A case-control study to compare the variability of operating time in laparoscopic and open surgery

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The purpose of this study was to compare the variability of operating times for some of the most common gynaecological procedures performed laparoscopically and by open surgery. The case notes of 60 women randomly selected from a cohort of 600 who had undergone laparoscopic surgery for ectopic pregnancy, ovarian cysts, leiomyoma and hysterectomy were reviewed. These patients were matched with an equal number of women who had been treated by open surgery for similar indications. Additional matching criteria included age (± 2 years), size of the lesion in cases of ovarian cysts and fibroids (± 3 cm), the period of amenorrhoea in ectopic pregnancies, and uterine size and pelvic pathology in women undergoing hysterectomy. Comparison of laparoscopy and laparotomy showed that the mean procedure times were similar for the two routes of surgery, with the exception of hysterectomy which took significantly longer if done laparoscopically. The duration of laparoscopic surgery for ectopic pregnancy, ovarian cystectomy and hysterectomy was significantly less predictable than at laparotomy. These data indicate that with the exception of hysterectomy, the average operating time for laparoscopic procedures is comparable to that for laparotomy. In contrast, the variability of duration of laparoscopic surgery tends to be much greater than with laparotomy for all procedures considered.

Key words: laparoscopic surgery/laparotomy/procedure time/variability

Introduction

The introduction of operative laparoscopy in gynaecology has dramatically changed our approach to gynaecological surgery. Endoscopic approaches have been described for most routine gynaecological procedures. Although the place of some procedures such as laparoscopic hysterectomy remains highly contentious (Johns et al., 1995; Richardson et al., 1995), the benefits of laparoscopic surgery in terms of lower morbidity, shorter hospital stay and quicker recovery times are well established (Bruhat and Pouly, 1993; Dubuisson et al., 1995; Lin et al., 1995; Chapron et al., 1996; Tulandi, 1996; Clasen et al., 1997). On the other hand, a common criticism of laparoscopic surgery is that it is time consuming and complex (Magos, 1996).

We have recently shown from analysis of 1000 operative laparoscopic procedures that while the average operating time was 77 min, the range of operating times was great (10–400 min) (Shushan et al., 1999). These data suggest that while the average laparoscopic procedure may not take longer than traditional open surgery, endoscopic procedures are probably less predictable, having a wide range of operating times. Although there are many controlled studies comparing laparoscopic and open procedures, there are no data with respect to any differences in the variability of operating times between the two surgical approaches. The present case-control study was undertaken to compare the variability of operating times of some of the most common gynaecological procedures when done laparoscopically or by laparotomy.

Materials and methods

The operative coding sheets of 60 randomly selected women who had undergone laparoscopic salpingectomy for ectopic pregnancy, ovarian cystectomy (endometriomas and benign ovarian cysts), myomectomy, and laparoscopically assisted vaginal hysterectomy (LA VH) were reviewed. Cases were selected from a total of 600 women who underwent operative laparoscopic procedures and were identified using a list of computer generated random numbers with blocking for procedures.

These patients were matched with an equal number of women who had been treated during the same time period by laparotomy for similar indications. These patients were under the care of a different gynaecological team whose preferred management was by open surgery. Additional matching criteria included age of the women (± 2 years), the period of amenorrhoea in cases of ectopic pregnancies, size of the lesion (± 3 cm) in cases of ovarian cysts and fibroids, and uterine size and pelvic pathology in women undergoing hysterectomy. Patients’ characteristics according to the various pathological conditions are described in Table I. All surgery was done by surgeons experienced in laparoscopic and open surgery.

