

## Case Report

# Single-Incision Laparoscopic Appendectomy with the SILS Port™

Muneharu FUJISAKI<sup>1</sup>, Hidejiro KAWAHARA<sup>1</sup>, Kazuhiro WATANABE<sup>1</sup>, Takuro USHIGOME<sup>1</sup>, Yoichi TOYAMA<sup>1</sup>,  
Satoru YANAGISAWA<sup>1</sup>, Susumu KOBAYASHI<sup>1</sup>, and Katsuhiko YANAGA<sup>2</sup>

<sup>1</sup>*Department of Surgery, The Jikei University Kashiwa Hospital*

<sup>2</sup>*Department of Surgery, The Jikei University School of Medicine*

### ABSTRACT

A 23-year-old woman was referred to our hospital because of daytime pain in the right lower quadrant of the abdomen in March 2011. She had rebound tenderness and underwent emergency appendectomy with single-incision laparoscopic surgery (SILS). A longitudinal skin incision approximately 3 cm long was made in the umbilicus. After laparotomy, a SILS Port (Covidien, Mansfield, MA, USA) laparoscopic port with 3 trocars was placed through the incision, and pneumoperitoneum was established. A 5-mm flexible laparoscope was used to inspect the abdominal cavity through a 5-mm trocar in the SILS port, and the other two 5-mm trocars were used to insert Roticulator Endo Grasp and 5-mm LigaSure instruments (Covidien). The appendix was lifted and the mesoappendix including vessels was separated at the root of the appendix by means of LigaSure. After the section of the appendicular base with a stapler, the peritoneal cavity was rinsed with sterile saline, and the appendix was removed from the abdominal cavity with a specimen bag. After the SILS Port was removed, the abdominal incision was closed. The duration of the operation was 60 minutes, and blood loss was negligible. The postoperative course was uneventful, and the patient was discharged 8 days after the operation. The pathological diagnosis was gangrenous appendicitis with a fecalith.

(Jikeikai Med J 2011 ; 58 : 83-7)

Key words : appendectomy, single incision, laparoscopic surgery, SILS port

### INTRODUCTION

Acute appendicitis is the most frequent abdominal condition requiring emergency surgical treatment. Fitz et al. first described and diagnosed appendicitis in 1886, and McBurney first performed appendectomy in 1894<sup>1</sup>. Since then, appendectomy has been established as the standard treatment for appendicitis<sup>2</sup>. Laparoscopic appendectomy has increasingly been used as an alternative to open appendectomy. Since first being described by Semm in 1983<sup>3</sup>, laparoscopic appendectomy has undergone several modifi-

cations, and several techniques using 1 or more trocars have been described. In abdominal surgery, single-incision laparoscopic surgery (SILS), in which only 1 incision is made through the umbilicus, has recently received increasing attention. One-port umbilical surgery and single-port access surgery are synonymous with of SILS. Other approaches, such as natural orifice transluminal endoscopic surgery, may represent the final frontier for minimally invasive revolutionary surgery without skin incisions. Several advantages of SILS have been noted and include better cosmesis (scarless abdominal surgery performed through an

Received for publication, July 5, 2011

藤崎 宗春, 河原秀次郎, 渡辺 一裕, 牛込 琢郎, 遠山 洋一, 柳澤 暁, 小林 進, 矢永 勝彦

Mailing address : Hidejiro KAWAHARA, Department of Surgery, The Jikei University Kashiwa Hospital, 163-1 Kashiwashita, Kashiwashi, Chiba 277-8567, Japan.

E-mail : kawahide@jikei.ac.jp

umbilical incision), less incisional pain, and the possibility of conversion to standard multiport laparoscopic surgery if necessary. Various techniques for SILS cholecystectomy<sup>4</sup>, appendectomy<sup>5</sup>, nephrectomy<sup>6</sup>, adrenalectomy<sup>7</sup>, and obesity surgery<sup>8</sup> have been reported, and we have already performed SILS to treat several conditions<sup>9-11</sup>. However, we have not performed SILS appendectomy because we are unsure whether it is superior to conventional surgery. We describe our first experience with SILS appendectomy performed for acute appendicitis at Kashiwa Hospital, The Jikei University School of Medicine.

