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SINGLE-INCISION LAPROSCOPIC CHOLECYSTECTOMY A COMPARISSION OF POST OPERATIVE PAIN AFTER CHOLECYSTECTOMY: CONVENTIONAL VERSUS SILS

General Surgery

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ABSTRACT

Single incision laparoscopic surgery in suitable cases is preferred today because it results in less postoperative pain, a more rapid recovery period, more comfort, and a better cosmetic appearance from smaller incisions. This study aims to present our experiences with single incision laparoscopic cholecystectomy to evaluate the safety and feasibility of this procedure.

This study also undertaken to compare the postoperative pain after cholecystectomy done by single-incision laparoscopic surgery (SILS) versus conventional four-port laparoscopy [conventional laparoscopic surgery (CLS)]. SILS is a feasible and a promising method for cholecystectomy. It is possible to do this procedure without the use of special equipments. While there are cosmetic advantages to SILS, it is not clear whether or not the pain is also reduced.

KEYWORDS

Laproscopy, Single Insicion, Cholecystectomy

Fig.1. Single Scope With Multiple Port

INTRODUCTION

With the development of minimal invasive surgical techniques, surgeons are now focused on achieving cosmetic result and reducing surgical trauma. Today laparoscopy surgery is preferred because is reduce post-operative pain, post-operative complications, hospital stay and better cosmetic appearance Novel methods are currently being attempted to further develop the well-known advantages of this procedure so that the incision size and the number of trocars can be reduced.

Single-incision laparoscopic cholecystectomy (SILC) is perhaps the most common SILS procedure used to treat patients with gallstone disease. There are three approaches to SILC: (a) one that uses special, purpose-made access devices or ports for introducing the laparoscope and instruments which are usually, but not always, reticulating ones; (b) passing three 5-mm trocars side-by-side through the fascia after exposing a wide area via a single umbilical incision; and (c) using two trocars at the umbilicus along with suspension sutures to retract the gallbladder. Navarra ***et al***. originally described a technique using transabdominal 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.

SILS has also shown to have reduced postoperative pain as compared to four-port cholecystectomy in a recent randomised study. We performed SILS cholecystectomy using only conventional laparoscopic instruments. The study compared the postoperative pain scores in patients undergoing SILS and conventional laparoscopic cholecystectomy.

PATIENT SELECTION

INDICATION:

All indication same as multi-port laparoscopic cholecystectomy

CONTRAINDICATION:

- Obese individual
- Acute cholecystitis
- Shrunken gall bladder
- Cardio-respiratory reserve patient

INSTRUMENTS AND EQUIPMENTS

Our technique of SILC utilizes conventional laparoscopic instruments and equipment. The only equipment that is different from that available in most hospitals undertaking laparoscopic surgery is a 5-mm, 30°, 51-cm long bronchoscope, that we use as the laparoscope. Use of a long laparoscope moves the hand of the camera person about 8-10 inches away from the abdominal wall, thus reducing the crowding. The endocamera and the light source should be of the highest quality, and we prefer the Image-1 high-definition (HD) camera along with an HD screen and a 300W Xenon light source. A sharp image that allows clear distinction between tissue planes and tissue textures is essential for safe dissection. We prefer a short 5-mm, low-profile port in the ancillary position. This is either a plastic port or a short metal port designed for thoracoscopy. The absence of a side gas-channel on the latter poses a handicap in that the diathermy smoke generated cannot be released easily. The smoke is vented intermittently during exchange of instruments.

SURGICAL TECHNIQUES

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 (barring the long laparoscope) for all cases of SILC. At the same time, the emphasis was on emulating the key "safety" steps of MLC, viz. adequate fundal and lateral traction, demonstration of the "critical view" and secure control of the cystic artery and cystic duct.

- **Patient's Position**

Single-incision laparoscopic cholecystectomy (SILC) is a relatively new technique that is being increasingly used by surgeons around

the world. Unlike the multi-port cholecystectomy, a standardised technique and detailed description of the operative steps of SILC is lacking in the literature. This article provides a stepwise account of the technique of SILC aimed at surgeons wishing to learn the procedure. A brief review of the current literature on SILC follows.

- **Surgeon's And Team Position**

The surgeon stands on the left side of the patient, with the assistant opposite him during the placement of the first port. For rest of the procedure, the surgeon stands between the legs and the camera person stands to his right (near the left leg of the patient) [Figure 2]. The television trolley is placed above the patient's right arm. The diathermy pedal is placed near the surgeon's left foot and all tubes and cables are fixed such that they do not interfere with the camera person.

