

Pregnancy rates following ablative laparoscopic surgery for endometriomas

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BACKGROUND: In this prospective, cohort study we present the cumulative pregnancy rate following ablative laparoscopic surgery in patients with endometriomas. **METHODS:** The cyst was mobilized, fenestrated, and the capsule treated with the potassium–titanyl–phosphate (KTP) laser or bipolar diathermy. Pre- and post-operative transvaginal ultrasound scans were performed, and a detailed fertility history recorded. **RESULTS:** There were 39 women (38 intention to treat as a single procedure) who had been trying to conceive for >12 months. The mean age of the patients was 33.8 years (range 20–43), and there were 42 cysts (three bilateral) with a mean diameter of 4.8 cm (range 2–25). The mean revised American Fertility Society score was 64.9 (range 22–124), and 29 (74.4%) patients had stage IV disease. Seven patients (18%) had previously had a live birth, and 17 (43.6%) had undergone assisted conception in the past. The cumulative pregnancy rate was 15/38 (39.5%). The pregnancy rate in patients with stage IV disease was 11/28 (39.3%). There were no major complications. **CONCLUSIONS:** Our results indicate that laparoscopic cyst fenestration and capsule ablation is a safe and effective treatment for improving fertility.

Key words: ablative laparoscopy/cyst capsule ablation/endometriomas/laparoscopic surgery/pregnancy

Introduction

The choice of which laparoscopic technique to use in the surgical management of endometriotic cysts remains controversial (Jones and Sutton, 2000). There are two main schools of thought. The cyst capsule may be excised or ablated. There are concerns that cyst capsule excision is associated with post-operative adhesion formation (Fayez *et al.*, 1991) and damage to the underlying oocytes (Brosens, 1999). The consequences may be impaired fertility, chronic pain, and premature menopause. In view of this, it is our practice to mobilize, fenestrate and then ablate the pseudocyst capsule with a potassium–titanyl–phosphate (KTP) laser or coagulate it with bipolar diathermy (Jones and Sutton, 2002). In order to determine whether this management strategy is associated with a satisfactory pregnancy rate we have carried out a prospective, cohort study of infertile women with endometriomas undergoing ablative laparoscopic surgery.

Materials and methods

During a 12 month period from February 1999 to January 2000, 73 consecutive women with an endometrioma >2 cm underwent ablative laparoscopic surgery. Of these women, 39 had been trying to conceive for >12 months at the time of surgery. A laparoscopy was performed using a triple-puncture technique as described previously (Sutton and Hill, 1990). For endometriomas <15 cm a single-step procedure was carried out. The ovary was mobilized from the pelvic side wall using a combination of blunt and sharp dissection. In the majority of

patients the endometrioma opened at the site of invagination during mobilization. If it did not, this site was identified by the scarring and pigmentation and the cyst was fenestrated with laparoscopic scissors, and the chocolate fluid aspirated. The pelvis was irrigated with heparinized Hartman's solution until all the haemosiderin was removed, and then the cyst wall was inspected. If there were any features suggestive of additional pathology, they were biopsied. The capsule wall was then vaporized with a KTP laser (Laserscope, Cwmtran, UK) at a power setting of 18 W, or with Bicap[®] bipolar diathermy (Cory Bros, London, UK) at a power setting of 70 W. Any co-existing endometriosis was ablated, and at the end of the operation the pelvic organs were aquafloated in heparinized Hartman's solution. A detailed fertility history was recorded using a structured questionnaire at 3, 6 and 12 months following the operation. Endometriosis was classified according to the revised American Fertility Society classification (AFS, 1985).

To evaluate the effect of surgery on subsequent reproduction, we considered patients who had tried to conceive without success for at least 12 months before the laparoscopy. The patients were not selected to exclude those with other causes of infertility, such as anovulation, sperm defects, infrequent coitus due to dyspareunia, or those who had previously undergone assisted conception treatment. Pregnancies arising as a result of spontaneous, and assisted, conception were documented. A pregnancy was defined as the presence of an intrauterine gestational sac on ultrasound.

