Single Port Versus Multiple Port Laparoscopic Cholecystectomy—A Comparative Study

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Abstract Single port laparoscopic cholecystectomy (SPLC) was introduced to minimize postoperative morbidity and improve cosmesis. We performed a comparative study to assess feasibility, safety and perceived benefits of SPLC. Two groups of patients (104 each) with comparable demographic characteristics were selected for SPLC and multiport laparoscopic cholecystectomy (MPLC) between May 2010 to March 2011. SPLC was performed using X cone® with 5 mm extra long telescope and 3 ports for hand instruments. MPLC was performed with traditional 4 port technique. A large window was always created during dissection to obtain the critical view of safety. Data collection was prospective. The primary end points were postoperative pain and surgical complications. Secondary end points were patient assessed cosmesis and satisfaction scores and operating time. The mean VAS scores for pain in SPLC group were higher on day 0 (SPLC 3.37 versus MPLC 2.72, $p=0.03$) and equivalent to MPLC group on day 1 (SPLC 1.90 versus MPLC 1.79, $p=0.06$). Number of patients requiring analgesia for breakthrough pain (SPLC 21.1 % versus MPLC 26.9 %, $p=0.31$) was similar. Number and nature of surgical complications was similar (SPLC 17.3 % versus MPLC 21.2 %, $p=0.59$). Mean patient assessed cosmesis scores (SPLC 7.96 versus MPLC 7.16, $p=0.003$) and mean patient satisfaction scores (SPLC 8.66 versus MPLC 8.16, $p=0.004$) were higher in SPLC group indicating better cosmesis and greater patient satisfaction.

SPLC took longer to perform (61 min versus 26 min, $p=0.00$). Conversion was required in 5 patients in SPLC group. SPLC appears to be feasible and safe with cosmetic benefits in selected patients. However, challenges remain to improve operative ergonomics. SPLC needs to be proven efficacious with a high safety profile to be accepted as standard laparoscopic technique.

Keywords Single port laparoscopic cholecystectomy · Single incision laparoscopic surgery · X cone® · Patient assessed cosmesis · Patient satisfaction scores · Learning curve

Introduction

Today, laparoscopic cholecystectomy is the gold standard in the management of symptomatic gallbladder stones. The benefits conferred by minimal access surgery (MAS) include reduced postoperative pain, decreased hospital stay, less scarring, and fewer incisions [1]. In the quest for making MAS more-patient friendly in terms of fewer complications and better cosmesis, single-port laparoscopic cholecystectomy (SPLC) has emerged as a novel technique.

Having initially met with skepticism and uncertainty, traditional multiport laparoscopic cholecystectomy (MPLC) eventually has emerged as the most widely performed laparoscopic procedure. We are again at crossroads where surgeons are re-examining a gold standard procedure in the face of a surgical innovation. For any new technique to be adopted, it has to offer the safety and feasibility of the previously available techniques as well as has the potential to confer further benefits. To examine the feasibility, safety, and perceived benefits of SPLC, we conducted a prospective and comparative cohort study between two groups of patients who underwent SPLC and MPLC.

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Materials and Methods

We have been providing a wide spectrum of minimal access surgical services in a tertiary care referral center at a multi-specialty hospital for close to two decades. We performed SPLC in 104 selected patients between May 2010 and March 2011. We selected a group of 104 patients with comparable demographic characteristics who underwent MPLC during the same period for comparison (Table 1). An informed consent was taken from all patients before enrollment in the study. Patients between 16 and 80 years of age with uncomplicated cholelithiasis and ASA (American society of Anesthesiologists) grades I and II were included in the study. Laparoscopic cholecystectomy in both techniques was performed with a standardized operating protocol which included posterior dissection first and creation of a large window to obtain the critical view of safety. MPLC was performed by five consultants and senior fellows in training at the institute. SPLC was performed by three of five consultants. All consultants were vastly experienced, with an individual experience of over 500 laparoscopic cholecystectomies.

Patients with acute cholecystitis, choledocholithiasis, empyema, complications like perforation, cholecystoenteric fistula, and gallstone more than 2.5 cm in size on USG, and BMI >35 were excluded from the study. The final protocol was approved by the ethics committee of the hospital. Data for the study were prospectively collected and recorded on Microsoft Excel® worksheet.