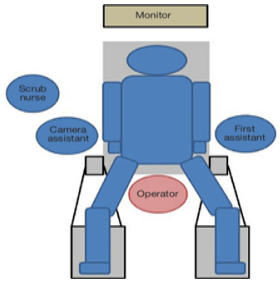

Fig.2. Position Of Patient, Operating Surgeon And Team And Laparoscopic Unit.

- **PORT'S PLACEMENT**

Our preference is for a transumbilical horizontal incision. The umbilicus is everted and held with two-toothed forceps in a cephalad and caudad position prior to making an incision of length 1.5-2 cm. This is deepened through the fat and the flaps are undermined to expose the fascia over a distance of 2-2.5 cm. The left edge of the skin incision is retracted and a fascial stab incision is made. A Verres needle is introduced through this incision and after confirmation of its intraperitoneal position, CO2 pneumoperitoneum is induced and maintained at 12 mm Hg. A 10-mm sharp-tipped port is placed in the peritoneal cavity after extending the fascial incision slightly. The preliminary step is a careful diagnostic laparoscopy. Particular attention is paid to the area around the umbilicus to exclude unsuspected omental or bowel adhesions. The right edge of the skin incision is then retracted, a stab incision made on the fascia and a low-profile 5-mm port is introduced [Figure 3]. Thus, the two ports are separated by a fascial bridge of about 5 mm, allowing the operating port to move without collision with the optic port. At this stage, the patient's position is changed to an anti-Trendlenberg one with a left-sided tilt. Exaggerated tilts than those used in MLC may be required to obtain satisfactory exposure of the Calot's triangle.

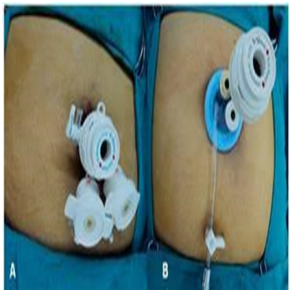

Fig.3. Port Placement

- **Traction Suture**

This forms the key step of the SILC. Use of the "puppeteer" technique using traction sutures has been described previously.[2] At the beginning of the procedure, a grasper or a dissector is used to move the omentum away from the right upper quadrant so as to obtain a view of the fundus of the gallbladder. Flimsy omental adhesions, if present, may be teased off at this stage.

We use a strand of 1-0 monofilament nylon on a 60-mm straight needle for placing the traction sutures. The needle is introduced laterally through one of the intercostal spaces above the level of the costal margin. A laparoscopic needle holder brings the needle into the peritoneal cavity and places it on the omentum. The needle is then regrasped at its midpoint, a bite of the fundus of the gallbladder is taken and the needle is driven out through the same intercostal space. The needle is retrieved using an open needle holder, and the suture is pulled out leaving two ends of 5-6 cm. The suture is divided and a haemostat is applied to both ends close to the skin, resulting in elevation of the gallbladder fundus. In our experience, if both passes of the sharp, straight needle through the intercostal space are at right angles to the chest wall, then pneumothorax does not occur. If the omental adhesions to the fundus are dense, they can be easily dissected at this stage once a strong counter-traction on the fundus is obtained.

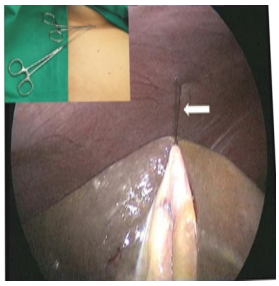

Fig.4. Use Of Traction Suture

The second traction suture placed on the Hartmann's pouch area as close to its junction with the cystic duct as possible. The 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 pouch. The needle is retrieved and a second pass is made to form a loop on the gallbladder. The needle and the suture are then passed through the loop and pulled. This locks the loop on the gallbladder. The needle exits the abdominal wall laterally [Figure 5]. Hemostats are placed on both ends of the suture. The gallbladder is now "suspended" on a length of suture, allowing its medial and lateral rotation in a manner identical to that during a multi-port cholecystectomy. The surgeon is thus able to carry out a two-handed dissection.

