Comparative Study: Single-Incision Laparoscopic Cholecystectomy and Conventional Three-Ports Laparoscopic Cholecystectomy

Chinda Akethong MD*,
Thiti Sawaengtham MD*

** Department of Surgery, Nakhonpathom Hospital, Nakhonpathom, Thailand*

Background: *Laparoscopic cholecystectomy is now standard treatment of gallstone disease and has traditionally been performed using multiple small sites. Single-incision laparoscopic surgery has emerged as an alternative technique to improve cosmesis and minimize complications associated with multiple incisions pain and longer hospital stay.*
Material and Method: *Between January 2010 and December 2012, 40 patients were assigned to one of the two groups, SILS-C or conventional LC. Surgical indication, operative time, length of stay, and surgical complications were compared between the two groups.*
Results: *Twenty patients underwent SILS-C and 20 patients underwent conventional three ports LC. The average length of stay was 2.60±0.88 days after SILS-C compared with 2.65±0.87 days after CLC (p = 0.871). Operative time was significantly longer in the SILS-C group. An average of 65 minutes was needed to complete a SILS-C (range 35-141) versus 51 minutes (range 24-109) for a CLC (p<0.001). There was no difference in pain score and complications between both groups but SILS-C group use less analgesic (81.00±36.55 mg in SILS-C vs. 123.00±42.31 mg in the conventional group).*
Conclusion: *The Single Incision Laparoscopic Cholecystectomy (SILS-C) is feasible and safe. The results of SILS-C were comparable with the standard conventional LC.*

Keywords: *Laparoscopic cholecystectomy, Single Incision Laparoscopic Cholecystectomy (SILS-C)*

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Laparoscopic cholecystectomy has been performed since 1985, and throughout the next two decades, this procedure became the standard of care for gallbladder disease[1]. Laparoscopic cholecystectomy has traditionally been performed using multiple small incisions/port sites. Single-incision, or single-site, laparoscopic surgery has emerged as an alternative technique to improve cosmesis and minimize postoperative pain that associated with multiple incisions. The first published report of a single skin incision laparoscopic cholecystectomy was by Navarra in 1997[2]. Several studies have shown the safety and feasibility of SILS cholecystectomy (SILS-C)[1-9]. We planned and carried out this study to assess the safety and feasibility of SILS-C using SILS instruments and compare the early morbidity parameters between SILS-C and conventional laparoscopic cholecystectomy (CLC). Primary endpoints were length of stay, operative time, and postoperative pain score.

Correspondence to:
Akethong C, Department of Surgery, Nakhonpathom Hospital, Tasa Road, Phra Pathom Chedi, Muang, Nakhonpathom 73000, Thailand.
Phone: 081-705-2886, Fax: 034-212-885
E-mail: doctorthiti@yahoo.com

Material and Method

After approval from ethical committee of Nakhonpathom Hospital, sample size was estimated by using Krejcie and Morgan table, n = 40. Between January 2010 and December 2012, forty patients were assigned to one of the two groups, SILS-C or conventional CLC, by sequencing alternately. The patients were given a choice between SILS-C and CLC. All SILS-C and CLC operations were performed by a single surgeon. All patients were informed about the surgery in detail and a written informed consent was obtained. The inclusion criteria were (a) symptomatic cholelithiasis and (b) American Society of Anesthesiology grade I or II. The exclusion criteria were (a) American Society of Anesthesiology grade >II and (b) a lack of written consent. History or presence of symptoms or signs of acute cholecystitis or pancreatitis or excess body mass index (BMI) were not exclusion criteria.

Operative technique

All operations were carried out under general anesthesia in reverse Trendelenberg position with the right side tilted upwards.

Single incision laparoscopic surgery-cholecystectomy (SILS-C)

The umbilical curvilinear incision was made then Single Incision Laparoscopic Surgery (SILS) port was introduced by open technique through Alexis wound retractor. Three 5 mm SILS port and curvable grasper, dissector was used. The Hartmann pouch was then retracted laterally with a grasper, and the cystic duct and the cystic artery were dissected after establishing the critical view of safety. The cystic duct and artery were clipped and transected. The gallbladder was dissected from the liver bed and bleeding was stopped until satisfied, then the gallbladder was extracted along with SILS port.

Conventional laparoscopic cholecystectomy (CLC)

A standard three ports CLC was performed using one 10-mm and two 5-mm ports.