### CASE REPORT

A 23-year-old woman was referred to our hospital because of daytime pain in the right lower quadrant of the abdomen in March 2011. She had rebound tenderness, and laboratory examination revealed a white blood cell count of 12,500/ $\mu$ l and a C-reactive protein level of 9.7 mg/dl; the results of all other blood tests were unremarkable. Ultrasonography could not demonstrate the appendix, but computed tomography showed that appendix was behind the cecum without abscess formation in the right iliac fossa (Fig. 1). Emergency SILS appendectomy was performed. The postoperative course was uneventful, and the patient was discharged 8 days after the operation. Although she was physiologically ready to be discharged 4 days after the operation, she strongly wished to be discharged on the Sunday after suture removal. The pathological diagnosis was gangrenous appendicitis with a fecalith.



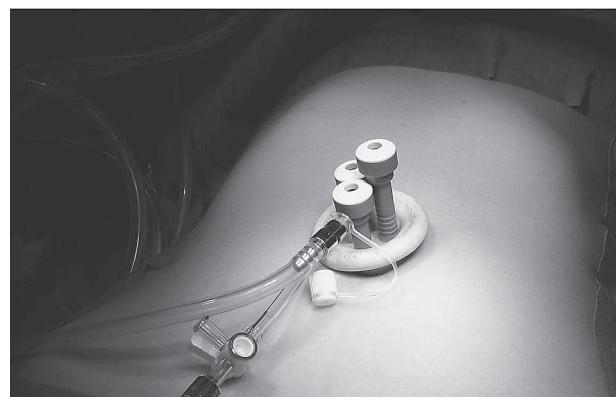
**Fig. 1.** Preoperative computed tomography  
Preoperative computed tomography demonstrated that the appendix containing a fecalith was behind the cecum.

lith.

### Surgical technique

The operation was performed with the patient under general anesthesia and placed in the supine position with both arms abducted. The surgeon stood on the patient's left side, the assistant stood on the left side of the surgeon, and the monitor was placed on the opposite side.

A longitudinal skin incision approximately 3 cm long was made in the umbilicus. After the laparotomy, a SILS Port (Covidien, Mansfield, MA, USA) laparoscopic port that had 3 trocars was placed in the incision and was used to establish pneumoperitoneum. A 5-mm flexible laparoscope was used to inspect the abdominal cavity through a 5-mm trocar in the SILS Port, and the other two 5-mm trocars were used to insert a Roticulator Endo Grasp instrument (Covidien) and a 5-mm LigaSure (Covidien) vessel-sealing device (Fig. 2). The vermiform appendix was lifted with the Roticulator Endo Grasp, and the mesoappendix including vessels was separated at the root of the appendix with LigaSure (Fig. 3). After a 5-mm trocar in the SILS Port was exchanged for a 12-mm trocar, the base of the vermiform appendix was amputated with a blue cartridge Endo GIA 30 stapler (Covidien) (Fig. 4). After appendectomy was completed, the peritoneal cavity was rinsed with sterile saline, and the specimen was removed from the abdominal cavity in a specimen bag (Endo Catch; Covidien). After the SILS Port was removed, the abdominal incision was



**Fig. 2.** Port setting  
The SILS port with 3 trocars was placed through the umbilical incision. A 5-mm flexible laparoscope and Roticulator Endo Grasp and 5-mm LigaSure instruments were inserted through each trocar.

