# Single Incision laparoscopic Cholecystectomy (SILC) Using A Novel Glove Port Technique: Early Unit Experience.

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**ABSTRACT**

**Background:** Single Incision Laparoscopic Cholecystectomy (SILC) was first introduced about 2 decades ago, as an evolution of the gold standard 3-4 ports laparoscopic cholecystectomy. **Objectives**: The objective of the study was to assess the safety and feasibility of SILC using a novel Glove Port Technique. **Methodology:** This is an retrospective cohort study of SILC using a novel glove port technique, carried out at our centre from 1st September 2014 to 31st December 2016**.** Data on patients' demographic data, operative time, post-operative pain, length of stay, post-operative intervention were retrieved from patients' medical records and overall satisfaction were recorded at follow-up. **Results :** A total of 50 patients, mean age of 58.2 ± 16.5 years, underwent SILC at our centre during the study period and were included in the study. The mean operating time was 83.6 $\pm$ 39 minutes. Thirty-five patients (70%) underwent SILC without additional ports or conversion. All patients who underwent SILC had minimal blood loss of less than 50mls (only 2 patients who were converted to open cholecystectomy had blood loss of 200mls and 250mls). The mean score for postoperative pain were 3.4 ± 1.8. The length of stay was 2.8 ± 3.0 days. Only 6 cases developed post-operative complications, which resolved with treatment within 30 days. There was no mortality recorded. The mean satisfaction score at 1 month was 8.9. **Conclusion:** Although technically more challenging, SILC is a safe and feasible procedure, with good and satisfactory post-operative outcomes. However these satisfactory outcomes are only achieved currently by surgeons who are trained in advanced laparoscopic surgery.

**Keywords**: **Cholecystectomy, Gallbladder, Incision, Laparoscopy, Port**

## INTRODUCTION

Laparoscopic cholecystectomy is the gold standard in treating gallstones diseases. Evolution in surgical field had brought this procedure from conventional laparoscopic cholecystectomy (CLC) to single incision laparoscopic cholecystectomy (SILC). The first reported SILC case was by Navarra et al in 1997 using two periumbilical incisions that were later joined to remove the gallbladder. [1] Since then, specially designed curve laparoscopic instruments and single port devices such as SILS port (Single Incision Laparoscopic Surgery, Covidien), ASC Triport (Advanced Surgical Concept) and the Gel-

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POINT device (Applied Medical Resources Corp), have been introduced to facilitate surgeons in performing this operation.[2]

Our centre started performing SILC surgery in 2014. However due to the high cost of the above single port devices, our centre has adapted using SurgiSleeve (Covidien, USA) and sterile surgical gloves, as handmade port, a technique adapted from Son and coworkers who used ALEXIS wound protector (Applied Medical) as their port.[1,3]

SILC has been reported to give better patient satisfaction as well as cosmesis and lesser pain.[4,5] Even though this procedure took longer than CLC, the operation time was significantly reduced as the surgeons gained experience and confidence.[5,6]

The objective of the study was to assess our unit's early experience in performing SILC by looking at intraoperative and postoperative outcomes and patients' satisfaction at 30 days post-surgery.

## METHODS

### Patients

This is a retrospective cohort study of SILC surgery carried out at our centre from 1st September 2014 to 31st December 2016**.** Patients who had undergone SILC during this period were identified from our operation theatre records. Data on socio-demographics such as age, gender, body mass index, indication for surgery, operative time, conversion rate, intra-operative blood loss and post-operative outcomes such as pain score, re-intervention, length of hospital stay, post-operative complications and patients overall satisfaction score were retrieved from patients medical records. The latter two outcomes were assessed at 1 month follow up.

### Operative Technique

Patients were positioned in supine position with their right arm abducted and in French position. General anesthesia was used for all patients. The surgeon stands between patient's legs, the assistant to his left and scrub nurse to his right. A high definition monitor and the insufflator system (Karl-Storz HD, Karl-Stroz, Germany) were positioned to the right of the patient's right shoulder. An umbilical incision of 25-30mm through the umbilicus was made. Rectus fasciotomy was performed to enter the peritoneal cavity. SurgiSleeve® (Covidien, USA) was used to protect and retract the wound. Size 8 sterile, non-powdered glove was used as a novel multi-port access for instrumentation. (Figure 1)

Three size 5mm endoscopic caps and a 5mm flexible ports (Karl-Storz Endoscope, Karl-Stroz, Germany) were used as working channels. $CO_2$ gas insufflation was maintained at a pressure between 10-12 mmHg. Fifty centimetre 5mm Hopkins II® 30° telescope and 5mm curved laparoscopic instruments

Figure 1: Hand made Glove Port using size 8 sterile glove.

Figure 2: Special curved instruments and ultrasonic device used for SILC.

