Single-incision laparoscopic cholecystectomy: from four wounds to one

Objective To review the initial results and surgical outcomes of single-incision laparoscopic cholecystectomy.

Design Prospective case series.

Setting A university teaching hospital and a regional hospital in Hong Kong.

Patients All patients undergoing single-incision laparoscopic cholecystectomy from August 2009 to March 2011.

Results Fifty patients underwent single-incision laparoscopic cholecystectomy during the study period. The indications for surgery included symptomatic gallstones (n=43) and gallbladder polyps (n=7). The mean operating time was 78 (standard deviation, 24) minutes. Forty-five of the patients successfully underwent single-incision laparoscopic cholecystectomy, giving a success rate of 90%. In the remaining five patients, additional working ports were constructed to obtain better exposure and dissection around Calot’s triangle. On comparing the results of the initial 25 cases to the subsequent 25 cases, in the latter group the operating time was significantly shorter (86 vs 71 minutes; P=0.02), and the success rate was higher (80% vs 100%; P=0.05). During the median follow-up period of 6.8 months, four patients had complications, which included: postoperative urinary retention (n=2), one each with a haematoma and an incisional hernia. No patient endured bile duct injury, postoperative bile leakage, or haemorrhage in our series.

Conclusion Single-incision laparoscopic cholecystectomy is feasible and safe for treatment of uncomplicated gallbladder diseases. There was a reduction in the operating time and increase in success rate with accumulation of experience. Nevertheless, surgeons should be cautious about the potential risks of this new technique.

New knowledge added by this study
• Single-incision laparoscopic cholecystectomy (SILC) is feasible and safe for patients with uncomplicated gallbladder diseases.
• With the accumulation of operative experiences in SILC, surgeons can reduce operating times and conversion rates.

Implications for clinical practice or policy
• SILC is an alternative procedural option to four-port laparoscopic cholecystectomy for patients with uncomplicated gallbladder disease.

Introduction
Surgery of the gallbladder has evolved tremendously over the last century. Nowadays, laparoscopic cholecystectomy is the gold standard for gallbladder removal and the most common laparoscopic procedure worldwide. Many studies have shown its benefits over open cholecystectomy in terms of less postoperative pain, faster recovery, and shorter hospital stays. Recent research has focused on whether further reduction of skin incisions could result in better postoperative outcomes. Against this background, single-incision laparoscopic surgery (SILS) has recently emerged as another approach for cholecystectomy. The feasibility of single-incision laparoscopic cholecystectomy (SILC) has been reported widely in the literature. With a reduced number of skin incisions, theoretically there may be less postoperative pain, a better cosmetic outcome, and higher patient satisfaction than conventional laparoscopic cholecystectomy. We would therefore like to share our experience and outcomes on our first 50 cases of SILC.
Methods

In what we considered a pilot study, from August 2009 to March 2011, we performed SILC on 50 patients who suffered from symptomatic gallstones and gallbladder polyps. Patients were excluded if they were older than 70 years; had American Society of Anesthesiologists (ASA) scores of higher than 2; a previous history of cholecystitis, cholangitis or pancreatitis; or radiological finding of chronic cholecystitis or suspected gallbladder carcinoma.

All procedures were performed or supervised by a single specialist in hepatobiliary surgery. Operations were carried out at the Prince of Wales Hospital and the Alice Ho Miu Ling Nethersole Hospital in Hong Kong. The latter hospital provides short-stay surgery services within the same cluster. Most of the patients stayed in the ward for overnight observation after surgery. The primary outcomes were operating time, the success rate, the complication rate, and duration of hospital stay. In addition, we compared outcomes of the first 25 cases to the subsequent 25 cases, in order to detect any differences after accumulation of operative experience. The duration of the operation was defined as the time interval between the initial skin incision and skin closure.

Operative technique

All surgical procedures were performed in the reverse Trendelenburg position with the table tilted downward to the patient’s left. The operating surgeon and assistant were standing at the left side of the patient. A 2-cm skin incision was made in the paraumbilical region. A single 10-mm trocar was inserted by open technique and a diagnostic laparoscopy was performed with a 5-mm laparoscope (5-mm 30-degree EndoEYE video laparoscope; Olympus, Tokyo, Japan). Another two 5-mm ports were introduced in a subcutaneous space slightly above the 10-mm port, one on the left and one on the right, leaving a small bridge of fascia between each port site to avoid leakage of pneumoperitoneum. In most of the cases, a straight-needle suture (2/0 polypropylene) was passed transabdominally into the right subcostal region for suspension of the gallbladder from the abdominal wall. Hartmann’s pouch was retracted with Endograsper roticulators (Covidien, Norwalk, CT, US) for exposure of Calot’s triangle. Dissection was performed with an ultrasonic device (SonoSurg, Olympus, Tokyo, Japan) and standard laparoscopic instruments. Calot’s triangle was dissected in the usual manner to obtain a critical view. After identification of both the cystic artery and cystic duct, they were clipped with 10-mm metal clips and 10-mm polydioxanone clips, respectively. The gallbladder was dissected away from liver with an ultrasonic or diathermy device. Then the gallbladder was retrieved within specimen retrieval bag (Endo-pouch, Unimax Medical Systems Inc, Taiwan), after removal of the suspending stitch from the abdominal wall. The umbilical fascia was closed with an absorbable suture. Intra-operative and postoperative photos are shown in Figures 1 and 2, respectively.
Statistical analysis

Outcome data were collected prospectively. Data were expressed as mean (standard deviation [SD]) or median (range). Continuous variables were compared using Student’s t test or the Mann-Whitney U test as appropriate. Categorical variables were compared by the χ² test or Fisher’s exact test, as appropriate. A statistically significant result was defined as P<0.05. All statistical calculations were performed using the Statistical Package for the Social Sciences (Windows version 15.0; SPSS Inc, Chicago [IL], US).

