

# Single-Incision Laparoscopic Combined Cholecystectomy and Appendectomy

Yongsheng Chen, MD, MS, Shuodong Wu, MD, PhD, Jing Kong, MD, PhD

## ABSTRACT

**Background and Objectives:** Single-incision laparoscopic surgery is becoming more widely used, but few combined procedures have been reported. Herein we share our experience with single-incision laparoscopic combined cholecystectomy and appendectomy.

**Methods:** We reviewed data from 26 patients who underwent single-incision laparoscopic combined cholecystectomy and appendectomy between May 1, 2009 and June 1, 2013 at Shengjing Hospital. All the procedures were performed with conventional laparoscopic instruments placed through a single operating portal of entry created within the umbilicus.

**Results:** All the operations were successfully completed without conversion to conventional laparoscopic or open surgery. No intraoperative complications occurred. Patients were satisfied with the therapeutic and cosmetic outcomes.

**Conclusions:** Single-incision laparoscopic combined cholecystectomy and appendectomy appear to be a technically feasible alternative to the standard laparoscopic procedure in simultaneous management of coexisting benign gallbladder and appendix pathologies. Larger studies are required to confirm these findings.

**Key Words:** Appendectomy, Cholecystectomy, Single-incision laparoscopic surgery.

## INTRODUCTION

It is not rare for a patient to have coexisting pathologies both of the gallbladder and appendix that should be ideally treated at the same time. A surgeon may face a situation of elongating or even making another incision when performing open surgery; in such a case, a simple “trocar-adding” may well solve the problem in laparoscopy. However, surgeons are now seeking to further this advantage by decreasing the number of trocars and avoiding visible scarring.

Single-incision laparoscopic surgery has come into being on the basis of this notion. It offers better cosmetic results as well as less incisional pain. Although this approach has been developed and applied to many kinds of abdominal surgical procedures,<sup>1-4</sup> few reports of single-incision laparoscopic combined procedures are reported. We herein describe the experience with single-incision laparoscopic combined cholecystectomy and appendectomy. The detailed operative techniques and challenges encountered during the procedure are described.

## METHODS

### Patients

From May 1, 2009 to June 1, 2013, 26 patients underwent single-incision laparoscopic combined cholecystectomy and appendectomy at Shengjing Hospital. There were 7 men and 19 women ranging in age from 32 to 76 years, with an average body mass index of 25.2 kg/m<sup>2</sup>. Computed tomographic scan and ultrasonic examination were performed on the patients. All the patients had a history of chronic appendicitis. Among them, 22 had chronic calculus cholecystitis and 4 had a gallbladder polyp >1 cm. Chronic appendicitis was diagnosed when the patient had a history of acute appendicitis or repeated right lower quadrant abdominal pain and an enlarged appendix on a computed tomographic scan. Patients who refused to undergo surgery after the symptoms of acute appendicitis were relieved by antibiotic injection. All these patients came to our hospital for surgical treatment of gallbladder diseases. When informed that appendectomy could be performed in the same operation without additional incisions, they were pleased to receive a combined surgery. Because we have attempted the technique for only 4 years, and single-incision laparoscopic

Biliary and Vascular Unit, Department of General Surgery, Shengjing Hospital of China Medical University, Shenyang, PR China (all authors).

Address correspondence to: Shuodong Wu, MD, PhD, Biliary and Vascular Unit, Department of General Surgery, Shengjing Hospital of China Medical University, #36 Sanhao Street, Shenyang, PR China. Telephone: 86-24-96615-31211#, Fax: 86-24-3180-3141, E-mail: surgeon\_cys@163.com

