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Research Article

Single-incision laparoscopic cholecystectomy: a novice technique

Vikas Singh*, Vipin Gupta, Shesh Kumar Verma

Department of Surgery, UP Rural Institute of Medical Sciences & Research, Saifai, Etawah, UP, India

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***Correspondence:**
Dr. Vikas Singh,
E-mail: drvikas_singh@yahoo.com

ABSTRACT

Background: Laparoscopic Cholecystectomy has been recognized since 1992 as the gold standard procedure for gallbladder surgery. Single-incision laparoscopic cholecystectomy (SILC) is a relatively new technique that has attracted the attention of all the laparoscopic surgeons worldwide.
Methods: The author shares his small experience of single-incision laparoscopic cholecystectomy in 80 cases as a step toward less invasive surgical procedures. The procedure was done with the conventional instruments used for laparoscopic cholecystectomy. A single intraumbilical 15-20 mm incision was given. Two ports, one 10mm and the other 5mm are introduced through the incision with a fascial bridge between them (one for 5 mm 30° laparoscope and other for 10mm right angled dissector). Two sutures placed through abdominal wall retracted the gall bladder. After Calot's triangle dissection, cystic duct and artery were clipped and divided. Cholecystectomy was completed with electrocautery and the gall bladder was retrieved through umbilical incision.
Results: The author performed SILC in 80 patients between January 2010 and December 2012 and completed it successfully. The procedures were performed for elective indications only. One additional 5-mm port had to be placed in two patients. One patient with acute cholecystitis required conversion to four-port cholecystectomy. Almost 50% patients who had elective SILC could be discharged the day after surgery. There were no postoperative or wound-related complications and all the patients were very pleased with the cosmetic outcome.
Conclusions: As per the available literature, the SILC technique is safe, feasible and reproducible. The learning curve can be steepened with experience and better results can be obtained.

Keywords: SILC, Cholecystectomy, SILS, Single incision, Trans umbilical

INTRODUCTION

Single-incision laparoscopic cholecystectomy (SILC) is perhaps the most common SILS procedure used to treat patients with gallstone disease. Navarra, et al originally described a technique using trans abdominal sutures to suspend the gallbladder during laparoscopic cholecystectomy (LC).[1] The technique did not gain much popularity and was not used for over 10 years. With recent interest in further minimization of the trauma of access by reduction in the number of ports, there is a renewed interest in the use of sutures for retraction of the gallbladder-a technique known as the "puppeteer technique". This article provides a detailed, step-by-step description of a technique of SILC using standard laparoscopic instruments and shares initial experience.

METHODS

All patients presenting with gall bladder stone disease admitted under the author's care through outdoor for elective cholecystectomy between January 2010 and December 2012. After proper workup and pre-anaesthetic check-up, patients were taken up for Single incision laparoscopic cholecystectomy (SILC). A written consent was obtained from all the patients after explaining the procedure properly. All the patients were subjected to the procedure under general anaesthesia using conventional laparoscopic instruments.

Operative technique

All the patients were given supine position for the procedure with head end elevation and left side tilt of the table as we do for standard laparoscopic cholecystectomy. Umbilicus was everted with the help of tooth forceps and towel clip. Skin was incised midway in the everted umbilicus upto the fascia keeping the incised margins within the umbilical margins. Upper and lower skin flaps were raised to expose the fascial layer underneath. Veress needle was used for initial insufflation of the abdominal cavity to 12 mm of pressure. Later, 5mm standard port (Om Surgicals) was inserted through the left side of the exposed fascia for the introduction of 5mm 30^0 telescope (Stryker) and 10mm port (Om Surgicals) on the right margin of the fascia with a fascial bridge in between them to keep the insufflation intact (Figure 1). This port would be used for working instruments and clip applicator.

We prefer to use Maryland forceps (5mm) or Right angled forceps (10mm) for dissection purpose and monopolar cautery as standard energy source. Initially, in cases of distended gall bladder, bile would be aspirated to reduce the contamination while passage of sutures through fundus and Hartman's pouch needed for manipulation. First suture (silk 2-0 on a straight needle) will be passed through the right costal margin in mid clavicular line, to hitch the fundus of the gall bladder and retract as done by the port placed in right iliac fossa in cases of standard laparoscopic cholecystectomy (SLC). The sutures will be held in position by applying an artery forceps on the skin surface. Second suture will be entered from the epigastric region and will encircle through the Hartman's pouch area to exit from the lateral subcostal region. This looped-suture will allow us to manipulate the Hartman's pouch exposing posterior and anterior area of Calot's triangle as we achieve by our right subcostal working instrument in SLC. The first assistant who stands opposite the surgeon as in SLC manipulates this suture as per need. The surgeon himself in his left hand holds the camera and the working instrument in right hand. The cable of the camera is manipulated by the first assistant for better visualization by a 30-degree scope.

The Calot's triangle is dissected to delineate cystic duct and artery separately. Cystic artery in taken care by monopolar cautery over the gall bladder surface and cystic duct is clipped with 10mm clip applicator. Gall bladder is dissected off the liver with monopolar cautery in Maryland's forceps while manipulation is done by looped-suture. Gall bladder is retrieved through 10mm umbilical port. Umbilical defect is closed with Vicryl no 1 using a special port-closure needle for meticulous closure. Skin is closed with Monocryl 3-0 subcuticular stitches. A guage piece is packed in the umbilicus while dressing to prevent seroma formation.

Figure 1: The placement of two trans umbilical ports.

Figure 2: Post-operative image after the umbilical closure.

