

Introduction of laparoscopic appendectomy to a rural centre

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Abstract

Objective and method: To evaluate and compare the open and laparoscopic approaches to appendectomy in a rural hospital through retrospective review of the charts of 77 consecutive patients presenting between Jan. 1, 1994, and Feb. 1, 1996, with suspected appendicitis.

Interventions: After Oct. 1, 1994, all patients presenting to the Canadian-trained general surgeon from the group of doctors performing the surgeries were considered for laparoscopic appendectomy.

Main outcome measures: Length of stay, postoperative use of analgesia, hospital costs and operating time.

Results: Laparoscopic appendectomy was associated with a significantly shorter hospital stay (1.39 days v. 2.37 days, $p < 0.01$) and a significantly reduced analgesia requirement (26.9 v. 48.3 morphine equivalents, $p < 0.025$). Operative times were not statistically different. Laparoscopic surgery resulted in a 30% reduction in total hospital costs.

Conclusions: Open appendectomy is associated with a significantly increased length of hospital stay, increased postoperative pain and increased total hospital costs compared with laparoscopic appendectomy. Laparoscopic surgery should be considered the gold standard treatment for appendicitis.

Résumé

Objectif et méthode : Évaluer et comparer l'appendicectomie sanglante à l'appendicectomie par laparoscopie dans un hôpital rural au moyen d'un examen rétrospectif des dossiers de 77 patients consécutifs qui se sont présentés entre le 1er janvier 1994 et le 1er février 1996 et chez lesquels on soupçonnait une appendicite.

Interventions : Après le 1er octobre 1994, on a envisagé de procéder à une appendicectomie par laparoscopie chez tous les patients qui se sont présentés au chirurgien général qui a reçu sa formation au Canada et qui faisait partie des médecins chargés de pratiquer les interventions.

Principales mesures des résultats : Durée du séjour, utilisation d'analgésiques après l'intervention, coûts hospitaliers et durée de l'intervention.

Résultats : On a établi un lien entre l'appendicectomie par laparoscopie et la réduction marquée de la durée de l'hospitalisation (1,39 jour c. 2,37 jours, $p < 0,001$) et une réduction très marquée du besoin d'analgésique (26,9 c. 48,3 équivalents-morphine, $p < 0,025$). La durée des interventions n'était pas différente sur le plan statistique. L'intervention chirurgicale par laparoscopie a réduit de 30 % les coûts hospitaliers totaux.

Conclusions : On établit un lien entre l'appendicectomie sanglante et le prolongement considérable de la durée de l'hospitalisation, l'augmentation de la douleur après l'intervention,

une augmentation des coûts hospitaliers totaux comparativement à l'appendicectomie par laparoscopie. Il faudrait considérer la laparoscopie comme l'étalon or du traitement de l'appendicite.

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Introduction

In recent years, laparoscopic appendectomy has been reported to hold a number of significant advantages over open appendectomy.¹⁻⁹ They include a shorter hospital stay, reduced analgesic requirements postoperatively, faster postoperative recovery, greater diagnostic accuracy and fewer wound infections. Despite these reported advantages many surgeons continue to view the procedure as too difficult, time-consuming and costly to perform on a routine basis. In this study, an attempt is made to shed further light on questions of hospital stay, analgesic use, cost and other factors.

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Methods

Seventy-seven patients who underwent open (43) or laparoscopic (34) appendectomy between Jan. 1, 1994, and Feb. 1, 1996, were included in this study. Incidental appendectomies and interval appendectomies were excluded from the analysis. Only those patients whose surgery was performed for suspected appendicitis were included. All patients were assessed with respect to age, leukocyte count, sex, hospital stay and analgesic use. Appendicitis positivity and perforation rates were calculated for open and laparoscopic groups. Extra costs associated with laparoscopic appendectomy as well as total hospital costs were also calculated. All operations were performed by a Canadian-trained general surgeon (who performed all the laparoscopic appendectomies), a British-trained general surgeon, or 1 of 2 GP surgeons.

Beginning in October 1994, all cases (39) of possible appendicitis referred to the Canadian surgeon were considered for diagnostic laparoscopy. Two patients were rejected for the laparoscopic approach: 1 because of the presence of a large palpable mass, the other because of the presence of diffuse peritonitis. In the remaining 37 patients, 3 required conversion to open procedures after diagnostic laparoscopy suggested severe or unsuspected disease (abscess with vascular compromise of the ileum, perforated cecal diverticulitis with abscess and perforated appendiceal abscess).

Laparoscopic appendectomy was successfully completed in the remaining 34 patients.

The laparoscopic procedure was performed by placing a 10-mm Hasson trocar through the umbilicus, using the open technique. Under direct vision, a 5-mm trocar was placed suprapubically and another 5-mm trocar was placed in the left lower quadrant just off the midline, halfway between the suprapubic and Hasson trocars. A 5-mm 30° laparoscope was used for all cases, allowing visualization through any of the 3 ports. The mesentery of the appendix was generally divided after clipping, and the base of the appendix was doubly ligated with several catgut endoloops. Retrieval of the appendix was accomplished through the Hasson trocar or an endocatch bag.

