Transumbilical SILC Using Conventional Laparoscopic Instruments—Initial Experience in a Resource-Limited Setting

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Abstract In the era of minimal access, single-incision laparoscopic surgery is gaining popularity. Expensive ports, disposable hand instruments and flexible endoscopes have been utilised, but they increase the cost of operation. We report our initial experience of two-trocar single-incision laparoscopic cholecystectomy (SILC) in 70 patients using conventional instruments that can be adapted as a novel technique in achieving minimal trauma and aesthetic results in resource-limited hospitals. Between September 2011 and September 2012, 70 consecutive patients underwent an attempted SILC in a single centre. The mean age of the patients was 42 years (range 18–65 years). There were 12 males and 58 females with a male-to-female ratio of 1:4.8. Transumbilical incision was used to access the abdomen, and two 10-mm ports/trocars were placed through the single incision side by side, maintaining a facial bridge of 5–8 mm in between. Gall bladder was manipulated through two strategically placed traction sutures to expose the Callot's triangle. Mean operation time in our series was 42.12 min (range 22–90 min). There was no need of additional sutures. Bleeding was minimal in nearly all cases. The mean hospital stay was 1.06 days (range 1–4 days). The post-operative analgesic requirement was one dose in 60.4 % patients. Additional port was required in two of our patients. Two patients needed conversion to open surgery. There was no major complication or mortality in our series. This technique of two-trocar SILC using conventional instruments can be adapted as a less invasive surgical procedure in resource-limited hospitals

in selected group of patients. Cosmetic result, reduced pain, short hospital stay and the degree of satisfaction appear to be significant with this technique.

Keywords Cholecystectomy · Laparoscopic · SILC · SILS · Single incision · GB (gall bladder)

Introduction

Laparoscopic cholecystectomy has rapidly replaced open cholecystectomy for treatment of patients with gall bladder diseases and has now become the procedure of choice for patients with gallstone diseases [1]. However, there has been a trend toward minimising the required number and size of ports to reduce post-operative pain with better cosmetic results [2].

Single-incision laparoscopic surgery refers to the operative technique wherein a surgical procedure is carried out through one incision only. It is a rapidly evolving method complementing traditional laparoscopy in selected fields and patients. In 1997, Navarra et al. described a single-incision laparoscopic cholecystectomy as a plausible alternative procedure to the four-port laparoscopic cholecystectomy [4]. Single-incision laparoscopic cholecystectomy (SILC) has been suggested as a bridge between traditional laparoscopy and natural orifice transluminal endoscopic surgery [3]. There are three main approaches mentioned in the literature to perform SILC. One technique uses special purpose-made access devices/ports (like TriPort) for introducing the laparoscope and instruments which are usually roticulating ones [5]. The second technique includes passing 3-mm trocars side by side through the fascia after exposing a wide area through a single umbilical incision [6]. The third technique uses two trocars at the umbilicus along with suspension sutures to retract the gall bladder.

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Among these three approaches, we have modified the third approach that was suitable in our resource-limited setting. Our aim was to study the outcome of SILC in terms of safety of the procedure, operative time, post-operative pain, requirement of analgesia, hospital stay, cosmesis, requirement of rescue ports and conversion to four-port LC or open procedure. In this article, we share our experience using SILC with a series of 70 patients in a single centre.

Patients and Methods

The prospective study was carried over a period of 1 year (September 2011 to September 2012) on 70 patients with symptomatic cholelithiasis in the Department of General and Minimal Access Surgery of SMHS Hospital Srinagar—a medical college-associated hospital located in northern India. The inclusion criteria for this study were patients with normal gall bladder wall thickness, normal bile duct on ultrasound, abdomen with no previous surgery and no obesity. Patients with history of jaundice, coagulopathy, suspected gall bladder (GB) malignancy, acute cholecystitis, choledocholithiasis or other contraindications to laparoscopic surgery were excluded from the study.

