis (Spearman), and logistic regression (for binary or ordinal response data, the LOGISTIC procedure was used). Mean and standard deviations are indicated unless stated otherwise. For highly skewed data, median and 10th to 90th percentiles are given

Results

The ages of the women and the size of the lesions and the indications for surgery are listed in Table I. As described previously, type III lesions were the largest and deepest lesions. The age distribution of the women was comparable in the three groups: 7, 28, 30, 20 and 14% of women with type I, 6, 38, 36, 16 and 4% with type II, and 17, 40, 25, 14 and 4% with type III lesions were <25, 25–30, 30–35, 35–40 and >40 years old respectively. Deep lesions were found predominantly in class II of the rAFS classification, whereas pain was a more prominent complaint in women with type II or III lesions.

Table I. Deep endometriosis age of the women, indications for surgery and depth, volume and revised AFS score

	Deeply infiltrating endometriosis			
	Type I (n = 99)	Type II (n = 55)	Type III (n = 71)	Total (n = 225)
Age (years)[a]	32.1 (26 3–40 9)	30 9 (26 1–38 1)	29.5 (24.5–38 5)	31 0 (25 0–39 4)
Depth (mm)[a]	8 (6–15)	11 (8–20)	15 (8–25)	10 (6–20)
Volume (ml)[a]	2 2 (0 5–10 6)	1 9 (0 5–12 3)	4 3 (0 8–21 2)	2.5 (0 5–12 6)
% in revised AFS				
class I	24.2	9 8	22 7	24 2
class II	40 0	41 2	36 4	40.0
class III	25.3	19 6	24 3	25 3
class IV	10.5	25 3	16 7	10 5
Indications for surgery				
infertility (%)	33 3	21 8	24 3	28 1
pain (%)	44.4	50 9	54 3	49 3
infertility and pain (%)	21 2	27 3	20 0	22 6

[a]Median (10–90th percentile)

Table II. Complications of CO_2 laser excision of deep endometriosis

	Deeply infiltrating endometriosis			
	Type I (n = 98)	Type II (n = 47)	Type III (n = 67)	Total (n = 212)
Incomplete excision	6 (6)	5 (11)	10 (15)	21 (10)
no bowel preparation	2	1	3	6
too difficult/dangerous	4	4	7	15
Complete excision	92 (94)	42 (89)	57 (85)[a]	191 (90)
bowel lesion	0 (0)	6 (14)[a]	6 (11)[a]	12 (6)
excision of vaginal fornix	4 (4)	2 (5)	20 (35)[a]	26 (14)
ureter lesion	1	0	0	1
bleeding from uterine artery	0	2	2	4 (2)
postoperative bowel perforation	1 (1)	4 (10)	2 (4)	7 (4)
postoperative vaginal suture	0	0	1	1

Figures in parentheses are percentages.
[a]Versus type I, P = 0 05

In 13 women (one, eight and four with lesions type I, II and III respectively) endoscopic treatment was not performed during the first laparoscopy. In two women who had received a bowel preparation, surgery was estimated to be too difficult or dangerous and it was preferred to give them pretreatment with a luteinizing hormone releasing hormone (LHRH) agonist for 3 months. In 11 women (n = 1, 8 and 2 respectively) no bowel preparation had been given; two of these women who already received medical treatment (one Danatrol®, one Decapeptyl®) were reoperated a few days later after receiving a bowel preparation; in the other nine women, however, reintervention was postponed for 3 months in order to give them pretreatment with an LHRH agonist in order to facilitate surgery.

Deep endometriosis was treated in 197 women by excision and in 15 women with small lesions by vaporization only (n = 212). In 15 women (Table II) surgical excision was judged not to be incomplete since this was too difficult or dangerous because of extension around the ureter or uterine artery. In six women excision was started without a bowel preparation and abondoned for safety reasons when the lesions proved to be deeper than anticipated and to be too close to the bowel. Complete excision was achieved in 90% of women.

The duration of surgery was comparable in the three types of lesions, ranging from 50 to >300 min with a median at 120 min. The three longest procedures took 270, 240 and 240 min, 300, 240 and 240 min and 300, 250 and 240 min for type I, II and III endometriosis respectively. Duration of surgery correlated with the depth (P = 0.02) and volume (P = 0 0001) of deep endometriosis, with the total volume of endometriosis (P = 0.0001) and with the class of the revised AFS classification (P = 0.0006). The latter is not unexpected, since it reflects the time required for surgery of cystic ovarian endometriosis and adhesiolysis. Duration of surgery also strongly correlated with the date of surgery (P < 0.005), reflecting a learning curve. Analysed by logistic regression (stepwise forward selection) all three variables, i.e. date of surgery (P < 0.001), revised AFS score (P = 0.001) and total volume of endometriosis (P=0.0001), were successively selected, identifying them as independent variables. Separate analysis by type of deep endometriosis showed that, besides date of surgery for type I lesions, the revised AFS score (P = 0.0007), the size of the cystic endometriosis (P = 0.009) and the volume of endometriosis (P = 0.009) were selected, for type II lesions no other parameter reached significance in addition to the date of surgery, and for type III lesions only

the volume of deep (P = 0.004) lesions was additionally entered into the model. These data reflect the observation that type II and III lesions are only rarely associated with cystic ovarian endometriosis.

