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Preliminary Report of One-port Laparoscopy-assisted Extracorporeal Appendectomy in Adult Appendicitis

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In our pediatric surgery department, one-port laparoscopy-assisted appendectomy (one-port LAA) is currently a routine procedure for the treatment of acute appendicitis. The benefits of one-port LAA in pediatric surgery have been reported in the literature: it is safe, effective, fast, has a low complication rate, and provides excellent cosmetic results. The feasibility of this surgery in adolescents has already been proved in clinical practice. Only two reports[1,2] of this surgery in adults have been published previously. The present study attempts to apply this technique in adult patients. This surgery was successfully performed on 12 patients with no postoperative complications. Only in one patient, the surgery was converted to a three-port laparoscopic appendectomy because of difficulty experienced in removing the appendix through one port. The benefits of the one-port LAA in adults are less postoperative pain, lower cost, and excellent cosmetic results. One-port LAA has proved to be an appropriate alternative procedure to other laparoscopic appendectomy techniques for the management of uncomplicated appendicitis in selected adult patients in our clinical practice.

Key words: One-port laparoscopic appendectomy, adult appendicitis, extracorporeal

INTRODUCTION

Since Semm first described laparoscopic appendectomy (L.A.) in 1983[3], the minimally invasive surgery has gradually become a trend in the treatment of acute appendicitis. Traditionally, laparoscopic appendectomy has been used to successfully treat both simple and complicated appendicitis through three ports. To date, this technique has undergone several modifications. Pelosi first proposed the one-port L.A. in 1992[4]. One-port L.A. has since then been effectively performed in pediatric cases and several studies have reported its benefits in pediatric surgery: safe, effective, fast, low complication rate, and excellent cosmetic results[1,2,5-7]. Our pediatric surgeons have gained considerable experience in using this surgical procedure in pediatric acute appendicitis, and good results have been reported in the literature[8]. The present study reports on 13 adult patients who underwent one-port laparoscopy-assisted extracorporeal appendectomy and shares the experiences of 12 successful cases. Some surgical indications and limitations of one-port LAA in adult patients were identified.

CASE ANALYSIS

Thirteen adult patients, with a mean age of 25 years (range, 20-37 years), who were diagnosed with acute appendicitis by clinical symptoms/signs or image study underwent one-port laparoscopy-assisted extracorporeal appendectomy, and all surgeries were performed by the same surgeon. The inclusion criteria were as follows: body mass index (BMI) ≦ 24, duration of symptom onset to operation <48 hours, patient age <40 years, and no history of previous lower abdominal surgery. The clinical characteristics of these patients included gender, age, BMI, duration of symptom onset to operation, serum white blood cell count (WBC), appendix diameter assessed by sonogram, and presence or absence of existing focal ascites (Table 1).

All patients underwent LAA under general anesthesia with endotracheal intubation and catheterization to deflate the bladder. One 10-mm trocar was placed infraumbilically by open approach and pneumoperitoneum was created.

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Table 1 Clinical Characteristics of Patients Treated by One-Port Laparoscopy assisted Extracorporeal Appendectomy (n=13)

Parameter	Median (range)	No. of Patients
Age, yrs	25(20~37)	
Sex		
Man		3
Woman		10
BMI*	19.9(16.6~24)	
Duration of symptom onset to operation		
<12 hrs		4
<24 hrs		6
<48 hrs		3
Serum WBC (/uL)	12400(6600~19050)	
Appendix diameter assessed by sonogram (mm)	9(6~10)	
Focal ascites in sonogram		
Positive		3
Negative		10

BMI*=Body mass index

The 10-mm laparoscope has a 5-mm operative channel that permits the use of a 450-mm grasper to catch the appendix. The appendix was grasped by its distal end and removed through the port site (Fig. 1). A mimicking open appendectomy was subsequently performed and wet gauze was used to protect the incision wound as much as possible. The mesoappendix was divided and then ligated, thereby rendering the appendix free of its mesentery. A purse-string suture was placed in the seromuscular layer of the cecum at the base of the appendix, if visible at the cecum. A ligature was performed around the base of the appendix, which was transected, and the stump was then inverted. A flexible suction tube was passed through the working channel to clear the existing turbid ascites, and the incision wound was routinely irrigated with saline after closing the peritoneal layer. The wound was sutured layer by layer (Fig. 2) and finally covered using a 3M Steri-Strip™.

RESULTS

The assessment of clinical outcomes in these patients included the following: operation time, duration of antibiotic treatment, the patients' pain score on postoperative day 1, length of hospital stay, and condition of the incision wound. The surgery was successfully completed in 12 of the 13 patients who met the inclusion criteria to undergo the one-port LAA procedure. Only in one patient, the surgery was converted to the three-port L.A. because of difficulty experienced in removing the inflamed appendix through the created port. The conversion rate was 7.7%.

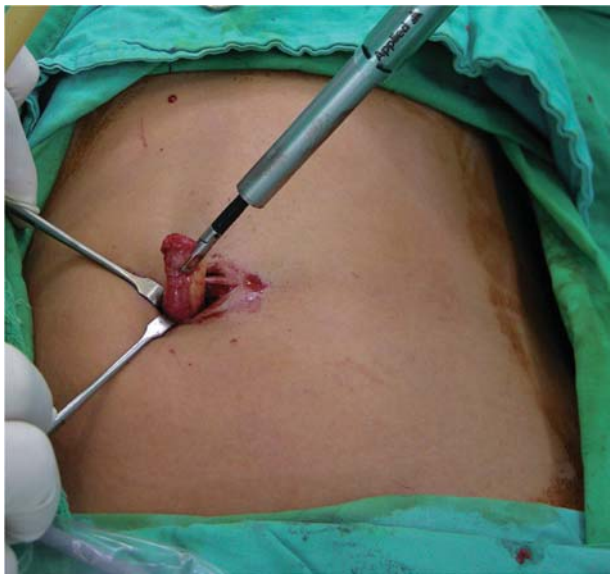

Fig. 1 The appendix was grasped and pulled out from the umbilical port by laparoscopic grasper after deflation of pneumoperitoneum.