Surgical Procedure

SPLC was performed by the single-incision, single-port technique using X-Cone® (Karl Storz, Tuttlingen, Germany). X-Cone is a reusable single-port device that allows insertion of three hand instruments and an optic through the same port. Surgical access was obtained through a periumbilical incision from 12 o'clock to 6 o'clock position on the left side. Pneumoperitoneum was created with a Veress needle up to an abdominal pressure of 15 mmHg. A 10 mm standard laparoscopy port was inserted, and a diagnostic laparoscopy was performed to confirm feasibility of performing SPLC. The 10 mm port was removed, the

margins of fascial defect held with Allis forceps and the fascial incision extended to about 2 cm. Stay sutures were taken on either fascial margin to facilitate proper closure of the fascial defect at the end of surgery. X-Cone was inserted and ports were utilized as shown in Fig. 1. The posterior peritoneum over the gallbladder was incised and posterior dissection was performed to identify the cystic duct and artery. A large window was always created to obtain the critical view of safety (Fig. 2). The cystic duct and artery were clipped with traditional 10 mm clip applicators used in MPLC (Ethicon Endosurgery, USA). A monopolar diathermy dissection was performed to remove the gallbladder from its bed. The gallbladder was extracted through the same incision. The fascial incision was identified and meticulously closed with Vicryl sutures. The skin was closed with a subcuticular Ethilon suture. Multiple port laparoscopic cholecystectomy (MPLC) was performed using the traditional four-port technique.

The following data of all the patients were prospectively collected and maintained in a database: age, gender, weight, height, BMI, operative indication, surgical approach (SPLC or MPLC), operative time, intra- and postoperative complications, length of hospital stay, pain assessment scores, patient-assessed cosmesis scores, and patient satisfaction scores. Primary and secondary end points of the study were identified and compared between the two groups. Postoperative pain and surgical complications were defined as primary end points. The secondary end points were patient-assessed cosmesis scores, patient satisfaction scores, and operating time. Post operative pain was assessed by using visual analog scale (VAS) score on day 0 (at 6 h postoperatively) and postoperative day 1 (at 24 h postoperatively) of surgery and by the number of doses of analgesics administered for breakthrough pain. As a routine pain management protocol, all patients received injection paracetamol 1 g and

Fig. 1 X-Cone® showing arrangement of hand instruments and telescope. A, X-Cone; B, surgeon's left-hand instrument (Hartmann's pouch retractor); C, surgeon's right-hand instrument (Maryland dissector); D, gallbladder fundus retractor; E, 5 mm 30° extra long telescope with inline light cord adaptor.

Table 1 Patient demographics in SPLC and MPLC groups

Patient Factors	SPLC	MPLC
Age (years)	37.7±11.1	49.6±12.2
Sex (M/F)	18/36	42/62
BMI	24.3±8.5	26.2±7.4

Values expressed as mean±standard deviation

Fig. 2 SPLC critical view of safety

diclofenac 75 mg alternately every 6 h for the first 24 h after surgery. The patients who required analgesia for breakthrough pain were administered injection tramadol 50/100 mg. VAS is a means of measuring subjective characteristics or attributes that cannot be directly measured. We used the VAS score in the form of questionnaires handed over to patients for scoring pain, cosmesis, and overall satisfaction with the surgical procedure. Cosmesis was assessed in patients at their first follow-up when dressing was removed on postoperative day 7 (Fig. 3). Patients in both groups were shown the same photograph of an abdomen with a surgical scar of open cholecystectomy (Kocher incision). This scar was rated 0 on the VAS scale. Patients were asked to rate cosmesis assessment of their own surgical scar (0–10) on a VAS scoring chart after comparing their postoperative scar to the scar on the photograph. The scale was calibrated from 0 to 10, 10 being the highest and 0 the lowest score for a given attribute. Complications were recorded as intraoperative and postoperative. Patient satisfaction scores were also determined using the VAS score on postoperative day 7.