DOI: 10.4293/JSLS.2014.00324

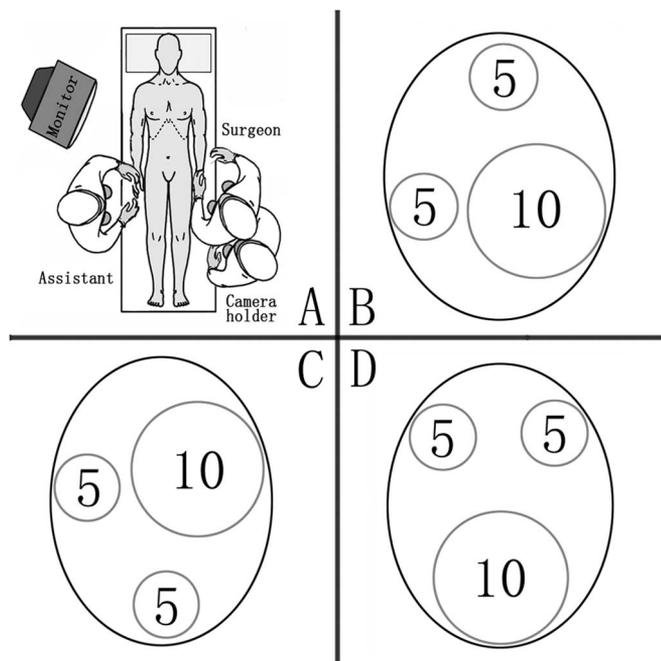
© 2014 by JSLS, *Journal of the Society of Laparoendoscopic Surgeons*. Published by the Society of Laparoendoscopic Surgeons, Inc.

combined procedures are more challenging, all the patients were carefully selected before the operation was scheduled to make sure that the gallbladder and appendix were not severely inflamed. All the diagnoses were confirmed by postoperative pathologic examination. The procedures were performed laparoscopically using conventional laparoscopic instruments placed via a single operating portal within the umbilicus.

### Operative Technique

General anesthesia was used in all cases. Patients were placed supine with the monitor on the right side. Both surgeon and first assistant were positioned on the left side facing the monitor (**Figure 1A**).

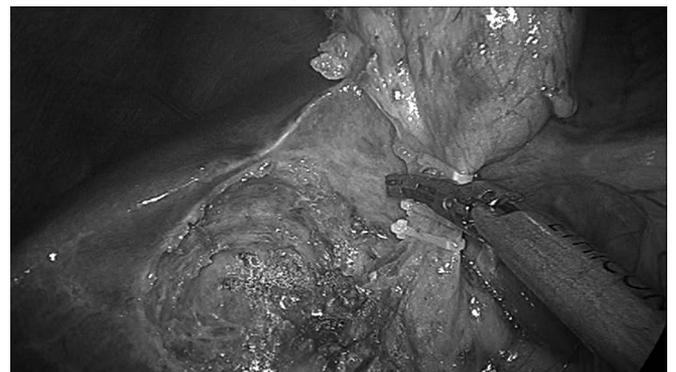
**The skin incisions.** Pneumoperitoneum was created with the closed method using a Veress needle. A 2-cm intraumbilical incision was made for trocar access, and a 10-mm trocar was inserted at the lower border of the umbilical incision for the camera port. Two 5-mm trocars were added through separate fascial openings with one above the initial trocar and the other on the right side of it, about 1 cm apart. As a result, all 3 trocars were introduced through the same incision at different fascial sites in a triangular arrangement (**Figure 1B, Figure 2**).



**Figure 1.** **A.** The surgical team setup. **B.** Trocar arrangement of transumbilical single-incision laparoscopic combined cholecystectomy and appendectomy. **C.** Trocar arrangement of transumbilical single-incision laparoscopic appendectomy. **D.** Trocar arrangement of transumbilical single-incision laparoscopic cholecystectomy.



**Figure 2.** Arrangement of the trocars.



**Figure 3.** Cystic duct was amputated between clips: the gallbladder infundibulum was being retracted laterally by a 5-mm grasper.

**Intra-abdominal procedure.** The patient was first positioned in a reverse Trendelenburg position with a 15° left tilt. We began our procedure with cholecystectomy in a retrograde fashion to gain better visualization and operational convenience. The gallbladder was dissected to the cystic duct, which was then ligated using 2 clips. It was then amputated using a harmonic scalpel and placed in the right hepatorenal recess before removing (**Figure 3**). The patient was then repositioned in the Trendelenburg position with a further left tilt to 25°. The appendix was located and the cecum adequately mobilized. The mesoappendix was dissected using a harmonic scalpel at the base of the appendix. Thereafter, the appendix was ligated using clips (if the appendix measured <10 mm in diameter) or a silk ligature in the case of an enlarged appendix (**Figure 4**). The appendix was then amputated, and the specimen of both gallbladder and appendix were delivered out of the body in a specimen bag.

