Teach the teachers: an observational study on mentor traineeship in gynecological laparoscopic surgery
Abstract

**Background:** To evaluate the effect of a mentor traineeship in laparoscopic surgery in a teaching hospital.

**Method:** This observational study was performed between January 1997 and December 2004 at the Bronovo Hospital, The Hague in The Netherlands. An advanced endoscopic gynecologist mentored the trainee in laparoscopic surgery since January 2001. Data on the trainee’s procedures preceding (1997-2000) and during the mentor traineeship (2001-2004) were compared. The number and type of procedures performed, complications and conversions were derived from a prospectively kept database supplemented by a retrospective chart review. Operating times of the total laparoscopic hysterectomy (TLH) were registered to establish the trainee’s learning curve.

**Results:** Since the presence of the mentor, the trainee performed significantly more advanced laparoscopic procedures. Despite the significant increase of advanced cases, the trainee’s laparoscopic conversion rate to laparotomy remained stable between period 1 and period 2 (respectively 7.5% and 4.5%, $p=0.35$, 95% CI: -0.033 to 0.092), moreover for level 3 procedures the conversion rate decreased ($p<0.001$, 95% CI: 0.30 - 0.71). Despite the increase of advanced cases, the total complication rate remained stable (respectively 3.2% to 4.5%, $p=0.62$, 95% CI: -0.07 - 0.04) including the number level 3 complications (respectively $p=0.63$, 85% CI: -0.4 - 0.3). A decreasing trend in operating time for TLH was found, however not significantly (Spearman correlation coefficient -0.421, $p=0.81$).

**Conclusions:** Mentor traineeship in gynecology enhanced advanced laparoscopic caseload. With the increase in advanced procedures, no increase in conversion rate, complication rate or operating times for TLH was found. Due to the mentorship, patients were not exposed to increased complications and conversions, or to the disadvantages of a prolonged operating time. Predominantly, mentor-traineeship facilitated the implementation of laparoscopic surgery into an established gynecological practice in a teaching hospital.
Introduction

The development of operative laparoscopy presents one of the most important steps forward in the field of gynecological surgery. Since operative gynecological laparoscopy is a technically difficult type of surgery, the question raised how gynecologists already in general practice can successfully learn, maintain and integrate this type of surgery into their daily practice. [SAGES 1998, Navez 1999, Loh 2002, Nussbaum 2002]

It is shown that the implementation of laparoscopy is a major challenge [SAGES 1998, Nussbaum 1999, Loh 2002, Navez 2002] and has its consequences for residency training. In a previous study in 2002 we found that 20% of the residents had no advanced laparoscopic gynecologist present in their teaching hospital. [Kolkman 2005] If teachers do not possess endoscopic skills, how can residents be trained in this field of surgery? More and more residents desire to learn the techniques needed to perform advanced cases. [Fowler 2000, Schijven 2004, Kolkman 2005,] Since endoscopic skills are not an innate behaviour, neither can they be easily mimicked due to their difficult and non-intuitive nature, [Gallagher 1998] this creates an educational need among practicing gynecologists for training in these techniques. [Rogers 2001]

This need for additional training has been met with courses or congresses developed by advanced laparoscopic gynecologists. However, concern is expressed about the clinical adequacy of these courses. [Rogers 2001] Simulator training is developed to acquire skills outside the operating room. In this context we have to consider that simulators train basic skills and not the difficult techniques required for advanced procedures. [Feldman 2004]

In general surgery it is shown that hiring an advanced endoscopic surgeon increased the caseload, improved resident exposure to laparoscopy and had a positive effect on laparoscopic education and research. [Fowler 2000] Mentor-traineeship has also shown to accelerate the learning curve of advanced laparoscopic procedures in Urology. [Fabrizio 2003] These studies suggest that a mentor traineeship improves the effectiveness of endoscopic training of advanced procedures.