Fig. 3 SPLC scar on postoperative day 7

Statistics

Data were presented in mean, median, standard deviation (SD) for continuous variables and frequencies or percentages for categorical variables. Statistical analysis was performed using the STATA software package, version 9.0. Categorical variables were analyzed using chi-square, and continuous variables were analyzed using Mann–Whitney *U* test (Wilcoxon rank test). A *P* value of less than 0.05 was considered significant.

Results

SPLC was performed in 104 selected patients between May 2010 and March 2011. Another group of 104 patients with comparable demographic characteristics who underwent traditional MPLC during the same period was selected for comparison (Table 2). In the SPLC group, conversion was required in 5 of 104 patients. Four patients required conversion to MPLC and 1 patient required one additional rescue port. In 3 patients, conversion was performed after diagnostic laparoscopy (pericholecystic adhesion in 2 patients and tense distended gallbladder in 1 patient). In 1 patient conversion to MPLC was required for a suspected bile duct injury. Another patient required an additional 5 mm rescue port in the right flank due to uncontrolled hemorrhage from the cystic artery. Analgesia for breakthrough pain was required in 22 of 104 patients (21.15 %) in the SPLC group and 28 of 104 patients (26.92 %) in the MPLC group (Fig. 4). There was no significant difference in the number of patients receiving extra doses of analgesics for breakthrough pain in the two groups ($P=0.317$).

The VAS scores for pain on day 0 in the SPLC and MPLC groups were 3.37 (0–9) and 2.72 (0–6), respectively ($P=0.03$). The VAS scores for pain on day 1 in the SPLC and MPLC groups were 1.90 (0–6) and 1.79 (0–8), respectively ($P=0.06$).

Surgical complications were experienced by 18 patients (17.3 %) in the SPLC group and by 22 patients (21.2 %) in the MPLC group ($P=0.59$). Complications were categorized as intraoperative and postoperative and analyzed separately in both the groups (Figs. 5 and 6). The most common complications in the SPLC group were omental laceration (4 patients) and shoulder pain (4 patients). In the MPLC group, rupture of gallbladder (6 patients) and shoulder pain (6 patients) were the most common complications. The mean VAS score for cosmesis was higher in the SPLC group—SPLC 7.96 (4–10), MPLC 7.16 (2–10), $P=0.003$ —thereby indicating that patients in the SPLC group were more satisfied with their cosmetic results. Patient satisfaction scores were also higher in the SPLC group—SPLC 8.667 (6–10), MPLC 8.06 (2–10), $P=0.004$. This suggested

Table 2 Statistical values of primary and secondary end points in SPLC and MPLC groups

Variables	SPLC (n=104 pts)	MPLC (n=104 pts)	p value
Pain scores Day 0	3.37±1.91	2.72±2.06	0.03 ^a
Pain scores Day 1	1.90±1.41	1.76±1.99	0.06
Pts requiring analgesia for break through pain	22/104 (21.15 %)	28/104 (26.92 %)	0.33
Surgical complications	18/104 (17.3 %)	22/104 (21.2 %)	0.59
Cosmesis scores	7.96±1.61	7.16±1.93	0.004 ^a
Pt satisfaction scores	8.66±1.17	8.06±1.53	0.003 ^a
Duration of surgery	68.70±18.39	29.04±5.76	0.000 ^a

Values expressed as mean±standard deviation

^aStatistically significant

that patients in the SPLC group were more satisfied with the surgery compared to those in the MPLC group. The mean duration of hospital stay was similar in both groups (2.1 days in both groups). The mean operating time was significantly higher in the SPLC group—SPLC 61 min (40–120 min), MPLC 26 min (15–40 min), $P=0.000$. In the SPLC group, the mean operating time of first 20 patients and remaining 84 patients was 89 and 54 min, respectively ($P=0.000$) (Figs. 7 and 8).

Discussion

Single-incision laparoscopic surgery (SILS) is among the most recent innovations in the field of MAS. The synergy between medical industry, technology, and surgical expertise is driving efforts to devise more patient-friendly approaches to surgery. The rationale of SILS is to reduce surgical trauma of access and provide scarless surgery as the wound of access is most often concealed within the natural umbilical scar.