Statistical analysis was performed on the data by Student's t-test and standard error of the difference between 2 percentages. Laparoscopic and open procedures were compared for all cases and for appendicitis cases only.

Total hospital costs were calculated with use of the Alberta Health Care per diem rates for inpatient stay as well as the actual dollar costs of any "extra" equipment used in laparoscopic surgery. The equipment costs of open surgery were regarded as being nil. Since the laparoscopic equipment had already been in use for several years in the rural hospital for cholecystectomy, there were no initial capital costs that needed to be factored in.

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Results

Laparoscopic and open groups were found to be comparable with respect to mean age of patients, their leukocyte count and sex distribution, and the perforation rate. Appendicitis, confirmed histologically, was present in 76% of laparoscopic cases and in 79% of open cases (not statistically significant). Hospital stay was shorter for laparoscopic cases than for open cases (1.39 days v. 2.37 days, $p < 0.01$). Postoperative analgesic use was reduced for laparoscopic cases (26.9 v. 48.3 morphine equivalents, $p < 0.025$). Although laparoscopic appendectomy took less time to perform than the open procedure (mean, 46.4 minutes v. 52.1 minutes), this difference was not statistically significant. The conversion rate was 8% (3 of 37 diagnostic laparoscopies). Equipment costs associated with laparoscopic appendectomy over and above those in an open case were calculated to be \$133 per case. Average hospital costs for laparoscopic and open cases were \$807.26 and \$1149.45, respectively. (Because these were calculated values based primarily on length of stay data, statistical analysis was not performed.)

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Discussion

Laparoscopic appendectomy is technically feasible in most patients with appendicitis and there

are no specific contraindications. Appendiceal phlegmons, perforation and appendicitis in pregnant women can effectively be dealt with laparoscopically. When the diagnosis is in question, laparoscopy affords a more accurate diagnostic approach to the patient who must undergo operative therapy.^{3,10} The abdomen can be thoroughly irrigated, and drains can be placed into abscess cavities through trocar sites, as needed.

Most studies in the literature have suggested a shorter hospital stay and decreased analgesic requirements as well as an earlier return to work for patients who undergo laparoscopic appendectomy.^{3,4,9,10} However, the technique of laparoscopic appendectomy has not been consistent in any of these studies. Some surgeons use 4 10-mm trocars, some use 12-mm trocars, and some use a combination of 10s and 5s. The advantage of the technique presented here is the use of as many small trocars as possible.

One common criticism of laparoscopic appendectomy is the excessive length of time it takes to perform. Some authors, however, have found there is no significant difference in operating times between laparoscopic and open procedures.^{3,7} In this study, laparoscopic appendectomy took less time to perform than open procedures, but the difference was not statistically significant. The long operating time seen in many studies is very likely attributable to operator inexperience rather than a defect in the procedure.

Wound infection rates between the 2 procedures were not assessed in this study because of the small sample size. However, numerous studies^{4,5,7} have demonstrated a significantly reduced infection rate, which is probably secondary to the fact that the infected appendix does not come into direct contact with the surgical incision. The appendix is either withdrawn into a trocar completely before the trocar is removed or else it is placed into an endoscopic bag before removal.

Total hospital costs were reduced by 30% when a laparoscopic appendectomy was performed, and these savings came primarily from a reduced hospital stay. The theoretic total cost savings for all 34 laparoscopic cases was \$11 634.46. This assumes that, ultimately, beds would be closed as a direct consequence of shortened stays. However, even if beds aren't closed, hospital costs for things such as casual nursing staff may be reduced. This would be particularly noticeable in a hospital that uses a large pool of casual nurses on an "as needed" basis. Costs likely could be reduced further by the total use of nondisposable trocars.

The length of hospital stay for laparoscopic appendectomy in this study was only 1.39 days, one of the lowest reported in the literature. Similarly, the length of stay for open appendectomy was only 2.37 days. These short hospital stays likely represent the efficiency of a rural centre, where surgery can be performed very quickly after the patient arrives at the hospital. The patient's presurgery hospital stay is likely reduced compared with that of an urban hospital because of the usual immediate access to the operating room.

Although open appendectomy remains a safe and effective treatment for appendicitis, some rural surgeons with laparoscopic capability may wish to consider adding laparoscopic appendectomy to their surgical armamentarium. The technique is relatively easy to master and does not require complex skills such as suturing or knot tying. Mentoring for the procedure remains a problem however, since many Canadian tertiary care centres have not progressed as rapidly in their advanced laparoscopic skills as have US centres. Numerous US courses throughout the year are ongoing, however.

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Conclusion

Laparoscopic appendectomy is an effective mode of management for acute appendicitis and provides distinct advantages over the open technique. Open appendectomy is associated with a longer hospital stay, more postoperative pain and possibly a greater cost to the health care system.

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