

The experience of transumbilical endoscopic appendectomies

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Minimally invasive surgery is being widely accepted in various fields of surgery. Although several appendectomy techniques have been reported but, there is no standardization. We report here the experiences of transumbilical endoscopic appendectomy in humans. Between July 2008 and September 2010, ten patients with appendicitis successfully underwent transumbilical endoscopic appendectomies. There were 7 cases of suppurative, 2 cases of gangrenous and 1 case of perforated in operative findings. The ages of the patients were 13–56 years (mean age, 32.7 ± 15.4 years). Under general anesthesia, a 15-mm port was inserted through the umbilicus and then a two-channel endoscope was inserted in the peritoneal cavity. After appendix identification, counter-traction of the appendix with a direct abdominal wall puncture using a straight round needle prolene was performed to achieve good visualization of the operative field. Tissue dissection was performed using an endoscopic needle knife. Tissue grasping and resected appendix retrieval were done with endoscopic forceps. The average operation time was 79.5 ± 23.6 minutes (range, 45 to 110 minutes). No procedures were converted to laparoscopic or open appendectomy. Hospital stay was 4–6 days. All patients completely recovered without complications. As it is highly maneuverable, we believe transumbilical endoscopic appendectomy can be a feasible method. And, as surgeons want to proceed from laparoscopic surgery to natural orifice transluminal endoscopic surgery, this procedure could be a triable method.

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Key Words: Appendectomy, Transumbilical approach, Endoscopy

INTRODUCTION

Laparoscopic surgery was developed since the pneumoperitoneum procedure was created in which the abdominal cavity and contents are examined. Kelling first described this technique in 1901 (quoted from [1]). The first laparoscopic appendectomy was performed by Semm in 1983 [2]. A laparoscopic appendectomy has the advantage of a faster recovery, better cosmetic outcome and reduced postoperative pain as compared to the conventional open appendectomy

[3]. Many other operative techniques were developed by many surgeons to reduce operation scarring and pain. We report here the experiences and the early results of a transumbilical endoscopic appendectomy in humans.

SURGICAL TECHNIQUE

The present study was approved by the local ethical committee, and written informed consent was obtained from all patients. The author (operator) visited Institute for Research

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on Cancers of the Digestive Tract Asia center located in Taiwan in 2009, and then finished the natural orifice transluminal endoscopic surgery (NOTES) advanced course. Since then, animal experiments were performed once a year.

Ten patients with acute appendicitis were candidates for transumbilical endoscopic appendectomies at the department of surgery in Chungbuk National University Hospital between July 2008 and September 2010. They were diagnosed with acute appendicitis based on a physical examination and ultrasonography or computed tomography. They were given the details of this new technique, and an appropriate consent was obtained. We analyzed these patient's medical records

retrospectively.

The following briefly describes the transumbilical endoscopic appendectomy technique. A patient was placed in the supine position in the same manner as a conventional laparoscopic appendectomy. The surgeon was at the left side of the patient and the first assistant was at the right side of the patient.

Under general anesthesia, a 15-mm port was inserted through the umbilicus and a two-channel endoscope (unit: LUCERA CLV-260, Olympus, Tokyo, Japan; endoscope: GIF-2TQ260M, Olympus) (Fig. 1) was inserted into the peritoneal cavity through the port. After identification of the appendix, counter-traction of the appendix with a direct abdominal wall puncture