The aim of this observational study is to evaluate the effect of a mentor traineeship in order to teach established gynecologists in a teaching hospital advanced laparoscopic surgery.
Methods

In 2001 faculty members (n=5) at the Department of Obstetrics and Gynecology of the teaching hospital Bronovo in The Hague, The Netherlands, decided to actively implement advanced gynecological laparoscopy. To ‘teach the teachers’ it was decided to hire an advanced endoscopic gynecologist. One faculty member (author MJGHS), registered as a gynecologist for 11 years, had endoscopic surgery as her field of special interest and was assigned the task to actively implement advanced gynecological laparoscopy. She already experienced level 2 laparoscopic procedures. An advanced endoscopic gynecologist from an Academic teaching hospital (author FWJ, 10 years of experience with level 3 laparoscopic procedures) was appointed to the Bronovo Hospital on a part time basis to facilitate the implementation of advanced laparoscopic procedures in a mentor-trainee model. He acted as mentor, whereas the faculty member with gynecological endoscopy as a field of special interest was the trainee. Financial support for this project was acquired from the Bronovo Research Fund. The trainee was scheduled to perform surgery one day each week and was biweekly mentored directly in the operating room. During all procedures the trainee was the primary surgeon and the mentor assisted. The mentor’s position can be compared to that of a driving instructor: he taught, guided and advised the trainee during the procedure to ensure safety and forward progress, and was able to intervene when necessary.

The number of all laparoscopic procedures performed by the trainee from 1997 to 2004 was collected from a prospectively kept database supplemented by a retrospective chart review. Data included type of procedures performed, conversion to open surgery, and number and type of complications. The trainee’s intra- and postoperative complications were analyzed.

All laparoscopic procedures were stratified by level of difficulty (level 1-3) in accordance with published guidelines from the Royal College of Obstetricians and Gynecologists, as shown in table 1. [RCOG 2001]

Data were tabulated for period 1 (1997-2000) and period 2 (2001-2004) in order to analyze the effect of the presence of the mentor on implementation.

The laparoscopic approach was the intention to treat for all procedures. Conversion to open surgery was defined as a case that could not be completed endoscopically as planned. Complications were categorized into intra- and post-operative. Intra-operative complications were defined as unexpected events during surgery, which required further treatment. Post-operative complications were defined as adverse events occurring within 30 days after surgery as a result of the laparoscopic procedure.

During the mentor traineeship all hysterectomies performed laparoscopically were total laparoscopic hysterectomies (TLH). Therefore, for this standardized
procedure the mean operating times were retrieved to measure the trainee’s learning curve for this procedure.

Statistical analyses were performed using SPSS, version 11.0 (SPSS Inc., Chicago, IL). Non-parametric tests, Chi-square, Spearman’s correlation coefficient were used for statistical analyses. A p-value below 0.05 was considered statistically significant.
Results

The number of laparoscopic procedures performed by the trainee is shown in figure 1.

Figure 1 | Number of laparoscopic procedures stratified by level of difficulty performed by the trainee during the mentor traineeship.

The trainee performed 216 laparoscopic surgical procedures between 1997 and 2004 of which 93 in period 1 (level 1: 57, level 2: 34 and level 3: 2 procedures) and 132 in period 2 (level 1: 39, level 2: 67 and level 3: 26 procedures), which resulted in a significant decrease for level 1 procedures (p < 0.001) and a significant increase for level 2 (p = 0.035) and level 3 (p<0.001). The latter was a result of the significant increase in the number of TLH’s performed (respectively from 2001 to 2004: 1-2-5-12 per year, p=0.04).

Conversion to laparotomy

Table 2 details the reasons for conversion to laparotomy performed by the trainee divided per level in which they occurred for both periods. The overall percentage of conversions remained stable between period 1 and 2 (respectively 7.5% to 4.5%, p=0.35, 95% CI: -0.03 - 0.09). No conversions occurred for level 1 procedures. The percentage of conversions for level 2 procedures remained stable. However, the percentage of conversions for level 3 procedures decreased significantly (respectively 1/2 to 0/26, p<0.001, 95% CI: 0.3 to 0.71). The most frequent observed indication for conversion was the inability to perform laparoscopic surgery due to adhesions.
Complications

The type and incidence of complications are detailed in Table 3. Five of the 8 postoperative complications occurred in two patients. Most frequently observed intraoperative complication was haemorrhage (1.3%, 3/225).