Results

The demographic details of the patients are summarized in Table I. The mean age of the women was 33.8 years (range

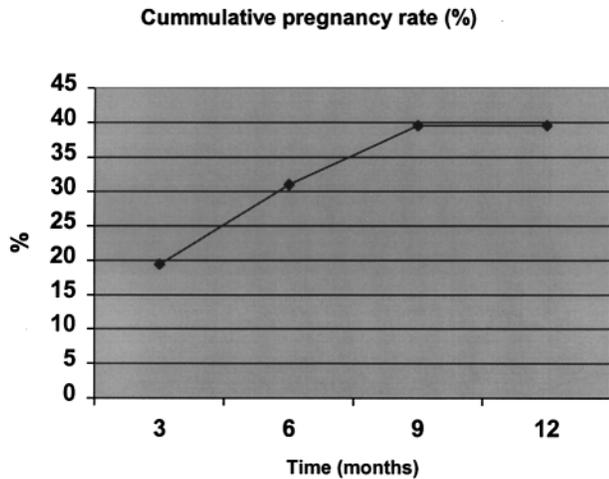


Figure 1. The cumulative pregnancy rate.

Table I. Demographics

Number of patients (cysts)	39 ^a (42 cysts)
Mean age (range) years	33.8 (20–43)
Previous assisted conception	17 (43.6%)
Parous	7 (18.0%)
Mean revised AFS score (range)	64.9 (22–124)
No. (%) with stage IV disease	29 (74.4%)
Mean diameter of cysts (range) cm	4.8 (2–25)
Previous laparotomy	17 (43.6%)
Sperm defects in partner	3 (11.1%)
Irregular menstrual cycle (>5 days)	10 (25.6%)
Dyspareunia as presenting symptom	33 (84.6%)

^a38 where intention to treat as a single procedure.
AFS = American Fertility Society.

20–43). There were 42 cysts (three bilateral) in the 39 women (38 intention to treat as a single procedure). The mean diameter of the endometriomas was 4.8 cm (range 2–25). The mean revised AFS score was 64.9 (range 22–124), and 29 (74.4%) patients had stage IV disease. Seven patients (18%) had previously had a live birth, and 17 (43.6%) had undergone assisted conception in the past. The partners of three patients (11.1%) had documented sperm defects, 10 (25.6%) patients had irregular menstrual cycles, and dyspareunia was a presenting symptom in 33 (84.6%) of the women. Seventeen (43.6%) of the patients had undergone a previous laparotomy. The details of the patients who achieved a pregnancy are summarized in Table II. The cumulative pregnancy rate was 15/38 (39.5%) (Figure 1). The pregnancy rate in patients with stage IV disease, was 11/28 (39.3%). Four of the pregnancies occurred following assisted conception treatment, and these included the three women who had partners with sperm defects. There were no major surgical complications.

Discussion

If endometriotic cysts originate by implantation (Hughesdon, 1957; Brosens *et al.*, 1994) or metaplasia (Meyer, 1919, 1923), then the disease is superficial and the pseudocyst capsule can be ablated with minimal loss of normal tissue. The lack of the

cleavage plane of the ‘true’ endometrioma, as opposed to a haemorrhagic cyst, and the effect that resection may have on follicular reserve, have led us to advocate that the cyst should be left *in situ* and the wall ablated (Jones and Sutton, 2000, 2002).

There are several studies which suggest that excision may be harmful to the follicular reserve which lies close to the cleavage plane of the cyst (Donnez *et al.*, 1996). Loh *et al.* demonstrated that the follicular response in natural and clomiphene citrate stimulated cycles for women <35 years of age was reduced after laparoscopic ovarian cystectomy (Loh *et al.*, 1999). The effect endometriomas have on IVF outcome also suggests that excision is harmful. Seventeen patients with endometriomas were compared to 44 patients who had undergone ovarian cystectomy. The patients with endometriomas had higher ongoing pregnancy rates per IVF cycle [50%, confidence interval (CI) 24–75%] compared with post-cystectomy patients (25%, CI 17–35%). There was also a consistent reduction in oocyte yields from post-cystectomy ovaries compared to intact ovaries despite different ovarian stimulation protocols (Nargund *et al.*, 1996). Adverse changes in ovarian artery blood flow have also been reported following laparoscopic stripping (La Torre *et al.*, 1998).