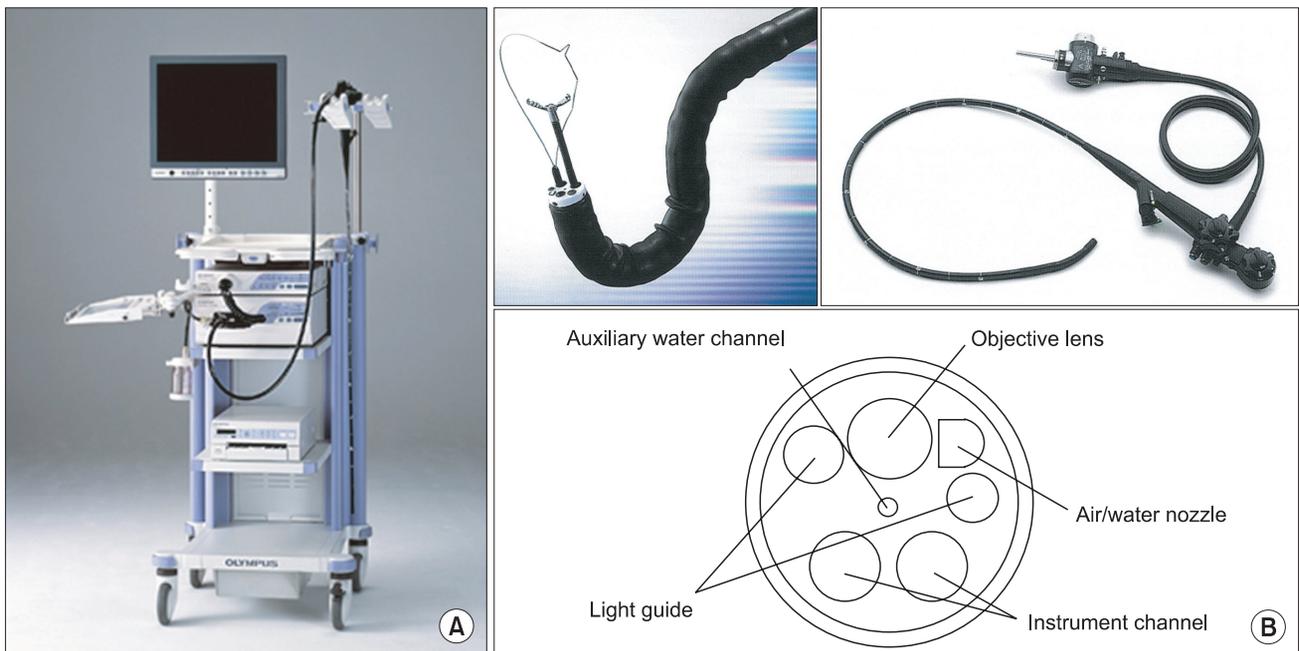


Fig. 1. (A) Unit; LUCERA CLV-260 (Olympus). (B) Endoscope GIF-2TQ 260M (Olympus). Adapted with permission by Olympus Co.

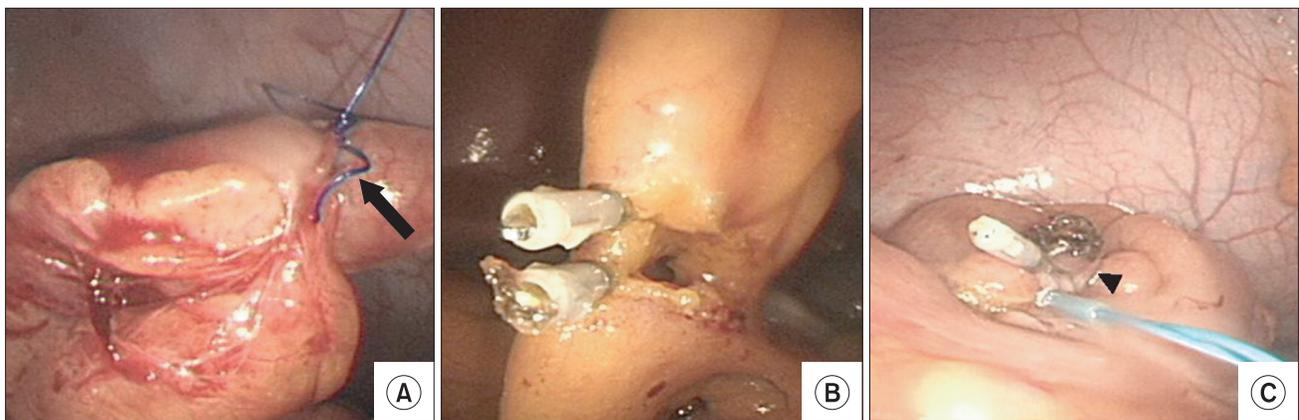


Fig. 2. Operative findings. (A) Traction tie (arrow) of appendix tip. (B) Mesoappendix: appendiceal artery clip ligation. (C) Appendiceal stump (arrowhead): clip ligation & endoscopic loop ligation.

using a straight round needle prolene was performed to achieve good visualization of the operative field. The mesoappendix was dissected using a needle-type endoscopic knife and the appendiceal artery was ligated with endoclips then divided. After the entire appendix was skeletonized up to the base of the cecum, one endoclip and one endoloop was applied to the base of the appendix then the appendix was transected using an IT knife (Fig. 2). Next, the appendix was grasped with an endoscopic grasper and removed from the abdominal cavity through the port at umbilicus.

We inserted a suction drain (Jackson-Pratt drain) in case the appendicitis was perforated, and all the specimens obtained from the operation were sent for routine pathology. The postoperative wound images of patients treated with a transumbilical endoscopic appendectomy are shown in Fig. 3.

