

Clinical Science

# Is routine single-incision laparoscopic cholecystectomy feasible? A retrospective observational study



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## KEYWORDS:

Cholecystitis;  
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Laparoscopic  
single-site  
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Learning curve;  
Routine;  
Single-incision  
laparoscopic  
cholecystectomy

## Abstract

**BACKGROUND:** Single-incision laparoscopic cholecystectomy (SILC) has been shown to be safe for uncomplicated gallbladder diseases. Routinely applying SILC is debatable.

**METHODS:** Two hundred SILCs were performed with single-incision multiple-port longitudinal-array and self-camera techniques.

**RESULTS:** Eighty-eight (44%) procedures were scheduled for complicated diseases. The routine group had a higher comorbidity rate, a lower preoperative endoscopic retrograde cholangiopancreatography rate, a higher intraoperative cholangiography rate, a higher proportion of complicated gallbladder diseases, shorter operative time, more intraoperative blood loss, and lower postoperative pethidine dose than the selective group (the first 73 patients). The conversion and complication rates showed no statistical difference. It took fewer cases but longer time to pass the learning phase of SILC for complicated gallbladder diseases. The multivariate analysis showed that male sex and complicated gallbladder diseases were associated with a higher procedure conversion rate, and increased patient age was related to a higher complication rate.

**CONCLUSIONS:** Routine SILC for benign gallbladder diseases is feasible in the experienced phase. Practicing SILC for uncomplicated gallbladder diseases helps to achieve competence in this technique for complicated diseases.

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Single-incision laparoscopic cholecystectomy (SILC) or laparoendoscopic single-site cholecystectomy has been shown to be feasible and safe for uncomplicated gallbladder diseases by experienced surgeons in recent meta-analyses.<sup>1–3</sup> But higher complication rates in SILC have been reported.<sup>4,5</sup> The existing studies have inconsistent conclusions regarding the accomplished case number needed to pass through the learning curve.<sup>6–9</sup> Applying this technique to complicated diseases, such as acute cholecystitis, is limited to small number of selective patients<sup>10–12</sup> and study aiming to clarify the learning curve in this scenario is absent. Reasonableness of applying this demanding technique in daily clinical practice is a great and interesting debate. This study presents our 3-year experience of SILC for complicated and uncomplicated gallbladder diseases. The comparison between the selective group (mostly in the learning phase) and the routine group (in the experienced phase) was analyzed. The learning curves of the SILC for complicated and uncomplicated gallbladder diseases were addressed separately.

## Patients and Methods

### Selective and routine single-incision laparoscopic cholecystectomy

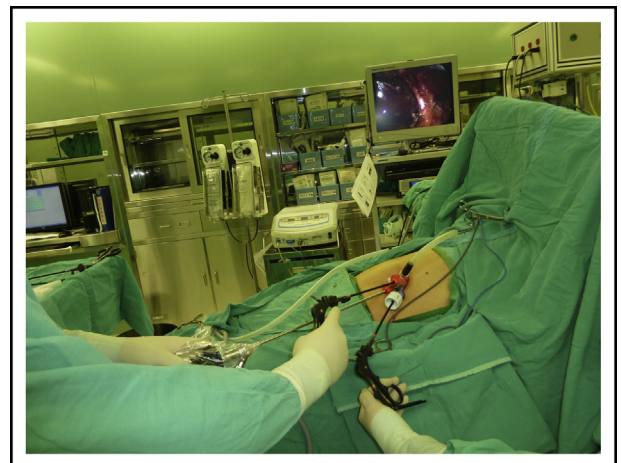
We developed SILC from multi-incision laparoscopic cholecystectomy (LC) step-by-step in March 2010.<sup>13</sup> Only conventional instruments were used to diminish the cost and to facilitate easy conversion either to multi-incision LC or open cholecystectomy (OC). Initially, this novel technique was performed only for uncomplicated gallbladder diseases, such as biliary colic, chronic cholecystitis, and gallbladder polyp. Since May 2010, we began to apply SILC to acute cholecystitis in selected patients. Complicated cholecystitis with sepsis, suspicious gallbladder perforation, severe cholangitis, liver cirrhosis, a history of major upper abdominal surgery, and aged patients with impaired cardiopulmonary function were considered relative contraindications for SILC. After 73 SILCs (52 for uncomplicated diseases and 21 for complicated ones) were accomplished with 3 (4.1%) Clavien–Dindo classification<sup>14</sup> grade I complications, this technique became the routine procedure for all benign gallbladder diseases. The surgical contraindication was the same as that for previous standard LC such as extremely poor cardiopulmonary function, hemodynamic instability, uncorrected coagulopathy, generalized peritonitis, and advanced cirrhosis with failure of hepatic function. Preoperative endoscopic retrograde cholangiopancreatography (ERCP) or intraoperative cholangiography (IOC) was performed for suspicious concomitant choledocholithiasis. In case ERCP and endoscopic sphincterotomy (EST) failed to clean the bile duct or IOC revealed a positive result, we would proceed to multi-incision or single-incision laparoscopic

common bile duct exploration;<sup>15</sup> accordingly, these cases were excluded from this study. As a whole, 200 SILCs were attempted by a single surgeon from March 2010 to March 2013. The medical charts were reviewed retrospectively. Patient demography, clinical data, operative results, and postoperative follow-up were recorded. The operative time was defined as the interval from initial skin incision to skin closure. Postoperative narcotic use was recorded as the intramuscular pethidine dose (milligram) per kilogram of patient body weight. The postoperative length of hospital stay was defined as the duration between the day of surgery and the day of final discharge including readmission for late-onset complications. Any procedure that failed to be fulfilled as scheduled was regarded as converted. The complications were recorded according to the 5-grade Clavien–Dindo classification system.<sup>14</sup> The collected data were analyzed by Pearson's chi-square test, Student *t* test, learning curve fitting with the power law, univariate logistic regression, and multivariate logistic regression. A *P* value of less than .05 was considered statistically significant.

### Single-incision multiple-port longitudinal-array and self-camera techniques

The details of the surgical techniques have been described previously.<sup>10,13</sup> We named it single-incision multiple-port longitudinal-array (SIMPLY) technique. The longitudinal arrangement of the ports facilitates the horizontal movement and reduces interinstrumental collisions. The self-camera technique, the operator controlling the working instrument with the right hand and the laparoscope with the left hand, can minimize the “sword fighting” between the working and optic ports (Fig. 1).

When severe inflammation or dense pericholecystic fibrosis obscured the critical view of safety recommended



**Figure 1** SIMPLY and self-camera techniques during a single-incision laparoscopic cholecystectomy. Only conventional straight instruments were used.

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