During excision the posterior vaginal fornix had to be opened in 13.6% whereas the rectum was opened in 6.3%. Both 'complications' occurred predominantly in women with type II and III lesions, and the incidence increased over the years: in 1987–1988, 1989–1990, 1991–1992 and 1993–1994 bowel injuries occurred in 6.2 (1/16), 2.4 (2/84), 5.4 (3/56) and 10.9% (6/55) of women respectively (P = 0.08; Mantel–Haenszel) and excisions with resection of the vaginal fornix were performed in 0 (0/16), 7 1 (6/84), 19 6 (11/56) and 16.4 (9/55) of women respectively (P = 0.02; Mantel–Haenszel). The incidence of bowel lesions correlated with the volume (P = 0.01) but not with the depth of deep endometriosis. Vaginal lesions correlated both with volume (P = 0.001) and depth (P = 0.002) of deep lesions. Excision of the vaginal fornix followed by suturing of the defect was uneventful; no pelvic infections occurred and all but one woman were discharged after 24 h; in one woman the vagina had to be resutured because of a leakage of peritoneal fluid. In all women, in whom the bowel had been sutured, the postoperative follow-up was uneventful.

One ureter lesion occurred: a ureter was accidentally semi-transected and endoscopically sutured as described (Neven *et al.*, 1993). In 17 women ureter stents were used either peroperatively or postoperatively to ascertain that both ureters were intact. In four women bleeding from the uterine artery occurred which was controlled with a titanium clip. In four women postoperative fever prompted us to give antibiotics No pulmonary embolism occurred.

In seven women a bowel perforation with peritonitis was diagnosed in the early postoperative period: two women with a type II lesion (1989 and 1991) and one woman with a type III lesion (1992) were readmitted after a week with progressively increasing symptoms of peritonitis; one woman (1992) with a type I lesion and a history of pouch anastomosis for ulcerative colitis, was observed for 1 week with atypical symptoms which later proved to be an ileal perforation, one woman (1994) with a type III lesion had symptoms of peritonitis 24 h after surgery, two women (1994) with a type II lesion had acute pelvic pain, 12 h following surgery and 2 days following surgery respectively. Although symptoms of peritonitis were minimal in the latter two, an immediate laparoscopy revealed a bowel perforation in both of them.

Medical treatment before surgery was used increasingly over the years. LHRH agonists (Decapeptyl®, n = 37) were given in 1989–1990, 1991–1992, 1993–1994 in 7.3, 30.4 and 24.1% of women respectively (in 2.2, 10 and 11.1% of women with type I, in 25, 42.9 and 31.8% of women with type II and in 5% 41.4 and 28.6% of women with type III lesions). Other medical treatments were orgametril (n = 13), danazol (n = 11) and combined oral contraceptive pills (n = 9). From these data it proved impossible to demonstrate that medical treatment decreased the incidence of complications, since the numbers were too small, and since over the years medical treatment had been given increasingly frequently and specifically to women with the largest lesions. This patient selection bias is reflected in the higher revised AFS score (Table III) in women pretreated with LHRH agonists and by the strong correlation (Spearman) between LHRH agonist therapy and the presence (P = 0.01) or volume (P = 0.007) of cystic ovarian endometriosis. This is not surprising, since cystic ovarian endometriosis neither disappears nor decreases in volume following LHRH agonist therapy. Notwithstanding the selection bias, in women with LHRH pretreatment the total pelvic area (P = 0.02), especially the area with subtle (P = 0.04) but not with typical lesions (P = NS), was smaller than in women without pretreatment. Although women with clinically the most severe deep endometriosis were treated specifically with LHRH agonists, it was surprising that in the whole group of LHRH agonist pretreated women, treatment did not correlate with the volume (P = 0.96) of deep endometriosis and only slightly correlated with its depth (P = 0.04). In women with type II lesions the volume of the deep lesions (P = 0.04) was even lower in women treated with LHRH agonists than in women without a pretreatment. By stepwise logistic regression (Proc Logistic), the LHRH agonist treatment was predicted by the presence (P = 0.01) or volume (P = 0.07) of cystic ovarian endometriosis, reflecting the selection bias, but not by the depth nor the volume of deep endometriosis, although the latter had been the indication for LHRH pretreatment.