Operative Technique

Pneumoperitoneum was created by blind puncture using a Veress needle. After everting the umbilicus out of its inward position, a vertical 3–4-cm transumbilical incision was made. Two 10-mm ports/trocars were placed through the single incision side by side, maintaining a facial bridge of 5–8 mm in between (Fig. 1). A telescope was passed through one port to perform peritoneoscopy. The gall bladder was manipulated through two strategically placed traction sutures, passed through the fundus (to retract it cephalad) and neck area of the gall bladder to get a clear view of the Callot's triangle. A straight needle is introduced high up in the epigastrium just to the right of the falciform ligament, grasped with the laparoscopic needle holder and driven through the Hartmann's

Fig. 1 External view showing placement of conventional 10-mm ports through umbilical incision

pouch which then exits the abdominal wall laterally. The suture that passed at the neck/Hartman's pouch of the gall bladder was secured with metallic clips. With this, the gall bladder remains “suspended” on a length of suture, allowing its medial and lateral rotation exposing anterior and posterior peritoneal leaves of the Callot's triangle acting as the surgeon's left hand. These clips also preventing any bile leak (Fig. 2).

Cystic duct and cystic artery were clipped separately. One difficulty with this technique is clashing of rigid instruments, but this was not considered as a significant technical problem. The gall bladder was retrieved through the working port of umbilical incision. The fascial openings and skin were closed with absorbable and non-absorbable sutures, respectively. Post-operatively, the severity of pain during the first 24 h was assessed using a visual analogue scale of 0 to 10.

Feeding was resumed as soon as tolerated. All patients were followed first at 1 week, then at the second week after surgery, then every 4 weeks for 3 months and finally after 6 months for cosmetic results.

Results

The mean age of the patients was 42 years (range 18–65-years). There were 12 males and 58 females with a male-to-female ratio of 1:4.8. There was a single stone in 27 patients and multiple stones in 43 patients. Mean operation time was 42.12 min (range 22–90 min).

There was no need of additional suture. Bleeding was minimal in 68 (97 %) patients, while two patients required conversion to open surgery in view of significant bleed from cystic artery due to adhesions. Bile spillage while passing the needle through the gall bladder occurred in four (5.7 %) patients. One additional 5-mm trocar was required in two patients with adhesions, but none was converted to four-port laparoscopic cholecystectomy.

The mean hospital stay was 1.06 days (range 1–4 days). The post-operative pain was assessed by visual analogue scale (VAS). Patients were explained that pain may be represented by a straight line which was calibrated from 0 to 10 cm,

Fig. 2 View of the suture being passed at the Hartman's pouch of GB, which was secured with metallic clips. With this, the gall bladder remains “suspended” on a length of suture, allowing its medial and lateral rotation exposing the Callot's triangle

extremes of which correspond to no pain “0” at one end and worst pain at other end “10”. Patients were assessed to rate their pain depending on the severity (Table 1). The scores were taken at 12 and 24 h post-operatively, and the mean was calculated.

About 41 (60.4 %) of the patients reported not requiring analgesics with a mild pain score, while 20 (29.4 %) of the patients required only one to two doses of oral tramadol. Those requiring open surgery have been excluded from Table 2. There were few minor complications in our patients (Table 2); however, no major complication occurred.

All patients were on liquid diet for 12 h. Patients were followed 1 week, 2 weeks, then every 4 weeks for 3 months after surgery and finally at 6 months for cosmetic result. There was no post-operative bile leak or port site hernia in any of our patients. All female patients on follow-up labelled the procedure as cosmetically better since major part of the umbilical incision was hidden in the umbilical pit. The appearance of each incision was rated on a scale of 1 (worst) to 10 (best) at the 1-month follow-up visit by patients and by an OPD nurse. The mean cosmetic score in our study was 8.5.

Discussion

The main point in reducing the number of incisions has not only been the cosmetic advantage but also lowered incision risks, morbidity of bleeding, pain, incisional hernia and cost [10, 11, 12]. We attempted SILC in 70 patients between September 2011 and September 2012 and completed it successfully in 66 patients. Patients with gross obesity and a large fatty liver were challenging and perhaps not worth the time and potential risk of this technique. The procedures were performed for elective indications ($N=70$). Conventional laparoscopic instruments as described above were used in all the patients. One additional 5-mm port had to be placed in two patients with multiple adhesions to allow the Hartmann's pouch to be grasped adequately for lateral traction. In two other patients, open cholecystectomy was required in view of significant bleeding from the cystic artery. Mean operation time in our series was 42.12 min (range 22–90 min). The mean hospital stay was 1.06 days (range 1–4 days). Almost 70 % of the patients who had elective SILC could be discharged the day after surgery. In our series, 41 (60.4 %) patients reported not requiring analgesics with a mild pain score, whereas 20 (29.4 %) patients required only one to two doses of oral tramadol. Tsimoyiannis et al. randomised 40

