

Clinical Experiences of Trans-Trocar Appendix Removal in Laparoscopic Appendectomy

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ABSTRACT

Purpose: Most of laparoscopic instruments are disposable and not reusable. Therefore, laparoscopic surgery is more ineffective according to environment conservation and recycling of resources than open surgery.

Trans-trocar appendix removal method was shown instead of using disposable specimen vinyl bag. Advantages of trans-trocar removal are cost-effective and decrement of disposable instrument. But, there has not been cited in the literature about clinical experiences and outcomes. Therefore, this study was conducted to analyze the clinical outcomes.

Materials and methods : Uncomplicated appendicitis patients were reviewed retrospectively in 2013. The enrolled patients were divided as trans-trocar appendix removal group (TTAR) and disposable specimen vinyl bag group (DSVB). Clinical data and outcomes were analyzed and compared.

Results: A total of 119 patients undergoing laparoscopic appendectomy were enrolled. Fifty-nine patients belonged to TTAR and 60 patients were DSVB. In the both groups, there were no significant differences in postoperative outcomes. Success rate of trans-trocar removal was 89.3%. According to body mass index (BMI), success rate is 100% below 20 kg/m², 87.8% in patients between 20 kg/m² and 25 kg/m² and 61% above 25 kg/m².

Conclusion: Although, it is difficult to generalize the results, it is thought that trans-trocar appendix removal is alternative and feasible on basis of our study. But in BMI > 25 kg/m², it is thought to be technically careful to perform trans-trocar appendix removal. It is also necessary to make comparison the efficacy of appendix removal methods through prospective randomized clinical study to establish the better method for laparoscopic appendectomy.

Keywords: Appendectomy, Laparoscopy, Specimen removal.

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INTRODUCTION

Acute appendicitis is one of the most frequent emergency operations in general surgery. Traditionally, acute

appendicitis was treated in open surgery. But, after laparoscopic appendectomy was performed firstly in 1983,¹ laparoscopic appendectomy is most popular method in treatment of acute appendicitis.

There are many laparoscopic surgical instruments in laparoscopic appendectomy. Most of all in laparoscopic instruments are disposable and not reusable. Therefore, laparoscopic surgery is more ineffective surgery according to environment conservation and recycling of resources than open surgery. So, many method and reusable laparoscopic instruments are developed to improve environment conservation and recycling of resources.^{2,3}

Among this effort, when resected appendix in laparoscopic appendectomy was removed, trans-trocar removal method was shown instead of using disposable specimen vinyl bag.⁴⁻⁹

Advantages of trans-trocar appendix removal method are cost-effective and decrement of disposable instrument because specimen vinyl bag is not needed in appendix removal.

But, although trans-trocar appendix removal method was introduced 10 years ago, there has not been cited in the literature about clinical experiences and outcomes.

Therefore, this study was conducted to compare the clinical outcomes between trans-trocar appendix removal group (TTAR) and disposable specimen vinyl bag group (DSVB) and to identify the better way to removal of resected appendix in laparoscopic appendectomy.

MATERIALS AND METHODS

The subjects were the patients in this hospital who diagnosed acute appendicitis between January 2013 and December 2013. Complicated appendicitis patients that diagnosed as perforated appendicitis or periappendiceal abscess by preoperative abdominal computed tomography, abdominal ultrasonography or intraoperatively operative findings were excluded.

Retrospective analysis was carried out based on the records made after surgery regarding clinical characteristics such as operative time, hospital stay, complications, readmission and additional analgesics.

SPSS 12.0 (SPSS Inc, Chicago, IL, USA) used for statistical analysis. Student t-test for average analysis and Fisher's exact test for cross tabulation analysis was used.

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Statistical significance was determined when p-value is below 0.05 in all analysis.

All of laparoscopic surgeries were performed by specialized laparoscopic surgeons. Laparoscopic surgery was performed to all patients in supine position under the general anesthesia. Three port maneuver were used. One 11 or 15 mm trocar for laparoscope entered at the inferior margin of umbilicus with either a vertical or semicircular transverse skin incision. There was not selection criteria for TTAR or DSVB preoperatively or intraoperatively. The usage of 15 or 11 mm trocar were selected randomly regardless of gender, age and body mass index (BMI) of patients and were performed in almost identical ratios.

A 5 mm laparoscope was inserted to visualize the abdominal cavity. Two additional 5 mm ports entered at the left lower quadrant and the suprapubic area.

Subsequently, the laparoscopic appendectomy was performed using procedures identical to those of conventional laparoscopic surgery.

In patients in using 15 mm trocar, after appendix specimen was divided from appendiceal base, trans-trocar removal method was performed. In trans-trocar removal method, 5 mm camera was inserted to 5 mm trocar port and laparoscopic specimen grasper was

inserted to 15 mm trocar port and resected appendix was grasped by laparoscopic specimen grasper and was performed trans-trocar appendix removal (Figs 1 to 4).

In patients in using 11 mm trocar and failure of trans-trocar removal, specimen removal was performed by disposable specimen vinyl bag identical to conventional laparoscopic method.

In all of patients, patient controlled analgesic system was applied postoperatively.

RESULTS

The total number of patients was 119 people. Fifty-nine patients were in the TTAR and 60 patients were in the DSVB and the male *vs* female ratio was 0.9:1 and 2:1 respectively. The age in TTAR and DSVB ranged 42.5 ± 35.5 and 47.0 ± 34.0 . The average BMI of the TTAR was 22.3 kg/m^2 and that of DSVB was 23.5 kg/m^2 showing no significant difference (Table 1).

The average operation time of TTAR was 85.4 minutes and that of DSVB was 92.5 minutes. The average of length of hospital stay (days) in both groups were 3.59 and 4.06 (Table 2).