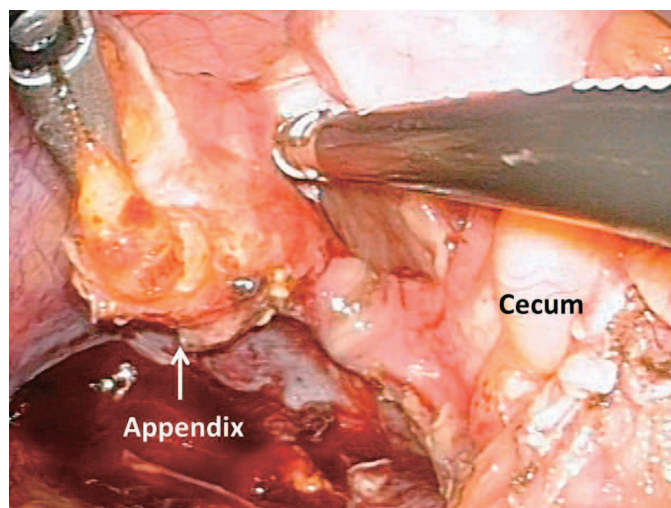


Fig. 3. Isolation of the appendix  
The mesoappendix and accompanying vessels were separated at the root of the vermiform appendix by means of Liga-Sure.

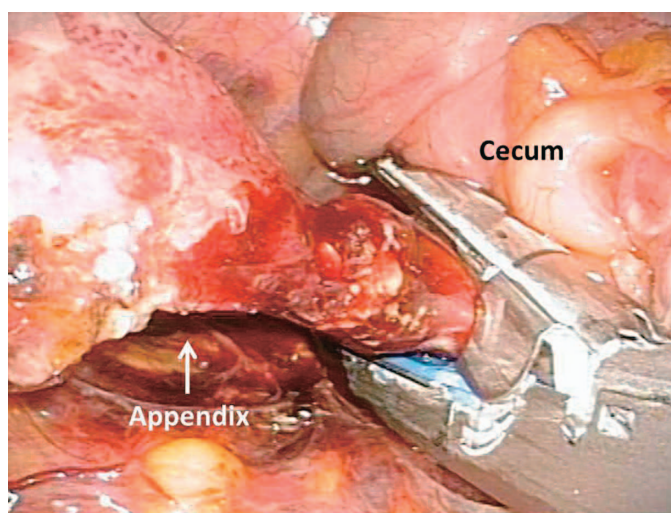


Fig. 4. Completion of appendectomy  
After a 5-mm trocar in the SILS Port was exchanged for a 12-mm trocar, the base of the vermiform appendicular was amputated with a blue cartridge Endo GIA 30 stapler.

closed (Fig. 5). The duration of the operation was 60 minutes, and the blood loss was negligible.

### DISCUSSION

The advantages of laparoscopically performed procedures over open procedures have increased interest in the development of less-invasive procedures. In reducing the number of skin incisions from 3 to 1, it is possible to reduce postoperative pain by eliminating muscular penetration by

the ports and to avoid injury to muscular or epigastric vessels<sup>12</sup>. Because the umbilicus is in the thinnest area of the abdominal wall, introducing ports and manipulating instruments in all directions are also easier. Therefore, transumbilical SILS should gain widespread use.

The procedure is based on the simultaneous use of 3 trocars through a single SILS Port. With this technique, all instruments must be parallel and closely introduced through the SILS Port. The possibility of motion is, therefore, reduced, and the surgeon must be prepared for the



Fig. 5. Surgical wound after SILS appendectomy  
The surgical wound is located in the hollow of the umbilicus and is, therefore, almost invisible.

eventual crossing of instrument shafts at the point of entry into the abdominal cavity. This crossing increases the difficulty of surgical dissection over that with conventional laparoscopic surgery. The introduction of this new technique without adding complications requires extensive experience with laparoscopic surgery.

The techniques of SILS have been evolving. In 1996, Kala et al.<sup>13</sup> performed SILS through a single umbilical port with extracorporeal section of the appendicular structures. A large variety of umbilical procedures with or without exteriorization of the vermiform appendix have been reported in clinical series of pediatric patients<sup>14-16</sup>. A group at the University of Naples<sup>14</sup> described transumbilical appendectomy using a single trocar and a flexible laparoscope with extracorporeal section of appendicular structures. However, they have indicated the need to use supplemental trocars or to perform a small laparotomy at McBurney's point when significant appendicular inflammation or intraperitoneal adhesion is found in the right iliac fossa. The most recently published study in 2009 by Hong et al.<sup>5</sup> describes transumbilical appendectomy with intracorporeal section of the base of the vermiform appendix with an "own-made" single-port system with an extremely small wound retractor. Hong et al. have also used this technique for 15 well-selected patients with cholelithiasis<sup>16</sup>. In our case, we used a SILS Port that has generally been used for laparoscopic cholecystectomy.