Discussion

In order to interpret the results of excision of deep endometriosis one should be aware that the surgical approach to deep endometriosis varies between surgeons as has become apparent during recent meetings. Some surgeons emphasize safety and avoid opening the bowel; when in doubt they prefer to do an incomplete excision by leaving some 'endometriosis-like tissue' behind; the term debulking might be most appropriate. Some surgeons prefer to be radical and perform a partial or a complete rectum resection for the most severe lesions. We primarily intend to perform a complete excision even if we have to open the bowel to achieve this. At this moment, it is unclear what is the most appropriate treatment. A candid reporting and comparison of complication rates and recurrence rates by each technique will hopefully bring an answer to this question in the near future.

Complete endoscopic excision of deep endometriosis with a CO_2-laser is technically feasible. In our hands it is, however, difficult surgery as evidenced by 10% incomplete excisions, 5.6% bowel lesions recognized during surgery, more than 10% very deep excisions including the posterior vaginal fornix, and 2–3% late rectum perforations in the early postoperative days. Moreover, the risk of ureter lesions or severe bleeding from a transsection of the uterine artery is continuously present. The progressively decreasing operating time reflects the learning curve, which is however not reflected in the complication rates (Wood *et al.*, 1993). This is not surprising, since in this historical series technique of surgery and patient selection has evolved over time. The growing awareness of deep endometriosis and the feasibility of endoscopic resection is reflected in the progressively increasing referrals over the

Table III Medical treatment in women with deep endometriosis the revised AFS score, the total pelvic area and volume of endometriosis and the volume of deep endometriosis are listed

	n	rAFS score	Total pelvic area (cm^2)	Total volume (cm^3)	Volume of deep lesion
Control	140	11 (4–44)	4 9 (1 3–16.0)	3 2 (0.8–15 7)	2 5 (0 6–12 6)
LHRH agonist	38	37 (4–99)*	3 1 (0.8–12 6)*	2 6 (0 8–13 8)	2 6 (0 6–13 8)
Danazol	11	8 (2–50)	3 5 (0.8–10.2)	3 0 (0 8–7 4)	2 5 (0 8–7 3)
Orgametril	13	8 (4–30)	4.9 (0 9–13 5)	4 9 (0 7–31 4	2 6 (0 5–31 4)

P versus control group **P* = 0 02, ***P* = 0 0007 (Wilcoxon)
Median (10th to 90th percentile)

years of very severe endometriosis such as type III rectovaginal lesions. Our surgery itself has become more radical over the years: whereas in the beginning incomplete excisions would have been preferred to prevent bowel trauma, at this moment a bowel trauma is considered a 'minor' problem and we emphasize complete excision. Both the increased referrals of very severe endometriosis and the fact that surgery has become more radical is reflected in the increasing incidence of resections of the bowel wall and/or the vaginal fornix. The growing expertise on the other hand is reflected in the decreasing operating time notwithstanding more radical surgery for more severe endometriosis.

The figure of 10% *incomplete excisions* should be interpreted carefully, since it is a clinical and partially subjective criterion. Since the incidence in our database of incomplete surgery for technical reasons did not decrease over the years, although surgery itself became more radical we suggest that the true incidence was initially under-reported. As experience accumulated, the awareness grew of small areas of endometriosis extending like an octopus around the uterine artery or deep into the rectovaginal septum. Thus possibly our actual figure of 10% could still be an underestimation of reality. Only a careful follow-up of recurrences will be able to answer this question.

Excision of the *posterior vaginal fornix* should not be considered a complication since follow-up showed this to be uneventful, without subsequent abdominal infection, or late complications as was described following culdotomy (Wood *et al.*, 1993). It is important to note, however, that the high incidence, and the difficulty to predict in whom it will occur — except when vaginal lesions can be seen *in speculo* — make it mandatory to perform a complete vaginal desinfection and draping before surgery, in order to permit subsequent sterile suturing. Initially suturing of the defect was always performed vaginally but since 1994 most vaginal defects have been sutured endoscopically for reasons of sterility reflecting progressively changing endoscopic techniques.

Judged by the difficulty of surgery, the incidence of ureter lesions is low, possibly because of the fact that the constant awareness and fear of this complication has prompted us to extreme prudence. As surgery became more radical, the incidence of ureter stenting has increased. One might argue that in all severe cases a prophylactic stenting could be advocated in order to decrease the risk of ureter trauma. The fact that suturing of a semi-transected ureter over a stent is technically not too difficult could be another argument in favour of more liberal stenting.