- **CALOTS TRIANGLE DISECTION**

The posterior peritoneum is divided to free the Hartmann's pouch. This is followed by further dissection of the anterior and posterior peritoneal leaves overlying the Calot's triangle with the help of a hook and/or a Maryland dissector. The cystic artery and the cystic duct are skletonised - the endpoint of this dissection is obtaining a "critical view"[fig.5]. Several aspects that add to the safety of this dissection merit highlighting. First, the insulation of operating instruments used in conjunction with diathermy must be scrupulously checked, as the trajectory of the instrument is such that the shaft may inadvertently come in contact with a loop of bowel outside the operative field. Second, the telescope must be withdrawn to observe the entry and exit of the operating instruments that travel parallel and close to bowel. Most importantly, the surgeon should not hesitate to "convert" the SILC to a LC by adding one or more 5-mm ports when faced with a gallbladder difficult to grasp, an unclear anatomy or a complication such as bleeding.

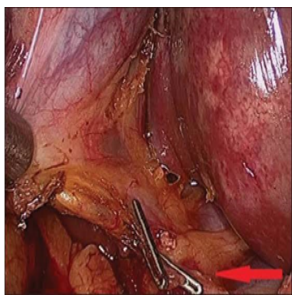

Fig.5. Calot's Triangle Dissection With Cystic Artery And Cystic Duct.

- **The Cystic Artery**

The two windows in the Calot's triangle are dissected more widely than during an LC so as to safely observe the tips of the instruments controlling the artery and the duct. We prefer to clip the cystic artery with a 5- or 10-mm reusable clip applicator. When the latter is used,

the telescope is temporarily shifted to the 5-mm port. Subsequently, the cystic artery is divided.

- **Control Of The Cystic Duct**

If the cystic duct appears narrow, it is clipped thrice with 10-mm clips and divided. If the duct appears wide, we prefer to pass a No 1 polyglactin suture around it, exteriorise the same and fashion an extracorporeal Melzer's knot. This knot is then snugged down onto the cystic duct with the help of a metal knot-pusher. The duct is divided between two extracorporeally tied ligatures. If there is a suspicion of an impacted stone in the cystic duct, it is controlled on the gallbladder side, divided partially to allow the stone to be milked out , and then the stump is ligated using extracorporeal knotting. A 10-mm port is convenient for introducing a spoon forceps for the retrieval of stones from cystic duct or those that may spill from the gallbladder if it is perforated during dissection. The divided ends of the cystic artery and duct are carefully inspected to confirm their secure closure.

- **Dissection Of The Gallbladder**

Alternating medial and lateral rotation of the gallbladder using the ends of the suture placed on Hartmann's pouch allows dissection of the gallbladder from the liver bed using a diathermy hook. Prior to the final detachment of the gallbladder, meticulous haemostasis in the liver bed is confirmed and the subhepatic space lavaged with saline. The fundal traction suture is loosened and the gallbladder is freed from the liver

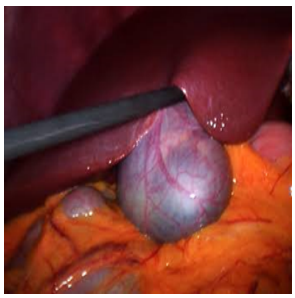

Fig.6 Gall Bladder

- **Specimen Extraction**

We prefer to use a sterile, inexpensive plastic pouch that is turned inside out. The pouch is rolled up, introduced in the abdomen through the 10-mm port and opened on the superior surface of the liver. The mouth of the everted bag stays open and aids in the one-handed introduction of the Fig.7 gall bladder extraction specimen into it . With the telescope in the 5-mm port, the pouch is grasped with a heavy grasper and pulled into the trocar. The pneumoperitoneum is deflated and mouth of the pouch is pulled out of the fascial incision. If necessary, the fascial incision may be extended or the two fascial incisions joined to facilitate extraction of the specimen

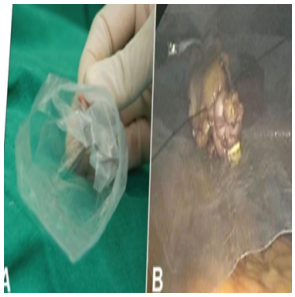

Fig.7. Specimen Extraction

- **Closure Of The Incision**

Careful closure of the fascial incision is mandatory to prevent formation of port-site hernia. The edges of the fascial incision are identified, grasped and elevated using fine Kocher's forceps. We prefer to close the fascia using two or more figure-of-eight sutures of a nonabsorbable suture material such as no 1 or 1-0 polypropylene. The fascia and the skin are infiltrated with a local anaesthetic and the skin is approximated with a running subcuticular suture [fig.8].