**Umbilical repair.** After the closure of the peritoneum, the umbilical ring and the skin 1 cm above were both closed in 2 layers, respectively. The suture began from the



**Figure 4.** The base of appendix was clipped by 10-mm endoclip applier.

middle of the incision to restore the umbilical ring. Then the skin above it was sutured to shorten the incision and conceal it in the umbilical fossa (**Figure 5**). No abdominal drainage was placed after the procedure.

## RESULTS

All the procedures were successfully completed without conversion to conventional laparoscopic or open surgery. The operations lasted from 30 to 120 minutes, with blood loss of 5 to 20 mL. No intraoperative complications occurred. All the patients regained normal bowel function on postoperative day 2 or 3 and were satisfied with the therapeutic and cosmetic outcomes. The follow-up period for all the patients was 2 to 36 months. Until now, no significant complication has been reported.

## DISCUSSION

Single-incision laparoscopic surgery is not a new concept. The birth of it can be dated back to 1992 when Pelosi and Pelosi<sup>5</sup> performed the first single-port laparoscopic appendectomy. But this method did not gain enough attention at that time because of the technical difficulty and instrumental limitations. However, there has been a resurgence of interest in single-incision laparoscopic surgery only recently when special port devices with multiple working channels and reticulating instruments became commercially available. It is becoming an emerging surgical field that allows complex operations to be performed without leaving visible

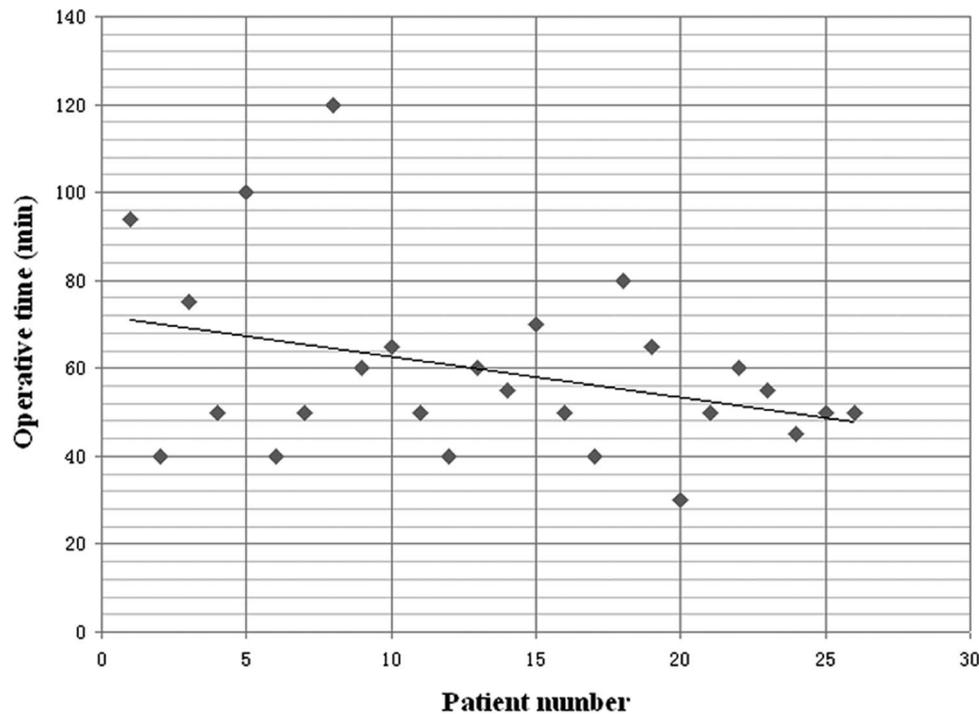
evidence. Although it is gradually becoming widely used, few combined single-incision laparoscopic procedures have been reported.

Since the beginning of application of single-incision laparoscopic surgery at our institution in 2009, we have performed over 1500 single-incision laparoscopic cholecystectomies. During this period, some patients had concomitant appendicitis whose disease should and could be treated at the same time. In this regard, we made an attempt to perform single-incision laparoscopic combined cholecystectomy and appendectomy. The initial results of this study have shown that the procedures can be done using conventional laparoscopic instruments through a single umbilical incision. It appears to provide outcomes similar to standard laparoscopic surgery with fewer incisions and a well-concealed scar.