The incidence of bowel wedge excisions is high and in severe cases of type II or III deep endometriosis close to 20%. This makes it mandatory to give a complete bowel preparation to all women. The most important lesson we learned, however, was that resecting part of the bowel wall followed by endoscopic suturing was postoperatively uneventful: no increased morbidity or late complications were seen. We therefore suggest that opening of the rectum during the resection of deep endometriosis should not be considered a complication. On the contrary, it reflects careful and complete surgery. The lack of postoperative complications shows clearly that aggressive and complete excision can safely be performed, and that resection of part of the bowel wall should not be avoided if it is necessary to remove all endometriosis.

Partial rectum resection and reanastomosis has been suggested for the treatment of deep endometriosis (Nezhat *et al.*, 1992b; Sharpe, 1992). Although we cannot compare results, it is interesting to note that with CO_2-laser endoscopy, we were able to achieve a resection in all women. During surgery the bowel, which was strongly retracted over the nodule, could be seen to expand progressively. These data might suggest that a liberal rectum resection and reanastomosis for rectovaginal endometriosis might be unnecessary. A careful follow up to estimate recurrences should answer this question.

Inoperatively unrecognized bowel perforations with peritonitis were the most severe complications. Four of these seven women needed a stoma and a long hospitalization. Since all women were checked for unrecognized bowel perforations, by injecting 120 ml of air at the end of surgery, even small perforations were probably not overlooked during surgery, but did occur during the first postoperative days, generally during straining, probably in areas with a weakened muscularis as a consequence of excision, thermal damage or focal devascularization as discussed by Khare *et al.* (1993). Since microscopic perforations are probably hard to detect and in order to prevent late perforations in weakened areas, we increasingly perform preventative suturing of serosal tears and of weakened areas, e.g. following coagulation of a vessel. In one woman, the diagnosis of perforation and peritonitis was postponed for several days because of the minimal clinical symptoms. This was probably a consequence of the complete bowel preparation. Therefore since 1994, because of this missed diagnosis of perforation, we have adopted the policy to perform an immediate repeat laparoscopy following an episode of acute pain or the presence of symptoms which even vaguely suggest peritoneal irritation and thus a bowel perforation. This has been performed three times so far and in each woman a perforation was found.

Most important was that in each woman these perforations could be sutured endoscopically, thus avoiding severe peritonitis necessitating repeat laparotomy and a stoma.

The benefits of medical pretreatment before surgery are difficult to prove. Indeed one should realize that in order to reach statistical significance for items such as blood loss, duration of surgery, difficulty of surgery, complications and long term results, the number of patients to be included in prospective randomized trials would be prohibitive. For this reason a prospective randomized trial comparing pretreatment with LHRH (Decapeptyl®, 3.75 mg/month, 3 months) or Danatrol (400 mg/day, 3 months) and no pretreatment which had been initiated was interrupted. Our clinical impression that following medical treatment, surgery became easier while the endometriosis was less vascularized, was another argument to stop the trial and, since then, women with clinically extensive endometriosis have been specifically pretreated for 3 months. This selection bias is clearly reflected in the higher revised AFS score in women treated with LHRH agonists. Since women with the most severe endometriosis were specifically treated before surgery, the observation that women pretreated with LHRH agonist had a significantly smaller pelvic area of subtle endometriosis and a smaller volume of deep endometriosis at least in type II lesions, strongly suggest that not only subtle lesions regress, but also that deep lesions regress during LHRH agonist treatment. The fact that medical pretreatment decreases the volume of deep endometriosis could explain the observation that six out of seven women with type III lesions, in whom excision was incomplete, had not been pretreated with LHRH agonist therapy. Our numbers are unfortunately too small to evaluate the specific effect of danazol, gestrinone or orgametril.

In conclusion, CO_2 laser endoscopic excision of deep endometriosis can be performed but is technically difficult surgery, requiring dissection of ureter and uterine artery and requiring excision of the vaginal fornix and of part of the rectum wall in some 5–10% of women, especially in women with deep lesions type II or type III. Therefore, a complete bowel preparation is mandatory in all women. Peritonitis due to interoperatively unrecognized bowel perforation during the first postoperative days is a most severe complication. Therefore preventive suturing of seromuscular tears is recommended. Moreover, whenever clinical symptoms suggest that a perforation might have taken place, we strongly recommend the immediate performance of a repeat laparoscopy without waiting for symptoms of diffuse peritonitis. Finally, our data may suggest that the medical pretreatment could facilitate surgery by shrinking the deep lesions.

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