In conclusion, SILS appendectomy is technically feasible and safe, representing a reproducible alternative to standard laparoscopic appendectomy. However, we believe

that the pure transumbilical approach cannot guarantee a complete satisfactory result for patients with complicated acute appendicitis. If we feel that continuing the SILS procedure would be difficult in these patients, we should immediately insert a 5-mm assist port.

#### CONFLICT OF INTEREST STATEMENT

Authors have no conflict of interest.

#### REFERENCES

1. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol* 1990 ; 132 : 910-25.
2. Kirkwood KS, Maa J. The appendix. In : Sabiston DC, Townsend CM, editors. *Sabiston textbook of surgery : the biological basis of modern surgical practice* 18th ed. Philadelphia : Saunders/Elsevier ; 2008. p. 1333-47.
3. Semm K. Endoscopic appendectomy. *Endoscopy* 1983 ; 15 : 59-64.
4. Piskun G, Rajpal S. Transumbilical laparoscopic cholecystectomy utilizes no incisions outside the umbilicus. *J Laparoendosc Adv Surg Tech A* 1999 ; 9 : 361-4.
5. Hong TH, Kim HL, Lee YS, Kim JJ, Lee KH, You YK, et al. Transumbilical single-port laparoscopic appendectomy (TUSPLA) : scarless intracorporeal appendectomy. *J Laparoendosc Adv Surg Tech A* 2009 ; 19 : 75-8.
6. Barros R, Frota R, Stein RJ, Tuma B, Gill IS, Desai MM. Simultaneous laparoscopic nephroureterectomy and cystectomy : a preliminary report. *Int Braz J Urol* 2008 ; 34 : 413-21.
7. Castellucci SA, Curcillo PG, Ginsberg PC, Saba SC, Jaffe JS, Harmon JD. Single-port access adrenalectomy. *J Endourol* 2008 ; 22 : 1573-6.
8. Merchant AM, Cook MW, White BC, Davis SS, Sweeney JF, Lin E. Transumbilical Gelpport access technique for performing single incision laparoscopic surgery (SILS). *J Gastrointest Surg* 2008 ; 13 : 159-62.
9. Kawahara H, Watanabe K, Ushiohime T, Noaki R, Kobayashi S, Yanaga K. Single-incision laparoscopic right colectomy for recurrent Crohn's disease. *Hepatogastroenterology* 2010 ; 57 : 1170-2.
10. Kawahara H, Watanabe K, Ushiohime T, Noaki R, Kobayashi S, Yanaga K. Single-incision laparoscopic ileoproctostomy for chronic constipation. *Hepatogastroenterology* (in press).
11. Kawahara H, Watanabe K, Ushiohime T, Noaki R, Kobayashi S, Yanaga K. Umbilical incision laparoscopic surgery with one assist port for anterior resection. *Dig Surg* 2010 ; 27 : 364-6.
12. Vidal O, Valentini M, Ginesta C, Marti J, Espert JJ, Benarroch G, et al. Laparoscopic single-site surgery appendectomy. *Surg Endosc* 2010 ; 24 : 686-91.

13. Kala Z, Hanke I, Newmann C. A modified technique in laparoscopy-assisted appendectomy, a transumbilical approach through a single port. *Rozhl Chir* 1996 ; 75 : 15-8.
14. Rispoli G, Armellino MF, Esposito C. One-trocar appendectomy. *Surg Endosc* 2002 ; 16 : 833-5.
15. Esposito C. One-trocar appendectomy in pediatric surgery. *Surg Endosc* 1998 ; 12 : 177-8.
16. Hong TH, You YK, Lee KH. Transumbilical single-port laparoscopic cholecystectomy : scarless cholecystectomy. *Surg Endosc* 2009 ; 23 : 1393-7.