Fertility after laparoscopic myomectomy: preliminary results

Emile Darani, Herve Dechaud, Jean-Louis Benilfa, Caroline Renolleau, Pierre Panel and Patrick Madelein

Service de Gynécologie, Hôpital Bichat-Claude-Bernard, 170 Boulevard Ney, 75018 Paris, France

We report the limits, complications, subsequent fertility and outcome of pregnancies after laparoscopic myomectomy. From January 1990 to October 1995, 143 patients underwent a first laparoscopic approach to myomectomy. A total of 41 patients (28.7%) had a laparotomy. The mean age of the patients was 38.3 years (range 24–55). Seventy patients (49%) wished to conceive: 26 had undergone laparoscopy and 44 laparoscopic myomectomy. A total of 19 pregnancies were obtained in 17 patients after laparoscopic myomectomy (38.6%): eight vaginal deliveries, three Caesarean sections, four miscarriages, two abortions, one ectopic pregnancy and one therapeutic abortion. The pregnancy rate in patients with unexplained infertility and with multifactorial infertility was 48.2% and 20% respectively. The mean delay to conception was 11.3 months. No uterine rupture was noted. Pelvic adhesions were found in the four patients who underwent secondlook procedure. Our preliminary results indicate that laparoscopic myomectomy is a useful technique.

Key words: adhesions/fertility/laparoscopy/myomectomy

Introduction

Uterine leiomyomata are the most common tumours of the female genital tract. These benign neoplasms are estimated to occur in 20% to 50% of women with increased frequency during the later reproductive years (Verkauf, 1992). Delaying attempts at pregnancy until a later maternal age has exposed many women to an increased prevalence of uterine myomata at the time of conception. Therefore, the increased use of myomectomy rather than hysterectomy for the treatment of myomata results from the desire of patients to maintain or improve their reproductive potential. Since the first report of myomectomy by Atlee (1844), surgical treatment of uterine fibroids has used a laparotomic approach, or less frequently, a vaginal route. In 1979, the first case of myomectomy using laparoscopy was reported (Semm and Mettler, 1979). Several reports on laparoscopic myomectomy have been published and confirmed both its feasibility and its safety (Nezhat et al., 1991; Daniell and Guerly, 1991; Hassan et al., 1992; Dubuisson et al., 1993). However, laparoscopic myomectomy has several drawbacks, in particular the difficulty of suturing the myometrium.

The role of uterine myomata as a cause of infertility remains a matter of debate (Buttram and Reiter, 1981; Berkeley et al., 1983; Smith and Uhlir, 1990; Verkauf, 1992). Nevertheless, more than half of women who have not previously given birth subsequently conceive following myomectomy for the treatment of recurrent pregnancy wastage or infertility (Verkauf, 1992). The long duration of infertility before surgery, the absence of other infertility factors, and the short time interval subsequent to surgery before conception occurred suggest that myomectomy is of benefit to infertile patients with leiomyomata (Rosenfeld, 1986). However, because those women present difficulties in suturing the myometrium, leading to the risk of rupture during pregnancy and delivery, it must be asked whether laparoscopic myomectomy is an appropriate treatment. Therefore, the aim of this retrospective study of 143 myomectomies was to evaluate: (1) the limits and the complications of laparoscopic approach, (2) fertility and pregnancy outcome after laparoscopy.

Materials and methods

From January 1990 to October 1995, 143 patients were subjected to a first laparoscopic approach to myomectomy. All gave their fully informed consent, and all were informed of the possibility of laparotomy. The mean age of the patients was 38.3 years (range 24–55). Seventy patients (49%) wished to conceive: 26 had undergone laparoscopy and 44 laparoscopic myomectomy. A total of 19 pregnancies were obtained in 17 patients after laparoscopic myomectomy (38.6%): eight vaginal deliveries, three Caesarean sections, four miscarriages, two abortions, one ectopic pregnancy and one therapeutic abortion. The pregnancy rate in patients with unexplained infertility and with multifactorial infertility was 48.2% and 20% respectively. The mean delay to conception was 11.3 months. No uterine rupture was noted. Pelvic adhesions were found in the four patients who underwent secondlook procedure. Our preliminary results indicate that laparoscopic myomectomy is a useful technique.