We have also justified our management strategy on the basis of a retrospective review of 66 infertile patients with endometriomas, who were treated in this unit over a 10 year period (Sutton *et al.*, 1997). In that study the mean duration of infertility was 63 months (range 12–168). The patients were not pre-selected with regard to fertility factors such as sperm defects, and several had undergone failed IVF treatments previously. The women’s ages ranged from 20 to 49 years, and the mean revised AFS score was 45, which is similar to the demographic data in this prospective study (Table I). The proportion with stage IV disease is unspecified. The KTP and CO₂ laser were used during a one-stage procedure, and the clinical outcome was determined as a result of a follow-up letter from the referring centre. The cumulative pregnancy rate was 35% at 12 months, and 45% at 36 months. The interval between laparoscopy and conception was 12 months for 77% of the women. It is reassuring that the previous retrospective report (Sutton *et al.*, 1997) and this prospective study have found similar cumulative pregnancy rates at 12 months (35 versus 39%).

There are 10 reports in the literature where pregnancy rates are an outcome measure following laparoscopic surgery for endometriomas (Table III). Only three authors have prospectively reported pregnancy rates following ablative laparoscopic surgery. Marrs carried out the ablation with a KTP laser (Marrs, 1991). Beretta *et al.* carried out the ablations with an electrosurgical device as part of a randomized controlled trial (Beretta *et al.*, 1998), and Donnez *et al.* used a CO₂ laser in a two-stage procedure (Donnez *et al.*, 1996). The study by Marrs most closely resembles our own (Marrs, 1991). However, it only involved 23 patients, and it was published 10 years ago. A prospective cohort analysis of pregnancy rates following any kind of surgery has shown that for patients with endometriomas, the 36 month cumulative life-table pregnancy rate is 52 ± 9% (Adamson and Pasta, 1994) which is generally in

Table II. Details of the patients who achieved a pregnancy

Patent number	Age (years)	Parity	Revised AFS score	Cyst diameter (cm)	Spontaneous conception	Interval to conception (months)
23	34	1	124	8	-	3-6
24	32	0	22	6	-	3-6
29	32	1	59	2 + 5	+	3-6
36	41	0	44	10	+	3-6
37	36	2	36	3	+	<3
38	31	0	104	5	-	<3
40	31	0	74	8 + 2	+	<3
45	32	0	44	5	-	3-6
56	41	0	116	4 + 3	+	<3
57	34	0	32	3	+	<3
61	29	0	106	6	+	3-6
60	40	0	66	4	+	6-9
69	31	0	80	3 + 4	+	6-9
66	31	0	92	4	+	6-9
77	30	0	76	6	+	<3

Table III. Pregnancy rates following the laparoscopic management of the endometrioma

Author	Year	n	Intervention	Pregnancy rate (%)
Daniell <i>et al.</i>	1991	32	Laser ablation and cyst stripping	38
Marrs <i>et al.</i>	1991	23	KTP laser ablation	30.4
Bateman <i>et al.</i>	1994	21	Cyst stripping	42.8
Montanino <i>et al.</i>	1996	11	Cyst stripping + GnRH agonist	45
Donnez <i>et al.</i>	1996	814	CO ₂ laser ablation + GnRH agonist	51
Sutton <i>et al.</i>	1997	66	CO ₂ + KTP laser vaporization	45
Hemmings <i>et al.</i>	1998	84	Cyst stripping versus electrocoagulation	50-60
Beretta <i>et al.</i>	1998	64	Cyst stripping versus electrocoagulation	66.7-23.5
Busacca <i>et al.</i>	1999	57	Cyst stripping	57.5
Milingos <i>et al.</i>	1999	32	Cyst stripping	53

n = number of infertile patients reported on.
KTP = potassium-titanyl-phosphate.