Laparoscopic surgery was performed under general endotracheal anaesthesia with a CO₂ pneumoperitoneum. Patients were placed in the lithotomy and deep Trendelenberg position and the bladder was catheterized. A 10 mm, 30° fore-oblique telescope was inserted subumbilically, and two or three 5.5 mm suprapubic cannulae for ancillary instruments were then inserted under direct vision. The lateral trocar sleeves were placed lateral to the deep epigastric vessels, but the sites of these punctures varied according to the size of the uterus and the pathology of the pelvis. In some cases the ancillary ports were replaced by 10–12 mm ports for larger instruments and staplers. All procedures were monitored using a video camera and high resolution colour monitor. Modalities used for haemostasis included monopolar and bipolar electrocoagulation, suturing, endocoagulation and rarely...
Table I. Patient characteristics at the time of surgery

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No. of cases</th>
<th>Age in years (range)</th>
<th>Parity (range)</th>
<th>Size of focal lesion (cm) (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Laparoscopy</td>
<td>Laparotomy</td>
<td>Laparoscopy</td>
</tr>
<tr>
<td>Salpingectomy</td>
<td>10</td>
<td>31.1 (21–39)</td>
<td>28.4 (21–35)</td>
<td>0.8 (0–1)</td>
</tr>
<tr>
<td>Cystectomy*</td>
<td>10</td>
<td>26.0 (21–38)</td>
<td>26.4 (15–48)</td>
<td>0.5 (0–3)</td>
</tr>
<tr>
<td>Endometrioma</td>
<td>14</td>
<td>32.8 (25–44)</td>
<td>31.2 (23–43)</td>
<td>0.1 (0–1)</td>
</tr>
<tr>
<td>Myomectomy</td>
<td>13</td>
<td>37.6 (25–48)</td>
<td>32.5 (26–39)</td>
<td>0.5 (0–2)</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td>13</td>
<td>46.5 (32–66)</td>
<td>46.6 (32–64)</td>
<td>0.9 (0–1)</td>
</tr>
</tbody>
</table>

*Non-endometriosis cases.
**Uterine size by no. of weeks of pregnancy.

Table II. The mean operating times and variability for laparoscopic surgery and laparotomy

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Laparoscopy (min)</th>
<th>Laparotomy (min)</th>
<th>P-value</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>95% CI</td>
<td>Mean</td>
</tr>
<tr>
<td>Overall</td>
<td>96.6</td>
<td>46.0</td>
<td>85.0–108.2</td>
<td>84.2</td>
</tr>
<tr>
<td>Salpingectomy</td>
<td>63.5</td>
<td>32.4</td>
<td>40.3–86.7</td>
<td>62.5</td>
</tr>
<tr>
<td>Cystectomy**</td>
<td>69.5</td>
<td>31.7</td>
<td>46.8–92.2</td>
<td>66.0</td>
</tr>
<tr>
<td>Endometrioma</td>
<td>85.0</td>
<td>27.2</td>
<td>69.3–100.7</td>
<td>92.1</td>
</tr>
<tr>
<td>Myomectomy</td>
<td>115.8</td>
<td>45.2</td>
<td>94.3–145.3</td>
<td>100.6</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td>130.7</td>
<td>50.1</td>
<td>101.8–159.6</td>
<td>90.3</td>
</tr>
</tbody>
</table>

*p < 0.05.
**Non-endometriosis cases.
CI = confidence limit.

staplers. Carbon dioxide laser, scissors or electrosurgery were used for dissection and ablation of endometriosis. Visualization of the pelvis was aided by manipulating the uterus using a Spackmann cannula (B.Braun, Sheffield, UK) inserted into the uterus. Laparotomy was performed under general endotracheal anaesthesia using traditional surgical techniques. For both laparoscopic and open surgery, the operative times were defined as the ‘skin-to-skin’ time and excluded anaesthetic and the set-up times.

Statistical comparisons were made using the Mann–Whitney U-test for non-parametric data and unpaired t-test with Welch’s correction for the F-test to compare variances (GraphPad Prism Software, San Diego, USA). A result was considered statistically significant if P < 0.05.