The mean age of patients treated with this operation was 32.7 ± 15.4 years (range, 13–56 years), and there was a 3:2



Fig. 3. The postoperative image of a patient treated with transumbilical endoscopic appendectomy.

ratio of males to females. There were 7 cases of suppurative appendicitis, 2 cases of gangrenous appendicitis and 1 case of perforated appendicitis in operative findings. There was no previous abdominal operation history among these patients. The operation times ranged from 45–110 minutes (mean, 79.5 ± 23.6 minutes), and there were no laparoscopic or open appendectomy conversions. Hospital stay was between 4–6 days excepting the case of a perforated appendicitis (12 days). Two of ten cases had fever on the first day after operation but these patients were managed with conservative treatment. All patients completely recovered and there was no other complication after the operation (Table 1).

CONCLUSION

NOTES was first described by Kalloo et al. [4] in 2004 in his report of a peritoneoscopy and transgastric liver biopsy in a porcine model. NOTES have been developed further by many investigators since 2004. It was found to decrease complications (postoperative pain, incisional herniation, wound infections) and to maximize the cosmetic satisfaction of the patient. But NOTES has some problems: technical difficulties, access organ damage, and abdominal cavity infection from the access organ. The transumbilical approach is favored to decrease the disadvantages of NOTES. The transumbilical approach with a flexible endoscope is a promising, single-incision approach that is effective and as safe as the transvaginal approach [5].

The mean total operative time for transumbilical endoscopic appendectomy tended to be slightly longer than that of conventional laparoscopic appendectomy. As we compared our previously published data, especially the operative times from our hospital, transumbilical endoscopic appendectomies required an additional 14 minutes to complete the operation as compared to laparoscopic appendectomies (Table 2) [6,7]. The reason why hospital stay for transumbilical endoscopic appendectomy group is a little bit longer than other groups

Table 1. Patient characteristics and clinical outcomes

Case	Age (yr)	Sex	Operating time (min)	Biopsy	HD	Complication
1	55	Male	105	Suppurative	5	No
2	16	Female	60	Suppurative	4	No
3	18	Male	95	Gangrenous	5	No
4	41	Male	60	Suppurative	6	No
5	13	Male	60	Gangrenous	4	No
6	31	Male	110	Perforated	12	No
7	36	Female	95	Suppurative	5	No
8	23	Male	100	Suppurative	4	No
9	56	Female	65	Suppurative	6	No
10	38	Female	45	Suppurative	4	No

HD, hospital day.

Table 2. Comparison of the results of previous studies

	OA	LA	SILA	TUEA
Operation time (min)	60.7 ± 25.9	55.8 ± 19.8	69.5 ± 23.3	79.5 ± 23.6
Admission period (day)	5.2 ± 2.5	4.9 ± 2.8	4.5 ± 1.9	5.5 ± 2.4

Values are presented as mean ± standard deviation.

OA, open appendectomy; LA, laparoscopic appendectomy; SILA, single incision laparoscopic appendectomy; TUEA, transumbilical endoscopic appendectomy.

is the acute perforated appendicitis case; it is due to the percentage of severe inflammation cases. Even though this study had a small number of cases, the transumbilical endoscopic appendectomies did not require a lengthy operative time or admission. There were no complications such as umbilical hernia, wound infection, abscess, hematomas etc.

Palanivelu et al. [8,9] reported transumbilical endoscopic surgeries: appendectomy and cholecystectomy. He excluded mass, abscess, and perforated appendicitis cases. However, we included a case of acute perforated appendicitis in this study. We found that transumbilical endoscopic appendectomy of acute perforated appendicitis requires more operative time but it is feasible and has been demonstrated as a technique that can give patient satisfaction in cosmesis and less pain.

Cosmesis is a proven benefit for patients undergoing single incision laparoscopic surgery (SILS). SILS surgery may offer other additional benefits, including less postoperative pain and a quicker recovery. SILS has been proven effective according to current literature of straight-forward surgical cases [10]. A transumbilical endoscopic appendectomy can give great cosmetic satisfaction to the patients. Despite this, this surgical method does not have any special benefit over SILS. We believe transumbilical endoscopic appendectomy can be a feasible, effective and maneuverable method. Also, it should become the type of method to treat acute appendicitis patients.

The purpose of this study is not to prove the advantage of

this procedure compared to single port surgery. This procedure, while maintaining the same advantages as single port surgery, is for surgeons who wish to conduct NOTES in an attempt to step into an experimental surgical method, and to examine whether it could be one of the possible options.

The results of this study, for surgeons who want to do NOTES, show this surgical method is thought to be an acceptable procedure for patients without additional risks and a helpful application of endoscopy in surgery.

In conclusion, we believe transumbilical endoscopic appendectomy is a feasible, effective, safe and maneuverable method. Further study with a longer-term follow-up may be needed to confirm the clinical value of the procedure. As surgeons want to proceed from laparoscopic surgery to NOTES, this procedure could be a triable method.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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