RESULTS

The author performed SILC in 80 patients between January 2010 and December 2012 and completed it successfully. The procedures were performed for elective indications only. Conventional laparoscopic instruments as described above were used in all the patients. One additional 5-mm port had to be placed in three patients. Two patients with acute cholecystitis required conversion to four-port cholecystectomy. Difficult Gall bladder was found in 20 patients out of which dense fibrosis at Calot's in 16 patients and acute cholecystitis in 4 patients.

Almost 50% patients who had elective SILC could be discharged the day after surgery. There were no postoperative or wound-related complications and all the patients were very pleased with the cosmetic outcome.

Table 1: SILC- Epidemiology.

n=80	
Sex	20/60
Age	13-70 years
Difficult GB	20 patients

Table 2: Operative parameters.

n=80	
Operative Time	
First 20 patients	45-90 minutes
Next 60 patients	35-60 minutes
Rescue port	3 patients
Conversion to SLC	2 patients

DISCUSSION

The literature related to SILC is evolving at a rapid pace. Recently, Antoniou et al. reported a systematic review of 29 studies, including a total of 1,166 patients undergoing SILC.[2] This review presents a number of salient features of this procedure.

Patient demographics

Patients with a lower body mass index (BMI) were often considered as suitable candidates in most studies. Similarly, many studies included acute cholecystitis as exclusion criteria for offering SILC. This reflects the initial learning curve of SILC and is comparable to what was reported in the early literature pertaining to SLC.

Surgical technique

A number of different techniques were described in terms of the number, type, and diameter of the trocars, the instruments and the method of gallbladder retraction and dissection of the Calot's triangle. Many surgeons reported discomfort using roticulating instruments. Clashing of rigid instruments was not considered as a significant technical problem.

Undue reliance on technology, particularly on disposable ports and instruments, precludes the widespread application of the procedure. Our technique described here used standard instruments for all cases of SILC. At the same time, the emphasis was on emulating the key "safety" steps of SLC, viz. adequate fundal and lateral traction, demonstration of the "critical view" and secure control of the cystic artery and cystic duct.

Technical failure and morbidity

In the review by Antoniou, et al, SILC was unsuccessful in 9.3% of the patients.[2] The most common causes for failure were obscure anatomy at Calot's triangle, inadequate exposure of the Calot's triangle due to insufficient gallbladder retraction and inability to maintain pneumoperitoneum. Conversion to open surgery was required in 0.4% patients.

Intraoperative complication rates ranged from 0% to 20%, with a cumulative rate of 2.7%. The most common intraoperative complications were gallbladder perforation/bile spillage and haemorrhage, whereas the most common postoperative complications were haematoma, bile leakage, and residual choledocholithiasis.

Recently, Chiruvella et al reported an instance of combined Bismuth type III bile duct and right hepatic artery injury in a patient undergoing SILC.[3] This case underscores the fact that surgeons undertaking SILC should receive adequate training in the procedure and, at all times, have a low threshold for conversion, i.e. for placement for additional port(s) (or indeed conversion to open surgery) to safely complete the procedure.

Outcome analysis

The review indicated a lower rate of complication in studies enrolling patients with a mean age less than 45 years. The operative times were longer in studies enrolling patients with a BMI of >30 kg/m^2. Inclusion of patients with acute cholecystitis did not increase the complication rates, but the operative times tended to be longer in studies that included patients with acute cholecystitis.

The authors of the review highlighted that although a meta-analysis of about 78,747 patients undergoing SLC showed the incidence of wound infection of 1.1% and wound haematoma rate of 0.6%, the current review showed that wound complications occurred in 2.1% of the patients undergoing SILC.[4] Concerns have also been raised about the likely higher incidence of port-site hernias due to the use of multiple closely placed fascial incisions through a narrow area. Specific placement of the ports with a fascial bridge in between them is the key. Careful and secure closure of fascial defect at the umbilicus is mandatory to prevent this complication. Moreover, a long-term follow-up is required to ensure that a higher incidence of port-site hernias does not mar the short-term benefits in terms of lower pain and cosmesis after SILC.

Only two randomised trials comparing SILC with SLC have been reported in the literature so far. Lee, et al randomised 70 patients to SILC and SLC groups (35 in each group).[5] SILC was performed using Quadraport Laparoscopic Access Device (LAGIS, Taichung County, Taiwan) and the SLC was carried out using a 10-mm umbilical port for the endocamera and three 3-mm ports for instruments. Surgical pain scores, analgesic requirements, and time to return to work were similar in both groups. There was a statistically significant difference in favour of patients undergoing SILC in terms of the hospital stay, shorter wound length, and better cosmetic appearance. The SLC procedures required shorter time to perform than the SILC operations. Authors concluded that although SILC is superior to SLC in terms of cosmesis, SILC are MLC were equal in terms of postoperative pain and analgesia. Tsimoyiannis, et al randomised 40 patients into two groups of 20 each who underwent SILC and SLC.[6] They observed significantly

lower scores for abdominal pain in patients undergoing SILC after the first 12 hours and for shoulder pain after first 6 hours. Total pain after the first 24 hours was non-existent in the SILC group and the analgesic requirements were also significantly lower. As the number of patients included in this study is small, it is hard to conclusively confirm the superiority of SILC over SLC. A number of other trials comparing the two procedures are currently underway, and whether SILC is conclusively superior to SLC will become apparent once the results of these trials are published.

CONCLUSION

SILC is still a new technique in terms of its reproducibility and requires more studies to make a presence at par with SLC as an alternative to it. Our technique requires perseverance and persistence to steepen the learning curve and make it more beneficial for the common population.

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