These include single-incision single-port surgery, single-incision multiport surgery, and single-incision direct access surgery. The history of SILS dates back to 1997, when Navarra et al. [2] described the transumbilical technique

for cholecystectomy without the use of additional incisions. This was further described by Piskun and Rajpal [3]. This was further refined and popularized by Castellucci et al. [4] and Podolsky et al. [5] and published subsequently with their original technique of entry. In their techniques, a skin incision was made at the umbilicus, allowing a flap at the umbilicus to be raised. Further, three to four separate sheath incisions were made 2–3 cm apart in the classical “Mickey Mouse” configuration allowing insertion of three to four trocars.

The next advancement in SILS was the use of a single-access device. This technique involved the use of a singular access device that allowed introduction of three to four instruments through the device using a single opening in the umbilicus. The initial favorable reports with use of these devices paved way for a wide range of access devices entering the market [6]. These latest devices allow the surgeon to insert more than two instruments and an optic with or without trocars, through the same port [7–10]. The articulating instruments or prebent instruments used through these access devices give a sense of triangulation [11, 12].

These ports were inserted through an incision measuring anywhere between 17 and 50 mm depending on the port and organ to be accessed/removed.

Fig. 4 Patients requiring analgesia for breakthrough pain

Fig. 5 Intraoperative complications

In our study, the primary outcome measures were postoperative pain and surgical complications. The postoperative pain in the SPLC and MPLC groups was compared using VAS scores and the number of patients (and doses) requiring analgesia for breakthrough pain. Analysis of these two parameters in both groups revealed more pain in the SPLC group on the day of surgery. However, there was no difference in postoperative pain between the two groups on post operative day 1. A randomized trial comparing SPLC with MPLC showed that SPLC and MPLC were similar in terms of postoperative pain and requirement for analgesia [13]. Another study comparing SPLC and MPLC showed that patients in the SPLC group experienced less postoperative pain than those in the MPLC group. The difference was however not statistically significant [14].

Surgical complications were similar in both groups in terms of frequency and nature of complications. This indicates that SPLC is a safe procedure in the hands of experienced

surgeons. However, in our study, patients were carefully selected to ensure that difficult cholecystectomies were excluded. A systematic review of 29 studies, including a total of 1,166 patients undergoing SILC, reported intraoperative complication rates up to 20 % with a cumulative rate of 2.7 % [15]. The most common complications reported were gallbladder perforation/bile slippage, hematoma, bile leakage, and residual choledocholithiasis. In our study, 5 of 104 patients in the SPLC group required conversion. The advantage of SPLC is that conversion is always possible and can be readily performed. Conversion may be to traditional MPLC (4/104 patients) or an additional rescue port (1/104 patients) may be used.

The secondary outcome measures in our study were patient-assessed cosmesis scores, patient satisfaction scores, and operating time. Patient-assessed cosmesis scores were higher in the SPLC group. This indicates that patients in the SPLC group were more satisfied with their cosmetic results.

Fig. 6 Postoperative complications

Fig. 7 Duration of surgery

A randomized trial comparing SPLC with MPLC showed that SPLC was superior to MPLC in terms of cosmesis [13]. Patient satisfaction scores were also higher in the SPLC group, thereby suggesting that patients in the SPLC group were more satisfied with the overall results of the procedure. In our study, on the basis of patients' own assessment, it is found that SPLC offers the advantages of better cosmesis and more patient satisfaction.

Most single-port surgery entails a fascial incision of at least 2.5 cm. Moreover, there is a continuous stretching effect on the access wound due to the nature of the design of the X-Cone. The umbilicus is an inherently anatomically weak area. It follows that an incision around the umbilical cicatrix would be prone to development of incisional hernia in the postoperative period. A careful and meticulous closure of the fascial defect is mandatory [16].

The operating time was significantly higher in the SPLC group. As number of patients undergoing SPLC increased, there was a significant reduction in the operating time. In our experience, operating time significantly reduced after

first 20 SPLC procedures. This corroborates with the reported "learning curve" in literature. A study on SPLC suggested that operating time in SPLC was significantly influenced by the use of additional instruments or retracting devices [17]. The learning curve was identified as a significant factor in the quality and outcome of laparoscopic cholecystectomy. The single-port approach increases the technical complexity of the procedure and may require a new learning phase. In this study, the learning curve was overcome with about 15 procedures, after which a flattening of the learning curve was observed. Another study comparing SPLC and MPLC showed that the operating time was higher in the SPLC group [14].

