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Research Article

A comparison of length of hospital stay between open appendicectomy and laparoscopic appendicectomy: a large retrospective study

Hannah L. Adams*, Sheik S. Jaunoo

Warwickshire Surgical Research Group, University Hospitals Coventry and Warwickshire, Coventry, UK

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***Correspondence:**
Dr. Hannah L. Adams,
E-mail: h.l.adams@doctors.org.uk

ABSTRACT

Background: The aim of this study was to evaluate whether there is a statistically significant difference in length of hospital stay for open vs. laparoscopic appendicectomy.
Methods: A retrospective analysis of all patients undergoing emergency appendicectomy over a 24 month period at a large teaching hospital. Length of stay, measured in days, was defined as the period between admission date and date of discharge. LA converted to OA was classified as OA. Data was analysed using descriptive statistics.
Results: A total of 648 patients underwent emergency appendicectomy during the study period. 117 (27.3%) were laparoscopic appendicectomies and 471 (72.7%) were open appendicectomies. The median length of stay was 3.0 days (IQR 3.0) and was not affected by modality of surgery (median (IQR) 3.0 (3.00) days vs. 3.0 (2.00) days in OA and LA respectively, P = 0.447). 7 patients underwent conversion from LA to OA and did not experience a significantly longer hospital stay (3.2 days, range 2-6 days).
Conclusions: OA and LA are comparable with regards to length of hospital stay, a finding in line with similar studies. It is therefore up to the individual surgeon's discretion as to which method to use, taking into account other important factors such as the surgeon's ability to perform the procedure.

Keywords: Appendicitis, Laparoscopic appendicectomy, Open appendicectomy, Length of stay

INTRODUCTION

Appendicitis is the most common cause of an acute surgical abdomen in all age groups.[1,2] Between 7-10% of the general population will develop acute appendicitis during their lifetime with the highest incidence being in the second and third decades of life.[3-5]

The surgical technique of Open Appendicectomy (OA) was first described in 1894 by McBurney and has remained relatively unchanged over the last century.[6] However, advances in surgical science have continually developed and improved outcome, leading to a substantial reduction in the mortality associated with appendicitis.[7,8]

Laparoscopic surgery was introduced by Semm in 1983 and its evolution has allowed appendicectomies to be optimised using this technique.[9] Since that time the advantages of the laparoscopic technique have been well demonstrated and Laparoscopic Appendicectomy (LA) has become the preferred procedure over OA in hospitals worldwide.[10-15] Advantages of LA include reduced post-operative pain, cosmesis and reduced length of stay in hospital.[8,12,14-21] Despite the popularity of LA, it is still a controversial subject and some studies demonstrate a preference towards OA.[18,22] When making a comparison between the two techniques, the disadvantages of laparoscopic surgery include a longer and more expensive procedure.[8,11,16,17,20,23]

The majority of studies which make a comparison between LA and OA look at length of postoperative hospital stay; generally suggesting that LA results in a shorter hospital stay for the patient.[3,7,9] However, several studies have suggested that there is no significant difference in length of hospital stay between the two procedures.[12,15,16]

This conflicting evidence warrants further investigation and will form the primary endpoint in this study.

METHODS

Study population

A retrospective analysis of 648 patients undergoing emergency appendicectomy between February 2010 and January 2012 at a single tertiary care institution were considered for inclusion in this study. A clinical diagnosis of acute appendicitis was made using history and physical examination alongside supporting laboratory results. In patients where a clinical diagnosis could not be established, radiological imaging was performed in the form of abdominal ultrasound or Computed Tomography (CT) scans.

Data collection

A comprehensive range of data was collected for analysis including patient demographics (gender, ethnicity, age), pre-operative laboratory investigations, time from A&E admission to theatre, operative procedure (LA, OA), grade of surgeon and histological diagnosis.

Patients were excluded if they underwent a laparotomy or conversion to a laparotomy, were pregnant or had a history of multiple abdominal operations and previous abdominal surgery. Those patients undergoing concurrent bowel resection were also excluded. Patients with intraoperatively diagnosed appendicitis whose appendix was normal on histology were not excluded.

Endpoint

The length of hospital stay, measured in days was defined as the time between date of admission and date of discharge of patient.

Operative procedures

OA was performed through a standard McBurney muscle splitting incision in the right lower quadrant. Peritoneum was accessed and opened to allow inspection of the mesoappendix. The appendix was crushed at the base, ligated with vicryl and then removed from the abdomen. Haemostasis was achieved and the appendiceal stump was buried into the caecum using a purse-string suture. If contamination was visualised the abdominal cavity was irrigated with a warm saline wash and evacuated before closing the peritoneum, muscle and skin.

LA was completed via the standard laparoscopic technique using three trochar. A small infraumbilical incision was made, and a 10mm trochar was placed at this incision site. Pneumoperitoneum was achieved to a pressure of 10-12 mmHg carbon dioxide and a 10 mm camera was inserted via this port. Under direct vision two 5 mm trochar were placed in the midsuprapubic and left iliac fossa regions. After identification of the appendix the appendicular artery was dissected and divided between haemostatic clips. The appendix was secured at the base with 2-3 endoloops and divided between the ligatures. Endodiathermy was used to achieve adequate haemostasis. The appendix was delivered through the 10 mm trochar or in an endoscopic bag. If contamination was visualised the abdomen was irrigated with warm saline solution. Some variances may have occurred owing to the demand of each individual case.

