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ORIGINAL ARTICLE

Can laparoscopic appendectomy be safely performed by surgical residents without prior experience of open appendectomy?

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KEYWORDS
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Summary *Background:* As laparoscopic surgery has become the mainstream technique for abdominal surgery, it has become difficult for surgical residents to have opportunities to perform open surgery. This study aimed to examine the appropriateness and feasibility of laparoscopic appendectomy performed by surgical trainees who had little experience with open appendectomy or laparoscopic training with animal models.
Methods: We retrospectively reviewed all the records of patients who underwent appendectomy for acute appendicitis from April 2008 to December 2014. Residents were assigned to two levels of seniority: junior residents who had undergone 1–3 years of residency and senior residents who had undergone 4–6 years of residency. Patient characteristics, histopathological results, operative time, blood loss, conversion to open procedure, complications, length of hospital stay, and mortality were compared between the two groups.
Results: During the study period, 174 patients with the clinical diagnosis of acute appendicitis underwent laparoscopic appendectomy by junior residents and 90 patients were operated on by senior residents. There were no statistical differences in the characteristics of the patients, conversion rates (0/174 vs. 1/90), median operative times (75 minutes vs. 75 minutes), complication rates (7% vs. 4%), and median lengths of hospital stay (4 days vs. 4 days).
Conclusion: Laparoscopic appendectomy can be performed safely by surgical residents who had little experience or training with animal models or open appendectomy. In this era of

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laparoscopic surgery, laparoscopic appendectomy represents an important opportunity for training surgical residents with little experience of open surgery.
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1. Introduction

Appendicitis is one of the most common acute abdomen conditions requiring surgery, with a lifetime incidence of 6–8%.[1] Appendectomy has long been the gold standard of treatment due to its efficacy and low mortality.[2] The first laparoscopic appendectomy (LA) was performed by Semm[3] in 1983. The safety of LA has been widely acknowledged, and it has been demonstrated to have the advantages of fast recovery, reduction in postsurgical pain and infection, and enhanced esthetic results.[4–6] As laparoscopic surgery has become the mainstream technique for abdominal surgery, surgical trainees have been expected to improve their skills in laparoscopic surgery. We consider that LA is a good training tool for surgical trainees to acquire the basic principles and skills of laparoscopic surgery. This study aimed to examine the appropriateness and feasibility of LA performed by surgical trainees (residents) who had little experience with open appendectomy (OA) or training with animal models.

2. Methods

The records of all patients who underwent appendectomy for acute appendicitis from April 2008 to December 2014 were retrospectively reviewed. A total of 313 patients were operated on in our institution, of whom 297 (95%) underwent LA including conversion to open surgery (1 case), and 16 patients (5%) underwent OA. Of the 297 patients, 264 (89%) underwent LA performed by residents and 33 underwent LA performed by consultants.

Surgical residents in our hospital undergo a residency of 6 years, wherein the postgraduate training program classifies junior residents as those who had undergone ≤ 3 years of residency and senior residents as those who had undergone 4–6 years of residency. Currently, in our hospital, approximately 98% of colorectal surgeries are performed laparoscopically, and surgical residents have little experience of open surgery. They learn laparoscopic surgery by viewing operation videos, by training with dry laparoscopic instruments to learn video–eye–hand coordination, as well as by participating in various laparoscopic operations as the camera assistant. Further, in our institution, surgical residents perform laparoscopic surgery under the supervision of board-certified surgeons of the Japan Society for Endoscopic Surgery.

Clinical records, pathological results, and operative records were examined retrospectively. In particular, the analyzed data included patient age, sex, histopathological results, operative time, blood loss, conversion to open procedure, complications, length of hospital stay (LOS), and mortality. This study was approved by the Institutional Review Board of Toranomon Hospital, Tokyo, Japan.

The results were compared according to the type of resident surgeons: junior residents (Group A) or senior residents (Group B). We allotted the cases of acute appendicitis to the residents so that all the residents could have equal opportunity to perform LA and did not allot those for the residents as to difficulty to be preoperatively expected.

2.1. Surgical techniques

LA was performed under general anesthesia. A urinary catheter and a nasogastric tube were placed in all cases, and intravenous antibiotics were administered at induction. The patient was placed in the lithotomy position. The video monitor was placed on the right side of the patient. The surgeon stood on the left side of the patient, and the camera assistant stood on the right side of the surgeon. A 12-mm umbilical camera port was inserted using the open Hasson technique. Pneumoperitoneum to a pressure of 8 mmHg was achieved by carbon dioxide insufflation. Two 5-mm working ports were inserted in the left hypogastrium and mesogastrium. The patient was positioned in the Trendelenburg left-tilt position. A 5-mm flexible laparoscope was inserted through the umbilical camera port. After infected ascites and pus were aspirated, the appendix was identified. The mesoappendix and the appendicular artery were dissected using laparoscopic coagulating shears. A stapling device was used for dividing the appendix, and the appendix was inserted in a specimen retrieval bag and removed from the abdominal cavity through the umbilical port site. The abdominal cavity was then lavaged with warm normal saline. A drainage tube was inserted in cases of complicated or perforated appendicitis, and intravenous antibiotics were continued for such cases.

2.2. Statistical analysis

The data obtained in the presented study were entered into a Microsoft Excel spreadsheet (Microsoft Corporation, Redmond, WA, USA) for statistical analysis. The data were analyzed using the χ^2 test for categorical variables and the Mann–Whitney U test for other data. All p values < 0.05 were considered significant.

3. Results

Between April 2008 and December 2014, 174 cases were treated by junior residents (Group A) and 90 cases were

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