Results

The women were well matched with respect to age, parity, and pelvic pathology (Table I). All the procedures were completed successfully by the intended route without major operative complications. Minor complications included trauma to the inferior epigastric artery during insertion of an ancillary trocar during laparoscopic ovarian cystectomy, bleeding from the ovarian artery during laparoscopic hysterectomy and wound infection following abdominal hysterectomy.

The operating time statistics are shown in Table II. Overall, there was no significant difference between the mean procedure times for laparoscopy or laparotomy, but the variability was significantly greater with endoscopy. Looking at the individual procedures, the mean procedure times were similar for the two routes of surgery with the exception of hysterectomy which took significantly longer if done laparoscopically (P < 0.01). In terms of variability of operating times, the duration of laparoscopic surgery for ectopic pregnancy (salpingectomy), ovarian cystectomy and hysterectomy was significantly less predictable than at laparotomy.

Discussion

Our study shows that the average operating time for laparoscopic procedures is comparable to laparotomy with the exception of hysterectomy. In contrast, the variability of duration of laparoscopic surgery tends to be much greater than with laparotomy, particularly with hysterectomy and ovarian cystectomy. These results confirm our impression based on 1000 procedures that unpredictability of duration of laparoscopic procedures is greater than with laparotomy (Shushan et al., 1999).

Although no previous study has examined the variability of operating times specifically, several investigators have used operating time as one of the parameters to compare surgery by laparoscopy and laparotomy. Our finding that LA VH takes longer to perform than abdominal hysterectomy and is less predictable in terms of duration is consistent with many previous reports (Summitt et al., 1992; Howard and Sanchez, 1993; Phipps and Nayak, 1993; Dorsey et al., 1996; Meikle et al., 1997). Our results regarding ovarian cystectomy and salpingectomy are also consistent with other comparative studies (Foong et al., 1995; Mais et al., 1995; Yuen et al., 1997). For instance, in a randomized prospective study of laparoscopy and laparotomy in the management of benign ovarian masses, it has recently been reported that the operating time for laparoscopic cystectomy was 59.5 (SD 31.6) min, while open cystectomy took 52.7 min with an SD of only 1.9 min (Yuen et al., 1997). In another randomized comparison of laparoscopy and laparotomy in the treatment of non-
endometriotic benign adnexal cysts, it has been reported that mean operating times were 70 (SD 20) min with laparoscopy and 67 (SD 12) min with laparotomy (Mains et al., 1995). It has also been reported that when laparoscopy was compared to conventional surgery in the management of ectopic pregnancy, the range with laparotomy was 45 to 100 min while with laparoscopy it was 34–150 min (Foong et al., 1995). Laparoscopic myomectomy is even less predictable, and a wide range of operating times have been reported (Hasson et al., 1992; Dubuisson et al., 1996).

The factors that increase the unpredictability of duration of endoscopic surgery have never been investigated. It has been shown that laparoscopic surgery requires specific skills and that operating times can be shortened with experience (Yeko et al., 1994). For example, it has recently been shown that operating times of laparoscopic operations involving suturing can be shortened by training of tying techniques (Vossen et al., 1997). Given that in the present study factors like the nature of the operation, extent of pelvic pathology and experience of surgeon were similar, it may be that most of the delays with laparoscopic surgery may be inherent in the technique itself. Our impression is that factors such as availability of appropriate instruments, equipment breakdown, familiarity of ancillary staff assisting with the equipment, and complications which take longer to manage, are all more relevant with endoscopic surgery than with laparotomy.

In conclusion, our study confirms that in most cases, laparoscopic surgery is far more unpredictable in duration than conventional open surgery. This is a disadvantage when it comes to the planning of operating lists involving mainly laparoscopic cases. Whether careful preoperative assessment involving clinical examination, pelvic ultrasound and a prior laparoscopic evaluation can improve our estimate of the likely duration of a particular laparoscopic procedure, or whether the relative variability of duration of laparoscopic surgery is inherent in the technique itself, remains to be resolved.

References


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