The operative details were filled in the sheet by the operating surgeon. The patients were administered an injection pethidine 30 mg as requested by patients every four hours. The pain score was measured on a visual analogue scale (on a scale of 1 to 10, 1 = minimal pain; 10 = maximum/worst pain) at six and 24 hours. Postoperative nausea and/or vomiting and time of commencement of oral intake were noted. The patients were scheduled for discharge after oral diet in two days unless there was a reason to extend the stay, such as severe pain, ileus, vomiting, or any other complications. The patients were called for follow-up on the seventh day for suture removal and pain scoring.

Table 1. Indications for cholecystectomy in patients undergoing single-incision laparoscopic cholecystectomy versus conventional laparoscopic cholecystectomy

Indication	SILS-C (n = 20)	CLC (n = 20)
Acute cholecystitis	1	4
Chronic cholecystitis	5	1
Symptomatic cholelithiasis	14	12
Biliary pancreatitis	0	2

Statistical analysis

Comparison of categorical variables was performed by a Chi-square analysis or Fisher exact test, where appropriate. The continuous variables were assessed by analysis of variance or t-test. The significant cutoff point was set at $p<0.05$.

Results

Between January 2010 and December 2012, 20 patients underwent SILS-C and 20 patients underwent conventional three ports LC. Results are summarized in Table 1. The average age of the patients was 46.65±10.29 years in the SILS-C group and 46.70±10.50 years in the CLC group ($p = 0.989$). Indications for the operation were similar between the groups (Table 1). None of the SILS-C surgeries required conversion to a traditional technique, nor did any patient require conversion to an open technique.

The average length of stay was 2.60±0.88 days after SILS-C compared with 2.65±0.87 days after CLC ($p = 0.871$), this difference was not statistically significant.

Operative time was significantly longer in the SILS-C group. An average of 65 minutes was needed to complete a SILS-C (range 35-141) versus 51 minutes (range 24-109) for a CLC ($p<0.001$). When comparing surgeries performed at a teaching institution, there was no trend in operative time. No operative complications

Table 2. Results for patients undergoing single-incision laparoscopic cholecystectomy versus conventional laparoscopic cholecystectomy

Variable	SILS-C (n = 20)	CLC (n = 20)	p-value
Age (years)	46.65±10.29	46.70±10.50	0.989
Length of stay (days, range)	2.60±0.88	2.65±0.87	0.871
Operative time (minutes, range)	65 (35-141)	51 (24-109)	<0.001
Readmissions (n)	1	1	-
Analgesic injection (pethidine: mg)	81.00±36.55	123.00±42.31	0.01
Postoperative pain score	1.71±1.80	2.00±1.10	0.47

were noted in any patient. In both groups, one patient was readmitted postoperatively. The patient who had undergone SILS-C was admitted 17 days postoperatively with midepigastric pain, nausea, and vomiting. She was diagnosed with a urinary tract infection but was not found to have any biliary complications. After CLC, one patient was readmitted three days postoperatively with midepigastric pain, nausea, vomiting, leukocytosis, elevated liver function tests, and elevated lipase. She underwent endoscopic retrograde cholangiopancreatography and was found to have a narrowed pancreatic duct, which was treated with a stent. There was no difference in pain score between both groups but SILS-C group use less analgesic (81.00±36.55 mg of pethidine in SILS-C vs. 123.00±42.31 mg of pethidine in CLC at p = 0.01).

Follow-up was limited to one to two postoperative office visits. No complications were noted in this period.

Discussion

There was no statistical significance in length of stay for both groups. These results are different from a previous study by Joseph et al[5], who noted that the mean postoperative hospital stay for SILS-C patients was 12.7 hours shorter than that of four PLC patients[5]. These results came from all of our patients who are admitted. Although we did not study the time to normal activity, others reported that patients undergoing SILS-C tend to return to normal activity earlier than those undergoing CLC[6].

Similar to other studies, operative time was significantly longer in the SILS-C group than in the CLC group. The mean operative time for SILS-C was 14 minutes longer than that for CLC. According to Greaves and Nicholson, the average difference in operative times among other studies is 12 minutes[7]. Longer operative times are likely related to technical difficulties and a learning curve inherent in a new technique[3]. In the present study, operative times that significantly deviated from the mean were often due to difficulties such as placing the gallbladder in the retrieval bag, performing a cholangiogram, and dealing with severe inflammation of the gallbladder. SILC is technically difficult due to poor ergonomics, theorized decreased visualization, and inadequate retraction due to limitation of movement[8]. However, much of this difficulty is overcome with experience of both the surgeon and the assistant.