Table 2 Post-operative complications

Complications	No. of patients
Fever	2
Seroma (port site)	2
Hematoma	
Port site	0
Abdominal wall	1
Port site infection	3
Bile leak	0
Residual choledocolithiasis	0

patients into two groups of 20 each who underwent SILC and standard LC [9]. They observed significantly lower scores for abdominal pain in patients undergoing SILC after the first 12 h and for shoulder pain after the first 6 h. Total pain after the first 24 h was non-existent in the SILC group, and the analgesic requirements were also significantly lower. Patients were allowed to ambulate and take liquids 6–8 h after surgery, and a majority of them were discharged 24 h post-surgery. The mean hospital stay was 1.06 days (range 1–4 days). In the review by Antoniou et al. [8], SILC was unsuccessful in 9.3 % of the patients. The most common causes for failure were obscure anatomy at the Callot's triangle, inadequate exposure of the Callot's triangle due to insufficient gall bladder retraction and inability to maintain pneumoperitoneum. Conversion to open surgery was required in 0.4 % of the patients. Intraoperative complication rates ranged from 0 to 20 %, with a cumulative rate of 2.7 %. The most common intraoperative complications were gall bladder perforation/bile spillage and haemorrhage, whereas the most common post-operative complications were haematoma, bile leakage and residual choldocholithiasis. There were no post-operative or wound-related complications in 95 % of our patients. Three (4.4 %) patients reported port site infection. All the patients were uniformly pleased with the cosmetic result in their follow-up since major part of the scar was hidden in the umbilical pit (Fig. 3). There was no major morbidity or mortality in our series. Sinha in 2011 in his study on 240 patients used three conventional ports (10, 5 and 5 mm) through transversely placed umbilical incision with separate transfacial punctures. Patients were predominantly females with an average age of 37.6 years. The mean operating time was 25.8 min compared with the standard laparoscopic cholecystectomy. Injectable analgesics were required in 138 (57.5 %) patients, and

Table 1 Post-operative pain assessment ($n=68$)

No. of patients	Severity of pain	VAS score	Analgesia required
41	None/mild	0–3	Nil
20	Moderate	4–6	1–2 doses of tramadol administered orally
7	Severe	7–10	2–3 doses of tramadol administered intravenously

Fig. 3 Umbilical wound after the completion of the procedure

infection was seen in two (0.8 %) patients. They concluded that SILC performed safely with conventional instruments is feasible, easy to learn and probably the future of laparoscopic cholecystectomy [6]. Philipp et al. in 2009 conducted a pilot study in a 7-month period to describe SILC using conventional laparoscopic instruments in comparison with concurrent patients undergoing conventional multi-incision laparoscopic cholecystectomy. From 51 conventional laparoscopic cholecystectomies, 29 were attempted using SILC and 22 using conventional four-port LC. No substantial difference in complications was identified. Operative time was significantly longer in SILC cases than in conventional LC (85 vs 67 min, $p=0.01$) [7]. Our two-trocar SILC should be performed by surgeons with significant experience in laparoscopy. Like all new procedures, SILC has its own unique learning curve. The surgeon needs to learn how to navigate the instruments using a limited range of movement and develop an understanding with camera-wielding assistant. However, one should not hesitate to “convert” SILC to either standard LC by adding one or more 5-mm ports when faced with a gall bladder that is difficult to grasp, when performing cholecystectomy in an unclear anatomy or when a complication like bleeding occurs.

Conclusion

Since multichannel devices used for SILC are costly, this technique of SILC using conventional laparoscopic instruments is safe, is feasible and can be adapted as a less invasive surgical procedure in resource-limited hospitals in a selected

group of patients. Cosmetic result, reduced pain and the degree of satisfaction appear to be significant with this technique. Further studies are required before it is accepted by the surgical community worldwide.

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