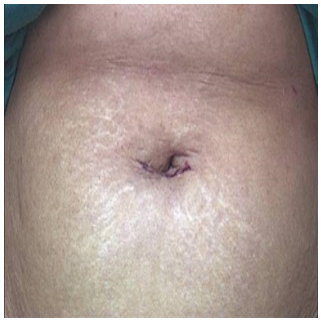

Fig.8 Closure Of Single Insicion Laproscopic Cholecystectomy

- **Post-operative Course**

The postoperative care is identical to that of patients undergoing a MLC. Intravenous analgesics and anti-emetics are administered for the duration of hospital stay. Patients are allowed to ambulate and take liquids within 6-8 hours of surgery and discharged within 24-48 hours. Oral analgesics are prescribed at discharge, but in our experience, most patients do not require analgesics beyond the second postoperative day.

REVIEW OF THE LITERATURE

SILC is a relatively new technique and despite the enthusiasm of surgeons around the world for its application, data that can prove its superiority over the conventional multi-port cholecystectomy are scant. However, 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.[3] This review presents a number of salient features of this procedure.

TECHNICAL FAILURE AND MORBIDITY

In the review by Antoniou et al.,[3] SILC was unsuccessful in 9.3% of the patients. 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 hemorrhage, whereas the most common postoperative complications were hematoma, bile leakage, and residual choldocholithiasis.

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 MLC showed the incidence of wound infection of 1.1% and wound haematoma rate of 0.6%,[5] the current review showed that wound complications occurred in 2.1% of the patients undergoing SILC. 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. A “Swiss-cheese” configuration of 5-mm fascial defects and pressure necrosis of the tissues due to placement of tight-fitting access devices are factors to be considered. 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 MLC have been reported in the literature so far. Lee et al.[6] randomised 70 patients to SILC and MLC groups (35 in each group). SILC was performed using Quadraport Laparoscopic Access Device (LAGIS, Taichung County, Taiwan) and the MLC 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 MLC procedures required shorter time to perform than the SILC operations. Authors concluded that although SILC is superior to MLC 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 MLC.[] 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 MLC. A number of other trials comparing the two procedures are currently underway, and whether SILC is conclusively superior to MLC will become apparent once the results of these trials are published.

RESULTS

A hundred patients undergoing cholecystectomy were included in the study and they were divided into two groups having 50 patients in each group. Group A comprised patients undergoing CLS and group B comprised those undergoing SILS. The groups were well matched for age and sex distribution as well as the body mass index (BMI)

Table1. Demographic Data Of Patient Under Going Conventional And Single Incision Laparoscopic Surgery.

	Cls(n=50)	SILS(N=50)
Age	38.5	36.5
Sex(m:f)	28:22	26:24
Bmi	26.6	27.2

Cls=Conventional Laparoscopic Surgery,
Sils= Single Incision Laparoscopic Surgery
Bmi= Body Mass Index

The pain scores in both the groups were tabulated (Table2.) The mean pain score was lower in the SILS group (2.62) as compared to the CLS group (2.78) but the difference did not reach statistical significance. The operative time (OT) was found to be significantly higher in the SILS group as compared to the CLS group (Table3.) The mean OT in the CLS group was 28.08 ± 1.35 minutes while in the SILS group it was 66.76 ± 5.78 minutes. The mean OT in the first 50 cases of SILS (79.2 minutes) was significantly higher than that in the second 50 cases (54.32 minutes).

On comparing the pain scores of the first 50 cases of SILS with the second 50 cases and the CLS group, we found that the second half of the SILS group had a significantly lower mean pain score (2.58) as compared to the first half (2.84). This group also had a lower pain score compared to the conventional laparoscopy group (2.78). Once again, the differences were not statically significant

Table 2. Mean Post Operative Pain Score In Two Group Of Patient

	Numberofpatients	Vasscore
GroupA(cls)	50	2.78
GroupB(sils)	50	2.62
Firsthalfofgroupb	25	2.84
Secondhalfofgroupb	25	2.58

Table 3. Mean Operative Time In Different Group

	Number of the patient	Opetative time
GroupA(cls)	50	28.8
GroupB(sils)	50	66.76
First half of groupb	25	79.2
Second half of groupb	25	5432

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