Our study was performed at a single tertiary care center with expertise in MAS. Patients in both groups were matched for comparable demographic characteristics and were studied during the same period. However, there are several limitations in the study. Patients were not randomized for procedure allocation as we believe that the true randomization is extremely difficult in the clinical setting

Fig. 8 The learning curve in SPLC

of a large private hospital. The study design was created to study the patients in both arms (SPLC and MPLC) during the same study period (patients in both arms operated on the same day). With this setting it was not possible to have completely similar demographics in both the groups. Patient follow-up was short and patient-assessed cosmesis and satisfaction scores were obtained only once at 1 week postoperatively. The cost implications of SPLC have not been studied. During surgery, triangulation of instruments entails vision to be central and to have one working instrument on either side. Triangulation ensures the most comfortable working position for the surgeon ergonomically. Triangulation is always present in conventional surgery and is most often possible in traditional MPLC. However, it is a struggle to achieve triangulation in SPLC. In SPLC, the optic and hand instruments are located in almost the same vertical plane. The curve of the grasper on Hartmann pouch and the angle of telescope provide a semblance of triangulation at the site of surgery. Sutures in various forms may be used to provide retraction. This can be an intra-abdominal suture used as a sling, a percutaneous suture or inline suture retracted through a port. Instrument crowding outside a single port causes interference and limitation of movement. The use of streamlined laparoscopes such as EndoEYE (Olympus, Center valley, PA, USA), light cord adaptors, streamlined and lower profile hand instruments, and difficult lengths of instruments are some measures that aid in reducing instrument crowding outside the port.

There are several challenges inherent in performing SPLC with access from the umbilicus. There is likelihood of injury to the underlying bowel during introduction and placement of the access port. The placement of stay sutures and lifting up the abdominal wall while manipulating the port in place is essential to avoid injury. In the initial phase of dissection during cholecystectomy, the duodenum forms a direct inferior relation. Accordingly, in SPLC, all hand instruments have to cross over the anterior wall of duodenum to reach the gallbladder. This makes the anterior wall of duodenum especially prone to thermal injury while using diathermy. Loss of triangulation of instruments is a hazard in SPLC. We use a pre-bent, curved, roticulating grasper to retract Hartmann pouch in the left hand of the surgeon and a straight Maryland dissector in the right hand of the surgeon for well controlled and precise dissection. In SPLC, the approach to dissection is necessarily from posterior. This may be an advantage as posterior dissection during cholecystectomy is safe in our experience. Since it is difficult to rotate the Hartman's pouch to provide an anterior view, the anterior peritoneum also needs to be divided from the posterior approach.

It is expected that SILS shall be driven by patient demand and expectation and propelled by medical industry seeking to introduce new equipment and technology. With the

development of a new technique, the accompanying learning curve may expose patients to risk. It has been our experience that during SPLC, it is possible to always follow the golden rule of creating a big window to expose the triangle of Calot and ensure the critical view of safety. Moreover, in our experience, the learning curve for SPLC was short (approximately 20 patients). The safety of patients undergoing a new surgical technique should be paramount.

A new and innovative surgical technique normally involves added expenditure. As equipments become more sophisticated, they are more expensive as compared to standard laparoscopic instruments. Whether the increased cost translates into better outcomes for the patient in terms of faster and better recovery is yet to be determined. The advantage of the X-Cone single-port device is that it is reusable and has low recurring expenditure. With the use of X-Cone, the factors that escalate cost include the use of an extra long 5 mm telescope, a curved grasper, and longer operating times taken for SPLC.

SILS provides a means of minimizing access with equipment and hand instruments for surgical intervention. Further developments and advances shall most likely lead to providing a solution with the “best” access with minimal invasion. It seems reasonable to expect that once best access is achieved, we shall then think in terms of devising instruments that can comfortably perform the surgical procedure with the requisite optimal ergonomics. Further developments in robotics appear to be the next logical step forward. Today, SILS stands where MAS stood about two decades ago.

