



Original research

The real-world application of single incision laparoscopic cholecystectomy



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HIGHLIGHTS

- Most published studies investigating single incision laparoscopic cholecystectomy (SILC) are case series with limited numbers of cases.
- We have reviewed the outcomes of 500 cases of SILC performed by a single surgeon at our center.
- SILC is a safe and effective procedure for cholecystectomy. It may be the main surgical approach in a selected patient population.

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ABSTRACT

Objectives: Most previous studies that have investigated single incision laparoscopic cholecystectomy (SILC) are case series with limited sample sizes. We have reviewed the outcome of 500 consecutive cases of SILC performed by a single surgeon at our center. **Materials and Methods:** From April 2009 to October 2012, a single surgeon performed 1250 laparoscopic cholecystectomies for various gallbladder (GB) diseases. SILC was chosen as the surgical modality unless there was evidence of acute cholecystitis or GB empyema, the patient had a prior history of upper abdominal surgery, endoscopic sphincterotomy, or had comorbidities with an ASA score of III or higher. The clinicopathologic features and perioperative data of patients were retrospectively reviewed. **Results:** The mean age and BMI of included patients were 42.7 years and 23.6 kg/m², respectively. The mean operating time was 52 min. Patients stayed in the hospital for an average of 1.3 days postoperatively. In 55 patients, an additional 2 mm trocar was inserted for retraction of the GB. One patient was converted to an open cholecystectomy because of Mirizzi syndrome. There were no observed complications including incisional hernias in this patient population. **Conclusions:** SILC is a safe, effective procedure for cholecystectomy that may be considered the main surgical strategy in select patients.

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1. Introduction

Laparoscopic cholecystectomy is the widely accepted gold standard treatment for various diseases involving the gallbladder. Navarra et al. first reported the use of laparoscopic cholecystectomy via a single incision (or “one wound laparoscopic cholecystectomy”) in 1997 [1]. Since then, several reports have been published regarding single incision laparoscopic cholecystectomy (SILC). Previous reports have emphasized the cosmetic benefit of SILC

[2,3], or its reduction of postoperative pain as compared to conventional laparoscopic cholecystectomy (CLC) [4]. In recent years, several randomized controlled trials regarding SILC have been published and SILC is gradually becoming a standard procedure in selected patients. However, there are still concerns that SILC has technical issues that prevent it from being applied to the general patient population. The authors have experience with over 500 cases of SILC at our institution. Here, we present our clinical experience with SILC.

2. Methods

Patients who had undergone laparoscopic cholecystectomy between April 2009 and October 2012 by a single surgeon (J.S.H) at

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Samsung Medical Center were included. Patients' medical records were retrospectively reviewed. Preoperative analysis included imaging studies (abdominal ultrasonography or computed tomography). When applicable, endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic sphincterotomy (EST) were used to remove stones and/or biliary sludge from the common bile duct (CBD). Laparoscopic cholecystectomy was performed after preoperative imaging and ERCP/EST.

The laparoscopic surgeon involved has performed 500 cases annually since 1998. A list of criteria (below) was used to determine if a patient would receive a single incision laparoscopic cholecystectomy or a conventional laparoscopic cholecystectomy. All patients were primarily considered for single incision laparoscopic cholecystectomy unless they had one or more of the following:

1. Acute or gangrenous cholecystitis and GB empyema on CT or ultrasonography
2. Severe systemic disturbance categorized as ASA score > III
3. Prior history of ERCP and EST for CBD stones or sludge
4. Previous upper abdominal surgery (not lower abdominal surgery)
5. GB polyp >1 cm with a possibility of GB cancer

2.1. Surgical technique

A 2 cm transumbilical incision was made and the umbilical stalk was completely separated. In order to prevent burning the umbilical skin, a #12 blade was used to dissect down to the fascia and peritoneum. An Alexis® Wound Retractor (Applied Medical, Rancho Santa Margarita, CA, USA) was inserted into the peritoneal space. Small openings were then made at the tips of the thumb, 3rd and 5th fingers of a size 6 glove. Two 5 mm trocars were inserted in the two end openings, and a 10 mm trocar was inserted in between. The glove was placed over the wound retractor making an airtight single port system. The two 5 mm trocars served as action ports and the endoscope was inserted through the middle 10 mm trocar. Carbon dioxide was insufflated and the patient was placed in the reverse Trendelenburg position with his/her right side tilted up, to ensure good GB exposure. The surgeon used an Autonomy Laparo-Angle Maryland Dissector (Cambridge EndoTM, Framingham, MA, USA) to retract the GB. The GB was brought upward and toward the patient's right side to expose the Calot's triangle. When the Calot's triangle was not visualized clearly, an additional 2 mm trocar was inserted in the right subcostal area for retraction of the GB. Then

