Is Laparoscopic Appendicectomy a Safe Procedure for Trainees in the Peripheral Hospital Setting?

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Abstract
Laparoscopic appendicectomy has become standard in the treatment of acute appendicitis in most hospitals in Ireland. Studies have shown that it is a safe procedure for trainees to perform. However, these studies were conducted in university teaching hospitals whereas a significant proportion of training in Ireland takes place in peripheral hospitals which provide a different training environment. The aim of this study was to determine whether laparoscopic appendicectomy is a safe procedure for surgical trainees to perform in a peripheral hospital setting. A retrospective analysis was performed of appendicectomies carried out at a peripheral hospital over a 12 month period. Comparisons were made between consultant surgeons and trainees for a variety of outcomes. Of 155 appendicectomies, 129(83.2%) were performed laparoscopically, of which 10(7.75%) were converted to open. Consultants performed 99(77 %) laparoscopic appendicectomies. There were no statistically significant differences between consultants and trainees in complication rates (19(19.2%) vs. 4(13.3%), p=0.46), mean length of hospital stay (4.7 +/- 4.0 vs. 3.4 +/- 3.3 days, p=0.13), or rate of conversion to open operation (9(9.1%) vs. 1(3.3%), p=0.45). For cases of complicated appendicectomies there were no significant differences between consultants and trainees in complication rates (12 vs 2, p=0.40) or length of hospital stay (6.4 +/- 3.9 vs. 4.7 +/- 5.6 days, p=0.27). We conclude that laparoscopic appendicectomy is a safe procedure for trainees to perform in the peripheral hospital setting and should be incorporated into surgical training programs at an early stage of training.

Introduction
Laparoscopic appendicectomy has become standard in the treatment of acute appendicitis in most hospitals in Ireland. It has been shown to be safe with comparable overall complication rates to open appendicectomy. In addition, laparoscopic appendicectomy is associated with fewer wound infections, less post-operative pain, better cosmesis, a shorter hospital stay and an earlier return to normal activity. Traditionally, open appendicectomy was considered an ideal procedure for surgical trainees to perform. There are concerns that the advent of laparoscopic surgery has resulted in less opportunities for junior trainees to perform appendicectomy. Since the introduction of laparoscopic appendicectomies in Ireland, there has been a 50% reduction in the number of appendicectomies performed by basic surgical trainees. This may be because of perceptions that laparoscopic appendicectomy carries a higher morbidity rate and is therefore not as safe for trainees to perform.

Several studies have shown that trainees safely perform laparoscopic appendicectomy with similar conversion rates, complication rates, and length of hospital stay to consultant surgeons. However, all of these studies were carried out in university or teaching hospitals, whereas much of the surgical training in Ireland, and elsewhere, takes place in peripheral hospitals. This study aimed to determine whether laparoscopic appendicectomy is a safe procedure for surgical trainees to perform in a peripheral hospital setting.

Methods
The study took place at St Lukes Hospital, Kilkenny, a peripheral hospital with 228 acute beds. A retrospective analysis was performed of all appendicectomies performed from August 2008 to July 2009. Patients were identified using the Leapin surgical audit system. Data was collected from patient charts and operative records and included the type of operation, the presence of intra-operative findings, post-operative complications, and the need to convert to open appendicectomy. The need for ICU admission, total length of the patients hospital stay and any re-admissions. Operating surgeons were graded as either consultant or trainee. Data on duration of surgery was not collected as this was not routinely recorded in the operative record and total length of anaesthesia was considered a poor proxy for duration of surgery. Laparoscopic appendicectomies were performed using a standard three port technique. Pneumoperitoneum was created using the Hasson technique at the umbilicus and two further ports placed suprapubically and in the left iliac fossa. The mesoappendix was divided between clips or controlled using ultrasonography. The appendix base was ligated with loop ligatures and divided. The appendix was retrieved using a retrieval bag system. Patients received a prophylactic dose of broad spectrum antibiotic at induction of anaesthesia, usually co-amoxiclavulanic acid 2.5g. The decision to continue antibiotics post-operatively was made by the operating surgeon based on the intra-operative findings and protocols in place dictating which grade of surgeon would operate on any particular patient, nor were there any guidelines in place to decide which patients would receive a laparoscopic or open appendicectomy. There were no statistically significant differences between consultants and trainees for a variety of outcomes. Of 155 appendicectomies, 129(83.2%) were performed laparoscopically, of which 10(7.75%) were converted to open. Consultants performed 99(77 %) laparoscopic appendicectomies. There were no statistically significant differences between consultants and trainees in complication rates (19(19.2%) vs. 4(13.3%), p=0.46), mean length of hospital stay (4.7 +/- 4.0 vs. 3.4 +/- 3.3 days, p=0.13), or rate of conversion to open operation (9(9.1%) vs. 1(3.3%), p=0.45). For cases of complicated appendicectomies there were no significant differences between consultants and trainees in complication rates (12 vs 2, p=0.40) or length of hospital stay (6.4 +/- 3.9 vs. 4.7 +/- 5.6 days, p=0.27). We conclude that laparoscopic appendicectomy is a safe procedure for trainees to perform in the peripheral hospital setting.