Laparoscopy was converted to open appendicectomy if uncertain anatomy, technical difficulties and bleeding were encountered. An LA converted to an OA was considered an OA and not on an intention to treat analysis.

Macroscopically normal appendices were removed as part of the standard procedure at our single institution.

Statistical analysis

Continuous data are presented as median (IQR) unless indicated otherwise. Differences in qualitative variables were assessed using Fisher's exact test and quantitative variables were analysed using an unpaired T-test.

Relative risk was described by the estimated Odds Ratio (OR) with 95 per cent confidence interval. Two-sided P values were computed and $P \leq 0.05$ was considered statistically significant. All statistical analyses were performed using GraphPad Prism® software (GraphPad Software, Inc, San Diego, CA 92130 USA).

RESULTS

648 emergency appendicectomies were performed over a two year period. Median age of patients undergoing appendicectomy was 24 years of age with a range of 6-86 years, 361 were male and 287 female (Table 1). A laparoscopic approach was used in 177 cases (27.3%) and a laparoscopic converted to open procedure in 7 patients (the latter have been treated as OA). A histological diagnosis of appendicitis was found in 484 patients (74.7%), other histological diagnoses included; normal appendix, benign hyperplastic polyp, carcinoid tumour and mucinous neoplasm.

The average stay in hospital was 3.0 days (IQR 3.00) and was not affected by modality of surgery (Median (IQR) 3.0 (3.00) days versus 3.0 (2.00) days in OA and LA respectively, p=0.447) (Figure 1).

Table 1: Characteristics of the patients included in this study (n=648).

Characteristic	Number
Age [median (range)]	24 (6-86)
Male:Female	361:287
Total appendicectomies	648
Laparoscopic procedure	177 (27.3%)
Open procedure	471 (72.7%)
Histologically normal appendicectomies	158 (24.4%)
Mean ± SD time to theatres (hours)	23.82 ± 23.65
Cases of pelvic sepsis	19

SD = Standard deviation

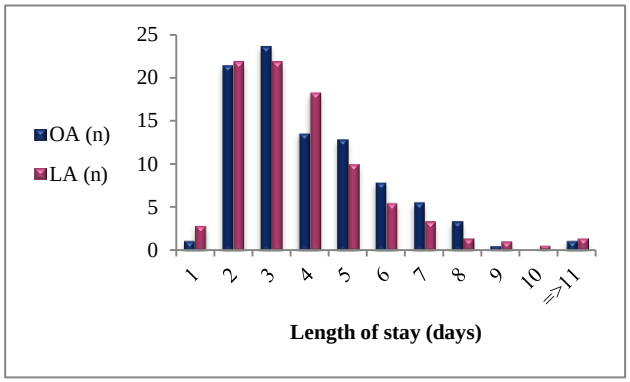

Figure 1: The frequency distribution for length of hospital stays in open appendicectomy and laparoscopic appendicectomy, for the 648 patients in this series.

DISCUSSION

Laparoscopic surgery has recently advanced and improved surgical procedures, enabled surgeons to decrease infection and improve complication rates that are often associated with the equivalent open procedure. This has been demonstrated for appendicectomies in a number of studies.[8,12,14-21]

Median length of hospital stay was in fact the same for both operative procedures (3.00 days), however this result has been distorted by three prolonged stays in hospital, one patient who underwent LA and two who underwent OA. The patient undergoing LA resided in hospital for 19 days; they developed a postoperative small bowel obstruction and required a laparotomy to resolve this complication. Two further patients who underwent OA had hospital stays of, 15 days and 14 days due to the development of wound dehiscence and superficial wound infection respectively.

The 7 patients who underwent conversion from LA to OA did not experience a longer hospital stay (Median 3.2 days, Range 2-6 days) which has been seen previously in other studies.[24] Conversion rate from LA to OA is very subjective and reported to occur due to surgeon experience, expertise and complications. Conversion rates reported in other studies have ranged from 0 to 23 per cent.[19,24] The conversion rate in this study was 1% (7 of 648) which is in agreement with current literature. Conversion at our institution is based on failure to make progress during the procedure or the inability to visualise adequately the appendiceal base.

This study had several limitations. First, it is a retrospective and uncontrolled study. Second, the laparoscopic and open groups contained varying numbers of patients due to the retrospective nature of this study. We recommend that a prospective randomised blinded study should be completed with computer generated allocations. Patients should be matched by gender, age and body mass index (BMI). This would enable an equal number of patients in both groups (open and laparoscopic). The conversion from LA to OA were analysed with the open cases and not on an intention to treat analysis. We acknowledge that some studies would treat these converted cases on an intention to treat basis, however had the data been compared using the procedure starting the case, our findings would remain valid.

In conclusion, appendicitis remains a sometimes difficult diagnosis. This study did not demonstrate a difference in length of hospital stay between the two operative techniques which is often discussed as an advantage of laparoscopic surgery. The decision to use a particular procedure should take into consideration the surgeon's ability and the likelihood of finding an alternative and unexpected intra-abdominal pathology. We have not been able to demonstrate superiority between open and laparoscopic appendicectomy.

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