Figure 3: Post operative surgical scar.

(Karl-Storz Endoscope, Karl-Stroz, Germany) were used. SonicisionTM (48cm, Covidien, USA) was used for dissection.(Figure 2) The gallbladder was dissected in the standard manner, followed by dissection of the Calot's triangle to expose the cystic duct and artery which was then ligated using Ligamax5 ® (Ethicon, USA). The gallbladder was removed through the umbilical port. Umbilical port wound was closed with Vicryl 3/0 suture (Figure 3).

**Post-operative management**

All patients were prescribed tablet enterocoxib 90mg daily from post-operative Day 1 to maximum Day 7 as standard analgesia. If the patient had contraindication for non steroidal anti-inflammatory drugs, simple opioids capsule Tramadol 50 mg three times daily were prescribed as replacement.

**Satistical analysis**

Categorical data was presented in number and percentage. Numerical data (age, operative time and length of stay) were presented as mean (SD). Scoring of pain score was based on a visual analogue scale from 1 to 10, where 1 represents no pain and 10 represents very intense pain. For patient's satisfaction score, a similar visual analogue scale from 1 to 10 was used, with 1 representing poor satisfaction and 10 representing high satisfaction. Patient's satisfaction score were obtained at 30-day clinic follow-up.

## RESULTS

A total of 50 patients underwent SILC at our centre between 1 September 2014 to 31 December 2016. The mean age was 58.2 ± 16.5 years (range: 15 - 80 years old) The mean body mass index (BMI) recorded was 23.9 ± 2.7 (range: 19.0 – 32.1). Eleven (22%) were male and 39 (78%) were female (Table 1).

The mean operating time was 83.6 ± 39 minutes (Range 40 to 175 minutes). Mean operative time for the first 5 cases was 111 minutes but this was reduced to 69.2 minutes with the last 5 cases, as the experience increases.

Successful completion of the SILC was

**Table 1: Patient's demographics and operating data.**

| | Mean (SD) | n= 50 (%) |
|---|---|---|
| **Age (years)** | 58.2 (16.6) | |
| **Gender** | | |
| Male | | 11 (22%) |
| Female | | 39 (78%) |
| **BMI (Kg/m$^2$)** | 23.9 (2.7) | |
| **Indications** | | |
| Biliary colic | | 15 (30%) |
| Cholecystitis | | 32 (64%) |
| Gallstone pancreatitis | | 3 (6%) |

achieved in 35 patients (70%). Thirteen patients require additional port at the epigastrium to assist the dissection of the Calot's triangle. Two cases, both with Cusheiri scale grade 4, required conversion to open cholecystectomy for completion.

All patients who underwent SILC had minimal blood loss of less than 50mls (only two patients who were converted to open cholecystectomy had blood loss of 200mls and 250mls respectively). Four cases of bile or stone spillage were reported but no intraoperative major events such as bleeding, bile duct injury or bowel injury were encountered. (Table 2)

The mean score for post-operative pain were 3.4 (1.8) (range: 0 - 7) and no patients reported pain score of 10 that interrupt their daily or work activities. Only 6 cases of early post-operative complications were recorded which resolved with treatment within 30 days (Table 3). The reported complications were surgical site infection, which resolved with daily dressing and antibiotics, intra-abdominal collection requiring relaparoscopy and drainage, bile leak from cystic stump resolved with ERCP and bile duct stenting and subcapsular liver haematoma which resolved spontaneously. No mortality was recorded. Hospital length of stay was 2.8 (3.0) days.

**Table 2: Patient's demographics and operating data.**

| | Mean (SD) | n= 50 (%) |
|---|---|---|
| **Cusheiri Scale** | | |
| G1 | | 34 (68%) |
| G2 | | 14 (28%) |
| G3 | | 0 |
| G4 | | 2 (4%) |
| **Conversion** | | |
| No Conversion (SILC) | | 35 (70%) |
| Additional 1 port | | 9 (18%) |
| Additional 2 ports | | 4 (8%) |
| Open | | 2 (4%) |
| Laparotomy | | 0 |
| **Operation time (minutes)** | 83.6 (39) | |
| **Blood loss** | | |
| < 50 mls | | 48 (96%) |
| 50-100 mls | | 0 |
| > 100 mls | | 2 (4%) |
| **Intraoperative Complications** | | |
| No complication | | 46 (92%) |
| Bile/stone spillage | | 4 (8%) |
| Bleeding | | 0 |
| Bowel injury | | 0 |
| Bile duct injury | | 0 |