Table 3 | Trainee’s intra-operative and postoperative complications of laparoscopic procedures

<table>
<thead>
<tr>
<th>Complications</th>
<th>Period 1</th>
<th></th>
<th>Period 2</th>
<th></th>
<th>p</th>
<th>Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=93</td>
<td>% (n)</td>
<td>N=132</td>
<td>% (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra-operative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retroperitoneal insufflation</td>
<td>1.1 (1)</td>
<td>0 (0)</td>
<td>0.36</td>
<td>0 (0)</td>
<td></td>
<td>-0.01 (-0.03 - 0.03)</td>
</tr>
<tr>
<td>Haemorrhage*</td>
<td>2.2 (2)</td>
<td>0.8 (1)</td>
<td>0.7</td>
<td>0.01 (-0.03 - 0.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postoperative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>0 (0)</td>
<td>0.8 (1)</td>
<td>0.28</td>
<td>-0.01 (-0.03 - 0.009)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>0 (0)</td>
<td>0.8 (1)</td>
<td>0.28</td>
<td>-0.01 (-0.03 - 0.009)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subcutaneous emphysema</td>
<td>0 (0)</td>
<td>1.5 (2)</td>
<td>0.12</td>
<td>-0.02 (-0.05 - 0.006)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abscess formation</td>
<td>0 (0)</td>
<td>0.8 (1)</td>
<td>0.28</td>
<td>-0.01 (-0.03 - 0.009)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reoperation herniation</td>
<td>0 (0)</td>
<td>2.3 (3)</td>
<td>0.06</td>
<td>-0.03 (-0.07 - 0.001)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CI = confidence interval, *Intraoperative haemorrhage converted to laparotomy (2x oophorectomy in period 1, 1x TLH in period 2), §occurred in 1 patient, ¶occurred in 1 patient.
Table 4 shows the complication rates stratified per level of difficulty of the procedure. No changes in complications rates were found between period 1 and period 2. No deaths occurred as a result of a laparoscopic procedure.

Table 4 | Trainee’s laparoscopic procedures in which complications occurred stratified by level of difficulty [RCOG 2001]

<table>
<thead>
<tr>
<th>Laparoscopy</th>
<th>Period 1</th>
<th>Period 2</th>
<th>p</th>
<th>Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=93</td>
<td>N=132</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% (n/n)</td>
<td>% (n/n)</td>
<td>p</td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>1.8 (1/57)</td>
<td>0 (0/39)</td>
<td>0.40</td>
<td>0.02 (-0.02-0.06)</td>
</tr>
<tr>
<td>Level 2</td>
<td>5.9 (2/34)</td>
<td>4.5 (3/67)</td>
<td>0.76</td>
<td>0.01 (-0.08-0.1)</td>
</tr>
<tr>
<td>Level 3</td>
<td>0 (0/2)</td>
<td>11.5 (3/26)</td>
<td>0.63</td>
<td>-0.1 (-0.6-0.4)</td>
</tr>
<tr>
<td>Total</td>
<td>3.2 (3/93)</td>
<td>4.5 (6/132)</td>
<td>0.62</td>
<td>-0.01 (-0.07-0.04)</td>
</tr>
</tbody>
</table>

CI = confidence interval

Operating time TLH
Mean operating time was 131 minutes (range: 60-225 min.). Figure 2 shows that the operating times has a decreasing trend, however not significantly (Spearman correlation coefficient -0.421, p=0.81).

Figure 2 | Operating times (minutes) for total laparoscopic hysterectomy
Discussion

Mentor traineeship in gynecology enhanced advanced laparoscopic caseload. With the increase in advanced procedures, no increase in conversion rate, complication rate or operating times for TLH were found. Due to the mentorship, patients were not exposed to increased complications and conversions, or to the disadvantages of a prolonged operating time. Predominantly, mentor traineeship facilitated the implementation of laparoscopic surgery into an established gynecological practice of a teaching hospital.

Nowadays, it is impossible to imagine operative gynecology without minimal invasive surgery. For this promising type of surgery, supported by literature, indications for laparoscopy are expanding when performed in experienced hands. However, at this moment experience in laparoscopic surgery is one of the inhibiting factors of the implementation of laparoscopy into daily practice. Especially for established gynecologists it is difficult to acquire an entire new surgical technique and successfully incorporate these into daily practice. [SAGES 1998, Loh 2002, Bröllman 2001, Kolkman 2006] ‘Open surgeons’ are hesitant about this type of surgery, they frequently develop a critical attitude towards laparoscopic procedures and are not willing to shift their ‘open’ procedures to minimal invasive surgery. Their criticism is mainly based on the long operating times for laparoscopic procedures, lack of training, lack of correct equipment and budgetary problems in clinics and the finance of the Dutch health care system [Kolkman 2006].