Key words: adhesions/fertility/laparoscopy/myomectomy

Technique

All myomectomies were performed under general anaesthesia. Three stab incisions were made in the suprapubic area: one in the midline of 10 or 12 mm and one in each iliac fossa of 5.5 mm. A 10 mm laparoscope was inserted through an umbilical incision and connected to a video monitor. Six instruments were used: uni and bipolar electrosuturing forceps, scissors, grasping forceps, aquapurator and,
since January 1995, an electrical morcellator (Storz, Tuttingen, Germany). For an intramural myoma, an incision was made through the uterine wall and the pseudocapsule of the myoma. Traction on the myoma combined with electrodesection allowed the leiomyoma to be cleaved. Uterine defects were closed using interrupted absorbable sutures of the vicryl myometrial and serosal layers with 2–0 or 3–0 calibre (Polyglactin®; Ethicon, Neuilly, France). For a subserous myoma, the pedicle was cut by electrocoagulation. For a myoma with sessile pedicle, the superficial uterine defect was approximated with a serosal suture. The myoma was removed by abdominal route if it was 5 cm or smaller and by the vaginal route if greater than 5 cm. Since 1995, the use of an electrical morcellator has simplified the removal of tumours, despite the time-consuming nature of this procedure. Recently, a gasless laparoscopic procedure was performed using Laparolift® (Origin, Rueil-Malmaison, France).

For each patient the total time spent in the theatre was recorded including anaesthesia, set up and actual operating times. The incidence of febrile morbidity, indicated by a temperature of 38°C or greater on any two post-operative days, was noted, together with the number of post-operative days spent in hospital.

Laparoconversion was defined as the substitution of myomectomy by laparotomy without any laparoscopic procedure or for peroperative complication.

In accordance with a previous study (Nezhat et al., 1996), laparoscopically-assisted myomectomy (LAM) was defined as the performance of a minilaparotomy, with an incision of less than 5 cm, when the correct closure of the myometrium could not be performed by laparoscopy.

Information about subsequent fertility was obtained from hospital records, physicians and direct reports from the patients. Only patients with a follow-up period at least of 12 months were included in the study. Two groups of patients were defined, one of whom underwent laparoscopy including myomectomy performed by laparoscopy, LAM or gasless laparoscopy, the other group underwent laparoconversion.

Statistical analysis
The χ² and the Student’s t-test were used to analyse results. A P-value of 0.05 was regarded as statistically significant.

Results
Among the 143 patients of the study, 102 (71.3%) had a laparoscopic myomectomy including 82 exclusive laparoscopic procedures, 15 LAM and five gasless laparoscopy procedures. Forty-one patients (28.7%) had a laparoconversion. Indications were: intramural myoma >7 cm (15 cases), number of myomata >5 (12 cases), peroperative haemorrhage (12 cases) and adenomyosis (two cases). Two patients (1.4%) required blood transfusion. The location of the major myoma was intramural in 87 patients (60.8%) and subserosal in 56 patients (39.2%). Besides myoma, other genital tract abnormalities were corrected during the same procedure in 41 patients (28.6%): tubal surgery in 37 patients (15 salpingotomies, five fimbrioplasties and 17 cases of tubal adhesiolysis) and peritoneal endometriosis in four patients.

Fertility after myomectomy
Seventy out of the 143 patients (49%) wished to conceive, including 44 women who had a laparoscopic myomectomy and 26 women who had laparoconversion. Of these 70 patients, 60 presented with infertility, six with persistent bleeding and four with pain. The pregnancy outcome is summarized in Table I.

Characteristics of laparoscopy and laparoconversion groups
No statistically significant difference between patients undergoing laparoscopy or laparoconversion was found in: (1) mean age (32.5 versus 34.3 years), or (2) mean duration of infertility (32 versus 36 months). The mean number of myomata removed was: 1.5 (range 1–4) and 3 (range 1–15) for laparoscopy and laparoconversion respectively (P = 0.045). The mean diameter of the largest extracted fibroid was: 54 mm and 75 mm for laparoscopy and laparoconversion respectively (P = 0.001). There was no statistically significant difference in mean operative time: 137 min (range 30–370) for laparoscopy and 153 min (range 70–210) for laparoconversion, and there was no statistically significant difference in blood loss (1.9 versus 2.2 g/100 ml). The number of postoperative complications after laparoscopic myomectomy was 6 (5.9%) including five episodes of febrile morbidity and one of myometrial infection which required a subsequent laparotomy. The mean hospital stay was 3.5 days for laparoscopy and 5.8 days for laparoconversion (P = 0.0001).