In both groups, superficial incisional site infections were developed in 5 persons. But, intra-abdominal abscess was none.



Fig. 1: The appendix was grasped by laparoscopic specimen grasper



Fig. 2: The appendix was retracted into 15 mm trocar



Fig. 3: The appendix was divided from appendiceal base



Fig. 4: The resected appendix was removed in trans-trocar space

In both groups, readmission were developed in each one person. Each person in TTAR and DSVB were admitted due to recurrent right quadrant pain without intra-abdominal abscess in abdominal ultrasonography or abdominal computed tomography and treated conservatively for few days.

DISCUSSION

The advantages of laparoscopic surgery are minimal wound, better cosmesis, less pain and quicker recovery. Because of these advantages, laparoscopic surgery is very popular method in most of surgery. In laparoscopic surgery, there are needed variable laparoscopic instrument. These laparoscopic instruments are almost disposable and expensive. Therefore, variable methods were showed by many clinicians to decrease to use disposable instrument.^{6,10,11}

Disposable specimen vinyl bag have several advantages. These are minimal contamination of the abdominal cavity or wound tract when removing the specimen and prevention of tumor cell spillage from resected specimen. But commercial specimen vinyl bag is expensive and limited size and design based on gallbladder in laparoscopic

cholecystectomy. So, there is not adequate for variable laparoscopic surgery.^{11,12} Therefore, there are several effort to renovation of specimen vinyl bag or minimize to cost of commercial specimen vinyl bag.^{4-7,10,11}

Trans-trocar appendix removal method in laparoscopic appendectomy was showed by several investigators instead of disposable specimen vinyl bag.⁶⁻⁸ But clinical experiences and outcome were not reported in literature.

Trans-trocar appendix removal method may be more risky that there are bacterial contamination in abdominal cavity and tumor cell spillage from resected appendix than using disposable specimen vinyl bag. But, actually, there has not been studied risk of trans-trocar removal method about bacterial contamination and tumor cell spillage.

Recently, the study about trans-trocar appendix removal is reported. Jung and Bae said that adequate trocar size of trans-trocar appendix removal in laparoscopic appendectomy was determined according to preoperative patient's BMI.¹³

In the Jung and Bae's study, when postoperative trans-trocar appendix removal test in 15 mm trocar was performed, predictive success rate was 88% in all patients. According to BMI, predictive success rate is 100% in patients below 20 kg/m², 94% in patients between 20 kg/m² and 25 kg/m² and 61% above 25 kg/m². In our study, success rate of 15 mm trans-trocar appendix removal is 89.3% in all patients.¹³ In 59 patients of 66 patients, trans-trocar appendix removal was successfully performed. And according to BMI, success rate is 100% below 20 kg/m², 87.8% in patients between 20 kg/m² and 25 kg/m² and 61% above 25 kg/m² (Table 3).

Although, it is difficult to generalize the result of this study, it is thought to be technically feasible to perform trans-trocar appendix removal in BMI <25. But, in BMI >25, it is thought to be technically careful to perform trans-trocar appendix removal.

In our study, the patients that had perforation, abscess formation and coexistence of appendiceal tumor were excluded, so that prevent to bacterial contamination and spillage of tumor cell. Therefore, surgical site infection rate was not significant in both groups.

This study is retrospective but, there are no selection bias by physician and no patient selection criteria between trans-trocar removal and specimen vinyl bag group. Therefore, there are no significant differences to age, gender and BMI between trans-trocar removal and specimen vinyl bag group. Furthermore, in operation time and hospital stay, there are no significant differences too.

There are possibility of more wound pain and larger scar in 15 mm trocar inserted patients than 11 mm trocar

Table 1: Patient demographics

	TTAR (n = 59)	DSVB (n = 60)	p-value
Age (year)	42.5 ± 35.5	47.0 ± 34.0	NS
Gender (male/female)	28/31	40/20	NS
Body mass index (kg/m ²)	23.8 ± 8.1	27.6 ± 5.1	NS

NS: nonspecific

Table 2: Postoperative clinical data

	TTAR (n = 59)	DSVB (n = 60)	p-value
Operation time (min)	117.5 ± 82.5	102.5 ± 57.5	NS
Hospital stay (day)	4.0 ± 2.0	4.5 ± 2.5	NS
Incisional site infection	3	2	NS
Intra-abdominal abscess	0	0	NS
Additional analgesics use	10	12	NS
Readmission within 30 days	1	1	NS

NS: nonspecific

Table 3: Review of the literature for trans-trocar appendix removal in laparoscopic appendectomy

	Predictive success rate in Jung and Bae (n = 62)	Our results	
		Success/fail (n = 66)	Success rate (%)
Total patients	88.7	59/7	89.3
BMI (kg/m ²)			
<20	100	19/0	100
20~25	94.3	29/4	87.8
25<	61.5	11/3	78.5

inserted patients in umbilicus. But, in single incision laparoscopic appendectomy (SILA), there are larger wound in umbilicus than 11 mm trocar site in conventional laparoscopic appendectomy (CLA). In most literatures of SILA, there is 15 mm or adult index finger size skin incision in umbilicus. Although, there is larger skin incision than 11 mm, there are no additional analgesics use and poor cosmesis in SILA compared to CLA.¹⁴⁻¹⁷ Therefore, it is thought that possibility of wound pain and cosmesis problem is very low in TTAR.

Although, it is difficult to generalize the results of this study, it is thought that trans-trocar appendix removal is alternative and feasible method on basis of our study. But in BMI > 25, it is thought to be technically careful to perform trans-trocar appendix removal.

It is also necessary to make comparison the efficacy of appendix removal methods through well-designed prospective randomized clinical study to establish the better method for laparoscopic appendectomy.

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