In this study, we found no difference in pain score and complications between both groups but SILS-C group use less analgesic. A recent systematic review showed no statistically significant difference in complication rates or postoperative pain scores for those undergoing SILS-C versus CLC[10]. However, Phillips et al published a study that showed higher pain scores for those undergoing SILS-C, but no difference in analgesic use between SILS-C and CLC patients. They also reported higher rates of superficial wound complications after SILS-C[11]. With larger incisions in the fascia and a longer skin incision, there is a theoretical increased risk of incisional hernias. In a series of 125 patients with follow-up as long as 22 months, Cui reported that no patient had presented with an incisional hernia[12]. Follow-up in our study was limited to six weeks. However, we noted no incidence of incisional hernia or wound complications.

In conclusion, the Single Incision Laparoscopic Cholecystectomy (SILS-C) is feasible and safe. The results of SILS-C were comparable with the standard conventional LC.

What is already known on this topic?

When compared between Single Incision LC and convention LC, the operative time was significantly longer in the SILS-C group than in the CLC group. The mean operative time for SILS-C was 14 minutes longer than that for CLC. According to Greaves and Nicholson, the average difference in operative times among other studies is 12 minutes[7]. Longer operative times are likely related to technical difficulties and a learning curve inherent in a new technique[3]. The SILC group has fewer scars, less pain, and the same complications.

What this study adds?

In conclusion, the Single Incision Laparoscopic Cholecystectomy (SILS-C) is feasible and safe. The results of SILS-C were comparable with the standard conventional LC.

Potential conflicts of interest

None.

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การศึกษาเปรียบเทียบระหว่างการผ่าตัดส่องกล้องตัดถุงน้ำดีแบบแผลเล็กแผลเดียวกับการผ่าตัดส่องกล้องตัดถุงน้ำดีแบบมาตรฐาน 3 แผล

จินดา แอกทอง, ธิติ แสวงธรรม

ภูมิหลัง: *ในปัจจุบันการรักษาโรคนิ่วในถุงน้ำดีโดยการผ่าตัดส่องกล้องถือเป็นมาตรฐาน โดยผ่านการเจาะรูที่ช่องท้องจำนวน 3-4 รู การผ่าตัดส่องกล้องเพื่อตัดถุงน้ำดีโดยผ่านแผลหน้าท้องขนาดเล็กเพียงหนึ่งแผล ได้ถูกพัฒนาขึ้นเพื่อลดภาวะแทรกซ้อนที่เกิดจากการมีแผลผ่าตัดหลายแผล เช่น ความเจ็บปวดที่บริเวณแผลผ่าตัด*

วัสดุและวิธีการ: *การศึกษานี้เป็นการเปรียบเทียบการผ่าตัด ตัดถุงน้ำดีโดยการส่องกล้องแบบแผลเดียว เปรียบเทียบกับแบบหลายแผลที่เป็นมาตรฐาน ในช่วงเดือนมกราคม พ.ศ. 2553 ถึง เดือนธันวาคม พ.ศ. 2554 โดยเปรียบเทียบข้อบ่งชี้ในการผ่าตัด, ระยะเวลาในการทำผ่าตัด, จำนวนวันนอนโรงพยาบาล และภาวะแทรกซ้อนที่เกิดขึ้นระหว่างการผ่าตัดทั้งสองชนิด*

ผลการศึกษา: *ในช่วงเดือนมกราคม พ.ศ. 2553 ถึง เดือนธันวาคม พ.ศ. 2554 มีผู้ป่วยเข้ารับการผ่าตัดส่องกล้องเพื่อตัดถุงน้ำดี 40 ราย แบ่งเป็น 2 กลุ่ม โดยแจกแจงสลับกันพบว่าระยะเวลาการนอนโรงพยาบาล ไม่มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ (2.60±0.88 วัน ในกลุ่มผ่าคัดแผลเดียว และ 2.65±0.87 วัน ในกลุ่มผ่าตัดแบบมาตรฐาน ระยะเวลาที่ใช้ในการผ่าตัดของกลุ่มแผลเดียวนานกว่าแบบมาตรฐานอย่างมีนัยสำคัญ (65 นาที เทียบกับ 51 นาที ในกลุ่มมาตรฐาน) การวัดความเจ็บปวดหลังผ่าตัดด้วยแบบประเมินความเจ็บปวด พบว่าทั้ง 2 วิธี ไม่แตกต่างกันแต่กลุ่มที่ผ่าตัดแผลเดียวมีการใช้ยาแก้ปวดฉีดน้อยกว่า*

สรุป: *การผ่าตัดส่องกล้องเพื่อตัดถุงน้ำดีโดยผ่านแผลหน้าท้องขนาดเล็กเพียงหนึ่งแผล สามารถทำได้และมีผลการรักษาที่ไม่ต่างไปจากการผ่าตัดส่องกล้องตัดถุงน้ำดีแบบมาตรฐาน*