It faces almost the same challenges and skepticism faced by the traditional laparoscopic surgery. With the ongoing changes and advances in the field of MAS, long-term follow-up and controlled trials are required to suggest if SILS is a meaningful and lasting technique or a stepping stone toward accomplishing a truly scarless intervention [18].

Conclusion

The advantages of SPLC are improved cosmesis and greater patient satisfaction. However, since SPLC is an emerging technique, it needs to be proved efficacious with a high safety profile to be considered a standard laparoscopic technique. More randomized trials are needed to evaluate the technique for its safety and efficacy.

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References

- Vecchio R, MacFayden BV, Palazzo F (2000) History of laparoscopic surgery. *Panminerva Med* 42:87–90
- Navarra G, Pozza E, Occhionorelli S, Carcoforo P, Donini I (1997) One-wound laparoscopic cholecystectomy. *Br J Surg* 84:695
- Piskun G, Rajpal S (1999) Transumbilical laparoscopic cholecystectomy utilizes no incisions outside the umbilicus. *J Laparoendosc Adv Surg Tech A* 9:361–364
- Castellucci SA, Curcillo PG, Ginsberg PC, Saba SC, Jaffe JS, Harmon JD (2008) Single port access adrenalectomy. *J Endourol* 22:1573–1576
- Podolsky ER, Rottman SJ, Poblete H, King SA, Curcillo PG (2009) Single port access (SPA) cholecystectomy: A completely transumbilical approach. *J Laparoendosc Adv Surg Tech A* 19:219–222
- Dapri G, Casali L, Dumont H, Goot LV, Herrandou L, Pastijn E et al (2011) Single access transumbilical laparoscopic appendectomy and cholecystectomy using new curved reusable instruments: a pilot feasibility study. *Surg Endosc* 25:1325–1332
- Rane A, Kommu S, Eddy B, Bonadio F, Rao P (2007) Clinical evaluation of a novel laparoscopic port (R-port) and evolution of the single laparoscopic port procedure (SLiPP). *J Endourol* 21:A22–23
- Rane A, Rao P (2008) Single-port-access nephrectomy and other laparoscopic urologic procedures using a novel laparoscopic port (R-port). *Urology* 72:260–263
- Rao PP, Bhagwat SM, Rane A (2008) The feasibility of single port laparoscopic cholecystectomy: A pilot study of 20 cases. *HPB (Oxford)* 10:336–340
- Kaouk JH, Haber GP, Goel RK, Desai MM, Aron M, Rackley RR et al (2008) Single-port laparoscopic surgery in urology: Initial experience. *Urology* 71:3–6
- Raman JD, Bensalah K, Bagrodia A, Stern JM, Cadeddu JA (2007) Laboratory and clinical development of single keyhole umbilical nephrectomy. *Urology* 70:1039–1042
- Raman JD, Cadeddu JA, Rao P, Rane A (2008) Single incision laparoscopic surgery: Initial urological experience and comparison with natural orifice transumbilical endoscopic surgery. *BJU Int* 101:1493–1496
- Lee PC, Lo C, Ps L, Chang JJ, Huang SJ, Lin MT et al (2010) Randomized clinical trial of single-incision laparoscopic cholecystectomy versus minilaparoscopic cholecystectomy. *Br J Surg* 97:1007–1012
- Prasad A, Mukherjee KA, Kaul S, Kaur M (2011) Postoperative pain after cholecystectomy: Conventional laparoscopic versus single-incision laparoscopic surgery. *J Min Access Surg* 7:24–27
- Antoniou SA, Pointner R, Granderath FA (2011) Single-incision laparoscopic cholecystectomy: A systematic review. *Surg Endosc* 25(2):367–377
- Kaouk JH, Goel RK, Haber GP, Crouzet S, Stein RJ (2009) Robotic single-port transumbilical surgery in humans: initial report. *BJU Int* 103:366–369
- Mutter D, Callari C, Diana M, Dallemagne B, Leroy J, Marescaux J (2011) Single port laparoscopic cholecystectomy: which technique, which surgeon, for which patient? A study of the implementation in a teaching hospital. *J Hepatobiliary Pancreat Sci* 18(3):453–457
- Richstone L, Kavoussi L (2009) Editorial comment. *Urology* 74:812