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Laparoscopic appendicectomy has become standard in the treatment of acute appendicitis in most hospitals in Ireland. Several studies have demonstrated that trainees perform laparoscopic appendicectomies with similar complication rates, and the greater technical demand of laparoscopic surgery with complicated findings indicates there was no significant difference in the type of patient or complexity of the surgery between the two groups. Furthermore, trainees have similar outcomes to consultants when performing appendicectomies with complicated findings.

Discussion
Laparoscopic appendicectomy has become standard in the treatment of acute appendicitis in most hospitals in Ireland. Although it has been shown to have advantages over open appendicectomy, concerns still remain amongst some surgeons about a potential increase in the risk of intra-abdominal abscesses, greater operative risks, longer operative times and the greater technical demand of laparoscopic surgery. As a result, there is often reluctance to allow trainees, especially junior trainees, to perform laparoscopic appendicectomies.

Several studies have demonstrated that trainees perform laparoscopic appendicectomies with similar complication rates, rates of conversion to open operation and patient's length of hospital stay to consultants who performed in large university or teaching hospitals where the training environment differs significantly from peripheral hospitals due to different staffing levels, levels of expertise, on-call duties, staff to patient ratios, levels of supervision, access to special investigations, access to theatre and availability of other specialties. A significant proportion of surgical training in Ireland takes place outside of these settings in peripheral hospitals, with most trainees working at some point during their training in a peripheral hospital. This study demonstrates that trainees can safely perform laparoscopic appendicectomies in a peripheral hospital setting with no significant difference in complication rates, rates of conversion to open operation and length of patients hospital stay to consultant surgeons. The fact that consultants and trainees performed similar proportions of appendicectomies with complicated findings indicates there was no significant difference in the type of patient or complexity of the surgery between the two groups. Furthermore, trainees have similar outcomes to consultants when performing appendicectomies with complicated findings.

The overall complication rate in this study of 17.8% was high. This was because of the broad definition of post-operative complications used. For example, recurrent or persistent abdominal pain was included as a complication so as not to inadvertently exclude patients with potential complications, such as small intra-abdominal collections or abscesses, who would not have received imaging and may not be diagnosed but would likely be included in this group. If these patients were excluded, the appendicectomy would be 10.6%, which is in keeping with that quoted in other studies. Similarly, the mean length of total hospital stay was relatively long. This was because the definition of total hospital stay included not only the hospital stay relating to the original admission but also any future re-admission within 30 days. This was felt to be necessary in case patients whose appendicectomies were performed by any particular grade of surgeon were discharged earlier than others, only to return later, particularly as laparoscopic appendicectomy may be associated with more re-admissions than open appendicectomy.

Many trainees are only performing laparoscopic appendicectomies later rather than earlier in their training. Irish study showing a 50% reduction in the number of appendicectomies of any type performed by basic surgical trainees since the introduction of laparoscopic techniques. Some trainees feel that they may not have mastered even basic laparoscopic techniques such as laparoscopic appendicectomy by the end of their training.

Assessment of laparoscopic skills using Hidden Markov Models shows that significant laparoscopic capability develops between the first and third year of surgical training. The learning curve for laparoscopic appendicectomy may be even shorter, with some suggesting proficiency after 20 procedures. The European Association for Endoscopic Surgeons (EAES) recommends a minimum of 20 laparoscopic appendicectomies are performed before accreditation. Increasingly, enforced restrictions on working time and the trend toward more streamlined, shorter training programs mean that trainees should learn common techniques such as laparoscopic appendicectomy early in their training. The more experience gained in laparoscopic appendicectomy the better the outcome under various degrees of difficulty of the appendicectomy. For example, the rate of post-operative intraabdominal abscess is significantly reduced with laparoscopic appendicectomy performed by surgeons more experienced in this technique working in dedicated laparoscopic surgery.

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<th>Consultant</th>
<th>Trainee</th>
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<td>23 patients experienced post-operative complications</td>
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The overall post-operative complication rate for procedures begun as laparoscopic appendicectomies was 17.8%. There were no statistically significant differences between consultants and trainees in post-operative complication rates (19.2% vs. 13.3%, p=0.46) or in mean total length of hospital stay (4.7 +/- 4.0 vs. 3.4 +/- 3.3, p=0.13). 9.1% of operations performed by consultants were converted to open operation versus 3.3% of those performed by trainees, but this difference was not significant (p=0.45). There were no significant differences between consultants and trainees for a variety of other outcomes including proportions of ICU admissions, re-admissions or the need for a repeat operation.

Table 2 shows the outcomes for laparoscopic appendicectomies performed by consultants and trainees. 23 patients experienced post-operative complications. The overall post-operative complication rate for procedures begun as laparoscopic appendicectomies was 17.8%. There were no statistically significant differences between consultants and trainees in post-operative complication rates (19.2% vs. 13.3%, p=0.46) or in mean total length of hospital stay (4.7 +/- 4.0 vs. 3.4 +/- 3.3, p=0.13). 9.1% of operations performed by consultants were converted to open operation versus 3.3% of those performed by trainees, but this difference was not significant (p=0.45). There were no significant differences between consultants and trainees for a variety of other outcomes including proportions of ICU admissions, re-admissions or the need for a repeat operation.
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Laparoscopic appendicectomy performed by trainees has been shown to be safe in university teaching hospitals, and this study shows it can be performed safely by trainees in a peripheral hospital setting. Laparoscopic appendicectomy should therefore be incorporated into surgical training programs at an early stage of training, allowing trainees to gain experience and a solid grounding in laparoscopic surgery.

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References