agreement with the studies in Table III. This would seem to indicate that it does not matter whether the cyst is excised or ablated. However, pregnancy rates following surgery cannot be compared in the same way as pregnancies following assisted conception because the strict pre-treatment definitions, and the Human Fertilisation and Embryology Authority (HFEA) regulations regarding the reporting of outcomes, do not apply to surgical studies. The severity of endometriosis and the classification system used may be different. The age of the patients and the duration of infertility may not be comparable. The presence or absence of other infertility factors and the method of achieving and reporting pregnancies may not be specified. The follow-up period in the different studies also varies.

Other factors that are not consistently reported include the proportion of patients with dyspareunia as a presenting symptom, which was reported by 33 (84.6%) of patients in this study. Clearly this will have a detrimental effect on sexual activity. Redwine found that only 1.06% of his patients with endometriomas had ovarian disease exclusively (Redwine, 1999). All our patients had endometriosis at other sites in the pelvis which required ablation, and this may contribute to the dyspareunia.

We have also noted the proportion of patients with irregular menstrual cycles, 10/39 (25.6%). These women may also have co-existing polycystic ovarian disease (Brincat *et al.*, 1994), and anovulation due to pituitary-ovarian dysfunction may be a contributing factor to their subfertility (Bancroft *et al.*, 1992).

Haemorrhage luteal cysts may be mistaken for ovarian endometriomas. However, Vercellini *et al.* have shown that the reliability of the visual diagnosis of ovarian endometriosis has a sensitivity of 97% and a specificity of 95%, positive and a negative predictive value of 98 and 94% respectively, and an overall accuracy of 96% (Vercellini *et al.*, 1991). Because of this, ovarian biopsy, although desirable in some cases, is often dispensable for a correct laparoscopic diagnosis. It is our normal management strategy to carry out selective biopsies, and the objective of this study was to assess the outcome of our routine clinical practice.

There is only one randomized controlled trial comparing cystectomy of the endometrioma with drainage and electrocoagulation (Beretta *et al.*, 1998), and the conclusion has been critically appraised in the literature (Brosens, 1999). The mean age of the patients in the ablation group was 30.2 years (range ± 5.1), compared with 33.8 (20-43) in this study. Another important difference relates to the median revised

AFS score, which was 28 (range 18–98), compared with 64.9 (22–124), and the proportion of women with stage IV disease was 21.9%, compared with 74.4% in our study population. Therefore our patients were older and had much more severe disease than the patients in Beretta's study (Beretta *et al.*, 1998). However, 17 (43.6%) of our patients had undergone a previous laparotomy, and were therefore predisposed to the formation of post-operative adhesions. The revised AFS score in this group of patients will be high, and not necessarily because of the disease itself. Beretta *et al.* excluded patients with previous surgery for this reason (Beretta *et al.*, 1998).

Thirty two patients in Beretta's study had been infertile for more than 12 months, and were selected to exclude pre-operative infertility factors such as sperm defects (Beretta *et al.*, 1998). In our study 17 (43.6%) of our patients had undergone assisted conception in the past, and sperm defects were present in three (11.1%) of the couples. These factors will also adversely affect our pregnancy rate. Despite all these considerations we still had a higher pregnancy rate at 12 months (39.5%) compared with the patients who underwent ablation in Beretta's study at 24 months (23.5%) (Beretta *et al.*, 1998). Given sufficient time the cohort of patients in our study may achieve a cumulative pregnancy rate equivalent to the patients who underwent cystectomy (66.7%) in the randomized controlled trial. We conclude that laparoscopic cyst fenestration followed by capsule ablation is an effective treatment for improving fertility in patients with endometriomas. The cumulative pregnancy rate at 12 months was 39.5%, and this rate was also achieved in patients with stage IV disease, which is as good as the rates reported in the literature.

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