Single-incision laparoscopic surgery is bearing doubts from various sources just like the birth of laparoscopic surgery did about 20 years ago.<sup>6</sup> Concern has been raised about whether improved cosmesis is worth the difficulties encountered and potential risks. All the instruments are closely packed together, so clashing between them is common, which poses a major handicap to operating.<sup>7</sup> The parallel alignment of these instruments limits triangulation to which laparoscopic surgeons have grown accustomed. The exposure and retraction process is difficult because of the lack of auxiliary operating channels. Furthermore, in-line placement of the scope narrows the visual field and forces the field of view to be dependent and limited by the movements of the instruments. These factors may affect the safety of the procedure, leading to a longer operating time and an increased risk of complications. Even better cosmesis, the most fundamental advantage of single-incision laparoscopic surgery, is questioned because the single incision is at best a 2- to 3-cm incision



**Figure 5.** Original umbilical configuration was retained.



**Figure 6.** The evolution of operative time. A clear trend toward reduction in operative time is shown.

rather than the 10-mm incision used in traditional laparoscopic surgery.<sup>8</sup>

As experience continues to accumulate, we come up with some methods to solve these problems. The gallbladder and appendix are usually in the opposite direction of the umbilicus, so both cholecystectomy and appendectomy should be taken into consideration before trocar insertion. The trocar placement is different from that in either appendectomy (**Figure 1C**) (the 10-mm trocar was inserted at the upper border of the umbilical incision with one 5-mm trocar on the right side and the other below; this arrangement facilitates procedures in the right lower quadrant) or cholecystectomy (**Figure 1D**) (the 10-mm trocar was inserted below two 5-mm trocars; this arrangement facilitates procedures in the upper abdomen). The changes were necessary to adapt to both procedures and increase the achievable triangulation between the instruments (**Figure 1B**). The surgeon and camera holder cooperated with each other by performing fine adjustments to ensure a smooth operation. Contraretraction in combination with posture adjustment of the patient turns out to be an effective technique to provide a clear view of the surgical field.

As for the prolonged operative time, the mean operative time was longer than that for conventional laparo-

scopic surgery, but the authors witnessed a clear trend toward reduction in operative time with increasing experience (**Figure 6**). The incision is longer than that in conventional laparoscopic surgery indeed. Fortunately, the umbilical ring of an adult is usually deep and provides a substantial amount of skin. So the scar could be very well concealed in the skin fold of the umbilical ring and the original umbilical configuration can be retained.

## CONCLUSIONS

Single-incision laparoscopic combined cholecystectomy and appendectomy appears to be technically feasible and can be performed with conventional laparoscopic instruments. However, the increased operative time and technical difficulty are the main concerns with this method. Our study enrolled a limited number of patients in a short observation time. Further studies with longer follow-up time are required to confirm these findings and determine the true benefits of the procedure.

## References:

1. Tam YH, Lee KH, Chan KW, Sihoe JD, Cheung ST, Pang KK. Technical report on the initial cases of single-incision laparoscopic combined cholecystectomy and splenectomy in children,

using conventional instruments. *Surg Innov.* 2010;17(3):264–268.

2. Tian Y, Wu SD, Chen YS, Chen CC. Transumbilical single-incision laparoscopic cholecystojejunostomy using conventional instruments: the first two cases. *J Gastrointest Surg.* 2010;14(9):1429–1433.

3. Joseph M, Phillips M, Rupp CC. Single-incision laparoscopic cholecystectomy: a combined analysis of resident and attending learning curves at a single institution. *Am Surg.* 2012;78(1):119–124.

4. Nonaka T, Hidaka S, Takafumi A, et al. Single-incision laparoscopy-assisted subtotal gastrectomy for intractable gastric ulcer: a case report. *Surg Laparosc Endosc Percutan Tech.* 2012;22(4):e210–e213.

5. Pelosi MA, Pelosi MA 3rd. Laparoscopic appendectomy using a single umbilical puncture (minilaparoscopy). *J Reprod Med.* 1992;37(7):588–594.

6. Trastulli S, Ciocchi R, Desiderio J, et al. Systematic review and meta-analysis of randomized clinical trials comparing single-incision versus conventional laparoscopic cholecystectomy. *Br J Surg.* 2013;100(2):191–208.

7. Saidy MN, Tessier M, Tessier D. Single-incision laparoscopic surgery—hype or reality: a historical control study. *Perm J.* 2012;16(1):47–50.

8. Garey CL, Laituri CA, Ostlie DJ, St. Peter SD. A review of single site minimally invasive surgery in infants and children. *Pediatr Surg Int.* 2010;26(5):451–456.