**Table 3: Post-operative and 30-days-outcome.**

| | Mean (SD) | n= 50 (%) |
|---|---|---|
| **Pain score** | 3.4 (1.8) | |
| **Pain duration (days**) | 2.9 (2.1) | |
| **Length of Stay (days)** | 2.8 (3.0) | |
| **Post-operative complications** | | |
| Surgical site infection | | 2 (4%) |
| Intra-abdominal Collection | | 1 (2%) |
| Bile leak | | 1 (2%) |
| Subcapsular liver haematoma | | 1 (2%) |
| Incisional hernia | | 1 (2%) |
| **Intervention required** | | |
| Re imaging | | 3 (6%) |
| Antibiotic (post-operative for 1 week) | | 4 (8%) |
| ERCP and biliary stenting | | 1 (2%) |
| Relaparascopy and lavage | | 1(2%) |
| Incisional hernia repair (primary closure) | | 1 (2%) |
| **Overall satisfaction at Day30** | 8.9 (1.1) | |

Mean patients satisfactory score at follow up at 4 was 8.9 (1.1) (Table 3: range 7 - 10). One patient had incisional hernia at 1-month follow up due to the suture cutting through the rectus sheath from excessive cough. The patient had immediate hernia repair and primary closure without further long term complication.

## DISCUSSIONS

CLC has been the gold standard for managing gallstones diseases since the 1980s, completely replacing open cholecystectomy. However, CLC requires at least 3 to 4 ports for instrumentation and dissection. Thus the next stage of evolution of CLC is the reduction of the number of ports required and Navarra et al in 1997 first reported SILC using two periumbilical incisions that were later joined as a single incision to remove the gallbladder.[1] Since then, interest in SILC surgery has increased tremendously and its evolution has been driven by industry with the development of single port devices, curve articulating instruments and specialized laparoscopic cameras. Innovative surgeons contribute further to the refinement of SILC technique. Surgeons like Mohamed Masry from Egypt used multiple hooks to elevate the gallbladder to facilitate dissection via Marionette technique.[7] Young Rok Choi and coworkers from Korea developed SILC without camera operator where the surgeons control the camera using flexible 90 degrees scope.[8] A meta analysis comparing SILC and CLC of 25 randomized controlled trials conducted in 2013 reported that SILC is superior to CLC in term of better cosmetic results and less post-operative pain but however inferior in term of operative time.[9]

SILC is commonly conducted in an inverse triangulation technique with the operator hands working in opposite direction; the right hand is used to control laparoscopic forceps to hold the gallbladder while the left hand controls instrument used for dissection.[2] Our technique differs in that we used a non-inverse triangulation technique with the multi-access port created using a sterile glove. Our novel technique of using a sterile glove for multi-access ports has the additional benefit of reducing cost by cutting down on the use of costly single port access devices.

Using our technique, we successfully completed 70% of SILC without any conversion or additional ports. Only 13 patients require additional ports at the epigastrium to facilitate the dissection of the Calot's triangle. In our series, only 2 patients underwent conversion to open cholecystectomy but this was in the early part of our centre learning curve. However, no patient requires conversion to laparotomy. Our centre's conversion rate using this novel technique was only 4% which is acceptably low. Among the reason for additional ports and conversion were hostile Calot's triangle by evidence of higher Cuschieri score, and anatomically redundant segment 4 of the liver obstructing the telescopic view. The two cases of convertion to open cholecystectomy had grade 4 Cuschieri scale.

Unlike CLC where there are abundant of well-established technical skills training workshops or programmes, there are currently none that are specific for SILC. To establish a SILC unit, surgeons need to purchase a whole new set of curve instruments. Abdelrahman et al in his study to evaluate stress and workload for those performing SILC mentioned that SILC was associated with significantly more awkward manipulations and more technical difficulty in performing the fine and precise movements when compared to CLC.[10] Other factors such as instruments collisions, narrow and confine external surgical work space for both surgeon hands and instruments and the limited range of motion add to the complexity of the procedure.[10] Currently SILC is almost exclusively performed by highly

skilled laparoscopic surgeons. A review of SILC operative experience recommends 10 to 19 cases to be conducted by a trained laparoscopic fellowship in order to be certified competent in performing SILC. [11,12]

## STUDY LIMITATION

Our study has several limitations, the first and foremost is that this is a retrospective cohort study which can be affected by missing data or patient's medical records. Secondly is the small sample size of 50 cases but this study is reporting on our centre's early experience in conducting SILC surgery. Furthermore, learning curve may affect some of the outcome measures particularly operative time, blood lost and post-operative complications. However despite these limitations, we were able to show that SILC can be performed safely and with good outcome results.

## CONCLUSIONS

SILC is technically more challenging compared to CLC. It is a safe and feasible procedure and has high patient's satisfaction, better cosmesis and low post-operative pain score. Reasonable success rate and reduction of operation time can be reached after an average of one year or ten cases performed. We recommend that SILC must be performed by expert surgeons who have previous training in advanced laparoscopy.

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