Fertility after laparoscopic myomectomy
A total of 19 pregnancies were achieved in 17 patients (38.6%), of whom 16 conceived spontaneously and one after in-vitro fertilization (IVF). Sixteen out of 41 patients (39%) with interstitial myoma and one out of three patients with subserosal myoma became pregnant; 18 pregnancies (94.7%) were intraterine, and the single ectopic pregnancy was treated by laparoscopic salpingectomy. Eleven patients (64.7%) delivered at term, vaginally in eight cases (72.7%). In the three cases requiring Caesarean section, the indications were: haemolysis–elevated liver enzymes–low platelet count syndrome at 36 weeks (one case), previous Caesarean section (one case) and the uterine scarring (one case). Therapeutic abortion was performed on a 38 year old patient because of trisomy 21 diagnosed after amniocentesis. No case of uterine rupture occurred.

Four miscarriages occurred in two patients (one miscarriage in one case, three in the other). In the latter patient, no uterine cavity abnormality was found on hysteroscopic examination.

In the four patients who underwent second-look procedure (one for treatment of ectopic pregnancy, and three during Caesarean section), adhesions on the uterine scar and bilateral tubal adhesions secondary to myomectomy were found.

Fertility after laparoconversion
Six patients (23.1%) became pregnant, five spontaneously and one after IVF. Only one patient (16.6%) had vaginal delivery at term. A late miscarriage occurred at 24 weeks in one case and premature labour at 32 weeks in the patient having IVF. In these two patients, and in a third patient with first trimester miscarriage, hysteroscopic examination showed no distortion of the uterine cavity.

Comparison of pregnancy outcome between the two groups
No statistically significant differences were found between women undergoing laparoscopy and those undergoing laparoconversion, with the exception of delivery rate [25% (11/44)
Table I. Outcome of pregnancies after myomectomy

<table>
<thead>
<tr>
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<th>Laparoscopic myomectomy</th>
<th>Laparoconversion</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Women wishing to conceive</td>
<td>44</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Women becoming pregnant</td>
<td>17 (38.6%)</td>
<td>6 (23.1%)</td>
<td>NS</td>
</tr>
<tr>
<td>Number of pregnancies</td>
<td>19 (43.2%)</td>
<td>6 (23.1%)</td>
<td>NS</td>
</tr>
<tr>
<td>Delivery rate</td>
<td>11 (25%)</td>
<td>1 (3.8%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Vaginal delivery</td>
<td>8 (42.1%)</td>
<td>1 (16.7%)</td>
<td>NS</td>
</tr>
<tr>
<td>Cesarean section</td>
<td>3 (15.8%)</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Miscarriage</td>
<td>4 (21%)</td>
<td>1 (16.7%)</td>
<td>NS</td>
</tr>
<tr>
<td>Late miscarriage</td>
<td>0</td>
<td>1 (16.7%)</td>
<td>NS</td>
</tr>
<tr>
<td>Premature labour</td>
<td>0</td>
<td>1 (16.7%)</td>
<td>NS</td>
</tr>
<tr>
<td>Abortion</td>
<td>2 (10.5%)</td>
<td>2 (33.3%)</td>
<td>NS</td>
</tr>
<tr>
<td>Therapeutic abortion</td>
<td>1 (5.3%)</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Ectopic pregnancy</td>
<td>1 (5.3%)</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Mean delay in conception (months)</td>
<td>11.3</td>
<td>10.6</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS = not significant.

after laparoscopy and 3% (1/26) after laparoconversion $(P = 0.02)$ (Table I).

Of 37 patients who received tubal surgery, four (10.8%) became pregnant. None of the four patients with endometriosis achieved a pregnancy.

**Analysis of fertility according to the presence of multifactorial or unexplained infertility**

Of the patients undergoing laparoscopy, 29 patients (65.9%) had unexplained infertility, 14 (48.2%) of whom conceived; 15 patients (34.1%) had multifactorial infertility, three (20%) of whom conceived (after adhesiolysis in two cases and fimbrioplasty in one). These pregnancy rates were not significantly different $(P = 0.06)$.

Of the patients undergoing laparoconversion, five out of 19 women (26.3%) with unexplained infertility associated with myoma and one out of seven women (14.3%) with multifactorial infertility conceived. These differences were not statistically significant.

**Analysis of fertility according to the presence of primary or secondary infertility**

Of the patients who underwent laparoscopy, 22 had primary and 22 had secondary infertility. The pregnancy rates (31.8 and 45.4% respectively) were not statistically significantly different.

Of the patients who underwent laparoconversion, eight had primary and 18 had secondary infertility. Again, the pregnancy rates were not significantly different (12.5 and 27.7% respectively).