Results

During the study period, 50 patients underwent SILC. Their mean (SD) age was 54 (10) years, and there were 15 males and 35 females. The mean (SD) body mass index was 23 (3) kg/m² and the median ASA score was 2 (range, 1-2). In 43 patients, the indication for cholecystectomy was symptomatic gallstones, and in 7 it was gallbladder polyps. Regarding operative outcomes, the mean (SD) operating time was 78 (24) minutes, and 45 patients successfully underwent SILC (success rate, 90%). The remaining five patients had additional working ports constructed or conversion to standard four-port laparoscopic procedures. The reasons for conversion were suboptimal view of Calot’s triangle in two patients and dense adhesions around Calot’s triangle in the other three patients. The median postoperative hospital stay was 1 day (range, 0-3 days). Immediate postoperative complications included two cases of postoperative urinary retention. During a median follow-up period of 6.8 months (range, 0.3-18.5 months), two more complications were observed, namely wound haematoma and incisional hernia. On comparing the first 25 patients with the subsequent 25, the latter had significantly shorter mean operating times (mean [SD]: 86 ± 23 vs 71 ± 21 minutes; P=0.02), and higher success rates (80% vs 100%; P=0.05), although this difference did not reach statistical significance (Table).

Discussion

Laparoscopic cholecystectomy is now the gold standard for treatment of benign gallbladder disease. In order to reduce postoperative pain and improve the cosmetic outcome, different technical modifications of laparoscopic cholecystectomy have been described. These include reducing the number of working ports,5 and the use of mini-laparoscopic instruments.6 The development of SILS is an even less invasive approach. The obvious benefit of SILC over conventional laparoscopic cholecystectomy is better cosmetic outcome. However, whether SILC causes less pain and better clinical outcomes is still under investigation.2,6 Nevertheless, the initial results from our centre showed that SILC for the treatment of uncomplicated gallbladder disease was safe and feasible.

Various operative techniques for SILC have been reported. Transumbilical access can be performed with a different single-port apparatus or using a single-incision multiport laparoscopic technique (as in our series). Besides, different techniques for gallbladder retraction have been reported and entail the use of transabdominal suture, transabdominal hooks, or a standard laparoscopic grasper. Regarding the different surgical techniques, it is essential to obtain a critical view of Calot’s triangle in order to avoid biliary injury. In our initial few cases, the gallbladder was retracted by a laparoscopic grasper and a transabdominal suture was not routinely applied, for which reason exposure of Calot’s triangle was found to be suboptimal. Thereafter, we tried to apply a transabdominal suture to Hartmann’s pouch to attain better exposure, but the result was still unsatisfactory. Under these circumstances, additional working ports were applied to obtain the critical view. Finally, we modified our technique with routine suturing of the gallbladder fundus to the anterior abdominal wall and retracted Hartmann’s pouch with a flexible endograsper so as to obtain the critical view. The conversion rate...
One patient developed wound haematoma after that settled after temporary urinary catheterization. With experience, the surgical assistant learnt how to cooperate with the operating surgeon in maintaining the laparoscopic view without hindering the surgeon’s movements. Nevertheless, we still encountered patients with adhesions around Calot’s triangle for which longer operating times and additional working ports for dissection became necessary.

Despite the feasibility of SILC, its safety is a matter of concern. A recent systematic review of 1166 cases of SILC showed that the overall success and complication rates were 91% and 6%, respectively. Complications included bile duct injury (0.1%), postoperative bile leakage (0.4%), bile duct stricture (0.1%), haemorrhage (0.3%), incisional hernia (0.1%), and wound complications (2.1%). From our series, there were four complications; two of the patients developed postoperative urinary retention (in association with underlying prostatic enlargement) that settled after temporary urinary catheterization. One patient developed wound haematoma after surgery, which was subsided spontaneously within a month visit. An incisional hernia was observed in one patient during the 6-month follow-up visit, and it transpired that this patient had the umbilical wound extended to extract the 2 cm–sized gallstone specimen. The patient then underwent a second operation to repair the incisional hernia. There were no instances of biliary injury, bile duct stricture, postoperative bile leakage or haemorrhage in our series. However, the limited follow-up period might not have been long enough to allow all complications to be observed. In summary, although there were no serious complications in our series, surgeons should be cautious of potential complications from this new procedure. In case of unclear anatomy or difficult dissection, additional working ports should be added without hesitation.

Conclusion

Single-incision laparoscopic cholecystectomy is feasible and safe for treatment of uncomplicated gallbladder disease. There were reductions in the operating time and increases in success rate with accumulation of experience. Nevertheless, surgeons should be cautious, and aware of the potential risks of this new technique.

References