The slow implementation of advanced procedures such as TLH was also observed in our current study. It took some time before TLH, a level 3 procedure started to implement, which resulted in a relatively small number of procedures performed during the study period and is therefore a limiting factor of this study. Besides being a limiting factor, it represents one of the main conclusion of our studies, since this phenomenon of the slow and difficult implementation of laparoscopy in The Netherlands in general, also plaques to other specialties and other countries. [Kolkman 2006]

We need to consider that the majority of gynecologists in the Netherlands, like in the UK [RCOG 2004] are generalists without a subspecialty and has a practice with obstetrics and gynecology combined [Bröllman 2001]. It was found that level 1 procedures were already properly implemented before the mentor traineeship, but it was not until the end of the study period that the level 2 procedures were adequately implemented and some of the more advanced procedures, such as TLH are currently still in the process of being incorporated as routine procedure in the surgical treatment options.
Not all gynecologists should perform advanced endoscopic procedures. All residents and gynecologists should, however, be capable of performing level 1 and operative procedures of level 2, for instance cystectomy, adnexectomy and ectopic pregnancy. Furthermore, every hospital (teaching and non-teaching) should be able to offer laparoscopic hysterectomy of level 2 (LAVH) and level 3 (TLH), for instance by developing an internal referral system. However, to accomplish this, every hospital should dispose of a laparoscopic expert.

Hesitation is expressed about the implementation of more advanced procedures, such as pelvic reconstructive procedures, myomectomy, oncological procedures, and tubal surgery for infertility. Besides knowledge of the disease, therapeutic alternatives, indications for surgery and the options of the surgical approach, these advanced procedures require a much higher level of competence in order to be completed successfully. [Rosser 2000] The competence required is much more than the technical surgical abilities necessary for a laparoscopic procedure. In addition, the incidence of these procedures is low and evidence to perform these procedures laparoscopically is still limited or in progress. Therefore, it is appropriate that only experienced, skilled and qualified (accredited and credentialed) gynecologists in that special field should perform these laparoscopic procedures in order to minimize complication rates and to deliver high-quality patient care.

Besides complication and conversion rates, the operating times of the TLH’s were registered as a parameter of the trainee’s learning curve. During the traineeship the mentor actively interfered with the procedure to ensure forward progress of the procedure, which resulted in protecting the patient from unnecessary long operating times and eliminates the argument that implementation of new surgical techniques on patients is unethical.

It is well established that the complication rate increases when more advanced endoscopic procedures are performed. [Jansen 1997, Chapron 1998, Mirhashemi 1998, Harkki-Siren 1999, Jansen 2000] However, despite the significant increase of complex laparoscopic procedures, the complication and conversion rates of the trainee in our study remained stable. Her conversion rate (4.5%) is comparable to other studies (1.2% - 6.3%). [Chapron 1998, Mirhashemi 1998, Leonard 2000, Sokol 2003] Presumably the presence of the mentor protects from making complications and conversions.

As there is evidence that laparoscopic procedures are more likely to be performed by surgeons who received training during residency, [Shay 2002] we consider mentor traineeship not to be a substitute for formal endoscopic training, as achieved during residency or fellowship training. Besides the mentor traineeship enables gynecologists in practice to properly implement endoscopic procedures.
into their daily practice without compromising patient care, it is found to increase caseload, to improve resident exposure to endoscopy and to have a positive effect on laparoscopic education and research. [Fowler 2000]

In order to demonstrate the optimal duration of mentor traineeship, not only learning curves for each procedure need to be determined, as done for laparoscopic hysterectomy [Altgassen 2004] also scoring of competence by GOALS or OSATS [Martin 1997, Vassiliou 2005] are objective tools to assess the trainee’s competence. This might shorten the length of mentoring, however, follow up study beyond the mentorship period is warranted to determine permanent benefits.

In conclusion, present study highlights the increase in case load and the introduction of new surgical techniques during a mentor traineeship in laparoscopic surgery in gynecology. In our opinion a mentor traineeship is a valuable solution to train gynecologists in daily practice and to facilitate the implementation of laparoscopic surgery without compromising patient’s care.