the surgeon used his other hand to control a hook cautery or dissector to dissect the cystic artery and cystic duct. Before dividing the cystic artery and cystic duct, 5 mm laparoscopic clips were applied doubly. After dividing the cystic duct and cystic artery, the GB was freed from the liver bed using a hook cautery. The specimen was withdrawn via the umbilical incision. Local anesthetics (0.5% bupivacaine) were injected around the fascia before absorbable sutures were used to close the subcutaneous tissue and skin layers.

During conventional laparoscopic cholecystectomy, a 1 cm transumbilical incision was made and a 12 mm trocar was inserted. A 5 mm trocar was then inserted in the epigastrium. Two 2 mm trocars were inserted in the right subcostal area and at the anterior axillary line. The surgical technique was then identical to SILC, and has been described previously [5].

2.2. Statistical analysis

Statistical analysis was done using SPSS 20.0 statistical software (SPSS, Inc., Chicago, IL, USA). Chi-squared tests and Mann–Whitney tests were used for discrete variables. A two-tailed *p*-value <0.05 was considered statistically significant.

3. Results

A total of 1246 patients were analyzed, of which 500 underwent SILC and 746 underwent CLC. The mean patient age was 42.5 years in the SILC group and 58.0 years in the CLC group. Mean BMI at the time of surgery was similar across the two groups: 23.2 kg/m² in the SILC group and 24.5 kg/m² in the CLC group. One patient in the SILC group and 29 patients in the CLC group had ASA scores > III. Five patients in the SILC group and 30 patients in the CLC group had previous history of abdominal surgery (Table 1).

The mean operation time was 49 min in the SILC group and 51 min in the CLC group. Patients stayed in the hospital an average 1.2 days and 1.6 days postoperatively in the SILC group and CLC group, respectively. The blood chemistry results on the first postoperative day were not different between the two groups (Table 2). Due to the large sample size, every variable was found to be statistically significant between the two groups (*p* < 0.05). However, these differences are not clinically significant.

Fifty-five cases in the SILC group required insertion of an additional 2 mm trocar during the procedure. One patient in the SILC group was converted to an open hepaticojejunostomy because there was difficulty dissecting between the cystic duct and the CBD. This patient was suspected to have type I Mirizzi syndrome. The patient had prolonged hospital stay (22 days) due to leakage in the hepaticojejunostomy site. Ten patients in the CLC group were converted to open surgeries due to adhesions from previous upper abdominal surgery (6), adhesions due to GB empyema (2), or Mirizzi syndrome (1). One patient was converted to open surgery because xanthogranulomatous cholecystitis was suspected. These patients in the CLC group had prolonged hospital stay. One patient was a 75 year old male with multiple comorbidities and GB empyema. The surgery was converted to open laparotomy and subsequent wound problems led to 35 days in the hospital postoperatively. Another patient had xanthogranulomatous cholecystitis and was converted to open laparotomy. This patient was diagnosed with aplastic anemia postoperatively and was transferred to the hematology department for further management for 22 days. One patient with Mirizzi syndrome had postoperative biloma in the abdominal cavity that required percutaneous drainage for 13 days. Two patients who were converted to open laparotomy had previous history of abdominal surgery. These patients had delayed return of intestinal motility and were discharged at postoperative day 8.

Table 1
Patient characteristics.

| | SILC (n = 500) | CLC (n = 746) | P value |
|----------------------------|-------------------|-------------------|---------|
| Age (Mean) | 42.5 | 58.0 | <0.001 |
| Male, n (%) | 169 (33.8) | 409 (54.8) | <0.001 |
| BMI (kg/m ²) | 23.28 (16.5–34.7) | 24.56 (17.3–34.0) | <0.001 |
| ASA score | | | <0.001 |
| I | 280 | 194 | |
| IE | 7 | 9 | |
| II | 114 | 263 | |
| IIIE | 3 | 11 | |
| III | 1 | 27 | |
| IIIE | 0 | 1 | |
| IV | 0 | 1 | |
| Previous abdominal surgery | 5 | 30 | <0.001 |

Data are mean with ranges.

SILC, single incision laparoscopic cholecystectomy; CLC, conventional laparoscopic cholecystectomy; BMI, body mass index; ASA, American Society of Anesthesiologists.

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