The mean operation time was 76 minutes in the first 6 patients, and 64 minutes in the last 6 patients. The overall mean operation time was 70 minutes (ranging from 60 to 82 minutes) in the 12 completed cases. The mean hospital stay was 2.9 days (ranging from 2 to 4 days). The mean duration of prophylactic antibiotics was 3.8 days (ranging from 3 to 5 days), including the use of oral antibiotics after discharge. None of the study patients had associated complications such as wound infection, intra-abdominal abscess, serous umbilical secretion, and umbilical hematoma. The median pain score on postoperative day 1 was 3 points (ranging from 2 to 4 points).

DISCUSSION

With the widespread acceptance of minimally invasive surgery, laparoscopic appendectomy has been the preferred modality to treat simple and even complicated appendicitis. The procedure has been modified to decrease its invasive degree by using special instruments to decrease the number of required ports. LAA is one of the methods used to minimize surgical trauma and the number of ports. Only two reports[1,2] of this surgery in adults have been published previously. Rispoli et al[1]. reported that one-port LAA was performed successfully cases in 55 of 65 patients, with a mean age of 18 years (range, 13-40 years) and its conversion rate is 15.3%. There were six (11%) postoperative complications (three serous umbilical secre-

Fig. 2 The final result after whole surgical procedure was completed.

tion and three umbilical hematoma). The other study was reported by Varshney et al.[2], and one-port LAA was done in eleven patients aged 12 to 56 years (mean, 34 years). No case was converted into 2- or 3-port L.A. and there are no major or minor postoperative complications. The entire procedure combines laparoscopic and traditional techniques. With this unique method, the cost of two additional trocars can be saved and surgical damage can be minimized. Postoperative pain can be effectively managed with acetaminophen, without the use of any narcotic analgesics.

The inclusion criteria established in the initial stage of developing this procedure were derived from clinical experience with the use of LAA in treating pediatric appendicitis. Smaller body size and lower BMI are the features in pediatric surgery; hence, the criterion of a BMI of less than 24 was established so that the surgery could be easily performed. In the literature[9], the mean time of prehospital symptoms in patients with perforated appendicitis is 57 hours. Another study[2] reported that the LAA procedure is not suitable for very obese patients or for complicated appendicitis because it is difficult to perform one-port LAA successfully and safely in these patients. On the basis of these previous findings, in the present study, adult patients with lower BMI and shorter duration of symptom onset to operation were selected to undergo this surgery. Further, to increase the success rate in the initial stage of development of this surgery, the criteria of age of <40 years and no history of previous lower abdominal surgery were chosen. Although these criteria were contrived, we thought it was necessary in the preliminary development of this surgery.

The first 6 cases of one-port LAA had a longer operating time (mean time: 76 minutes) than the last 6 cases (mean time: 64 minutes); this is possibly due to less experience in the initial stages of development of this surgical technique. However, the pneumoperitoneum time could be greatly decreased because most of the operative procedures were performed extracorporeally. If the surgeon is experienced in open appendectomy, the learning curve can be further shortened. Upon review of the literature[2], this technique is feasible only when the cecum is intraperitoneal and the appendix is mobile. The failed case was most likely caused by an immobile appendix.

Literature review indicates that the complications of this procedure include intra-abdominal abscess, wound infection, serous umbilical secretion, and umbilical hematoma[1,6,7]. Wound infection was the most concerning complication because the incision wound can be contaminated by the appendix as it is removed from the abdominal cavity, with only the gauze for protection. However, no post-operative wound infection occurred in any of the 12 study patients; perhaps a larger number of study subjects would yield a different result. One day of antibiotic therapy was suggested for uncomplicated laparoscopic appendectomy in the guidelines for the use of prophylactic antibiotics in surgery in Taiwan[9]. The duration of using prophylactic antibiotics in our cases was relatively longer; further study is required to evaluate the cost and benefit of antibiotic use. For a clean-contaminated one-port LAA wound, the duration of using prophylactic antibiotics could be shortened according to the guideline. In the present study cases, oral antibiotics were prescribed to some patients who had high level of WBCs (cell count > 12000/uL); hence, the mean duration of prophylactic antibiotics (3.8 days) was greater than the mean hospital stay days (2.9 days).

In our hospital, the range of hospital stay for one-port LAA patients (2 to 4 days, depending on the patient's general condition) was the same as that in the three-port L. A. procedure, without postoperative complication. The median pain score on post-operative day 1 was 3 points, which is acceptable in laparoscopic surgery. No narcotic analgesics were required for pain control.

This technique can always be converted to the two- or three-port technique when difficulties are encountered during surgery. In the future, it is hoped that the selection

criteria can be broadened and that a prospective, randomized clinical trial can be conducted to compare one-port LAA with three-port L.A. or traditional appendectomy.

CONCLUSION

In our experience, one-port laparoscopy-assisted appendectomy is simple and safe when performed under direct extracorporeal vision. It is an appropriate and economical alternative to other techniques of laparoscopic appendectomy for the management of uncomplicated appendicitis in selected adult patients.

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