**Discussion**

The feasibility of laparoscopic myomectomy appears to depend on the number and size of the myomata present. Laparoconversion was not required when less than four fibroids were present and, in 36.6% of cases, was performed for an intramural myoma $>7$ cm. There was no difference in either the mean duration or the blood loss of the two procedures. Therefore, in accordance with previous reports (Nezhat et al., 1991; Daniell and Guerly, 1991; Hasson et al., 1992; Dubuisson et al., 1993, 1994), our results confirm that laparoscopic myomectomy may be attempted when fewer than four myomata $<7$ cm in diameter are present.

The effect of myomata upon fertility is not fully understood and remains a matter of debate (Burtrum and Reiter, 1981; Berkeley et al., 1983; Smith and Uhlir, 1990; Verkauf, 1992). Several reports (Brown et al., 1956; Babaknia et al., 1978; Berkeley et al., 1983; Smith and Uhlir, 1990; Verkauf, 1992) demonstrated significant pregnancy rates after abdominal myomectomy in patients with otherwise unexplained infertility. Furthermore, in patients with myomata and unexplained infertility, Rosenfeld (1986) observed that adverse prognostic factors for fertility after laparotomy were: increased age of patients, long duration of infertility and large size or number of fibroids removed. Our results confirm that delivery rate is significantly higher after laparoscopic myomectomy than after laparoconversion. This difference may be explained by the smaller number and size of myomata removed by laparoscopy. Therefore, myomectomy may be recommended for patients wishing to conceive who have a limited number of myomata and a short duration of infertility.

Of the 44 patients who underwent laparoscopic myomectomy, 17 (38.8%) conceived, suggesting its possible importance in patients with unexplained infertility. These results are in accordance with previously published pregnancy rates of between 16.7% and 66.7% following laparotomy (Berkeley et al., 1983; Rosenfeld, 1986; Verkauf, 1992) and 33% following laparoscopic myomectomy (Dubuisson et al., 1996). Our results showed no statistically significant difference in subsequent fertility between patients with primary and those with secondary infertility, or between patients with unexplained infertility and those with multifactorial infertility, possibly due to the small number of cases included in each group. The number of months prior to conception also was not significantly different after laparoscopy or laparoconversion. Our data agree with other reports (Babaknia et al., 1978; Rosenfeld, 1986; Smith and Uhlir, 1990; Verkauf, 1992; Dubuisson et al., 1996) and confirm that myomectomy should be considered in patients with unexplained infertility.

Laparoscopic myomectomy has several drawbacks, including difficulties in suturing the myometrium, leading to the risk
of rupture during pregnancy and delivery and a risk of adhesions.

The technique renders difficult myometrial closure and the obliteration of all dead space. Therefore, in patients who wish to conceive, LAM may be performed if correct closure of the myometrium cannot be obtained by laparoscopy. In our study, this occurred in 15 cases (10.5%). Gasless laparoscopy may also be a good alternative to LAM or laparoverconversion when myometrial closure is difficult, since it allows the use of laparotomic instruments without alteration of laparoscopic vision.

Uterine rupture is a rare complication in women who conceive after laparotomic myomectomy (Brown et al., 1956), and depends on the ability to restore uterine anatomy with myometrial integrity and the propensity for vaginal delivery. Several factors may increase its risk following laparoscopic myomectomy. Extensive use of electrodissection for cleavage of myomata may induce adjacent myometrial necrosis which, in turn, may impair subsequent tissue repair. Harris (1992) and Dubuisson et al. (1995) reported two cases of uterine rupture during pregnancy following laparoscopic myomectomy. In the present study, no similar case was noted, despite the fact that the majority of women (8/11) gave birth vaginally.

As previously reported (Tulandi et al., 1993), laparotomic myomectomy with a posterior uterine incision is associated with a higher number and extension of adnexal adhesions than are observed after a fundal or anterior incision. Therefore, the standard uterine incision should be anterior and vertical. Myomas on the posterior uterine wall can usually be removed with a fundal incision and are easily sutured laparoscopically. Despite meticulous haemostasis, the use of fine suture material, and the accurate closure of uterine incisions, in our study adhesions were found at the site of myomectomy scar in the four patients who had follow-up laparoscopic investigations. Further studies are necessary to assess the specific risk of adhesions after laparoscopic myomectomy and to validate the interest of endoscopic second-look.

Finally, especially in patients in whom myomata are associated with the presence of unexplained infertility, our results in terms of fertility after laparoscopic myomectomy are encouraging. However, it is clear that further studies will be required to determine the subsequent risk factors of adhesions and of uterine rupture.

References

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