Comparison of Cosmetic Outcome Between Single-Incision Laparoscopic Cholecystectomy and Conventional Laparoscopic Cholecystectomy in Rural Indian Population: A Randomized Clinical Trial

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Abstract Persistent efforts are being made to reduce operative trauma and morbidity and to improve cosmesis following laparoscopic cholecystectomy. The trend is to reduce the number of incisions, and thus single-incision laparoscopic cholecystectomy (SILC) and natural orifice endoscopic surgery (NOTES) are becoming popular. There is a paucity of studies pertaining to cosmetic outcome after SILC and conventional laparoscopic cholecystectomy in rural Indian population. In the present study, the cosmetic outcome of SILC versus conventional laparoscopic cholecystectomy (CLC) in rural Indian population was evaluated. Sixty patients with gallstone disease were randomly assigned to two groups. In group A ($n=30$), CLC was performed, while group B ($n=30$) was subjected to SILC. The cosmetic outcome was evaluated using a body image questionnaire on the 7th and 30th postoperative days. On the 7th postoperative day, the body image score for SILC was 6.23 ± 0.89 and for CLC, 8.26 ± 1.08 ($p < 0.0001$), while the cosmetic score for SILC was 19.56 ± 1.07 and for CLC, 15 ± 1.20 ($p < 0.0001$). On the 30th postoperative day, the body image score for SILC was 5.50 ± 0.68 and for CLC, 8 ± 1.31 ($p < 0.0001$), while the cosmetic score for SILC was 21.13 ± 0.57 and for CLC, 15.63 ± 1.06 ($p < 0.0001$), which favored SILC over CLC. The patient perception and acceptance of SILC was better than that of CLC in terms of cosmetic outcome.

Keywords SILC · CLC · Cosmesis · Body image score · Rural · Cholecystectomy

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Introduction

The first cholecystectomy was undertaken by Langenbuch in 1882 through subcostal incision [1]. This technique remained the gold standard for over 100 years. The first laparoscopic cholecystectomy is credited to Muhê [2]. The advantages of laparoscopic cholecystectomy as compared to those of the open approach are better cosmetic outcome, less postoperative pain, and faster recovery [3].

Since the arrival of laparoscopic cholecystectomy, surgeons have strived to reduce the number of ports in laparoscopic surgery in order to improve cosmesis. In the quest for reduction of scars, single-incision laparoscopic surgery and natural orifice endoscopic surgery (NOTES) have emerged. NOTES has enabled the treatment of cholecystectomy via transgastric and transvaginal routes without the need for incisions [4]. SILC is considered as a bridge between conventional laparoscopic cholecystectomy (CLC) and NOTES [5]. SILC was first described in 1997 [6], but it remained reserved for selected patients owing to technical difficulties [7, 8]. With the advent of more sophisticated instruments, many reports on SILC cholecystectomy have demonstrated its feasibility and wide acceptability [9–11].

SILC utilizes three ports through a single skin incision at the umbilicus and is considered to be cosmetically superior in some studies [12–14]. However, most of the studies have been conducted in the urban population who are more conscious and demanding as far as cosmetic outcomes are concerned than the rural population whose expectations are comparatively modest. There is relative paucity of the number of studies conducted in the Indian rural population depicting their perception about the outcomes of SILC.

Considering the same, the present study was conducted in rural Indian population to know whether SILC is the more

acceptable modality than CLC as is shown by various studies done in urban populations.

Material and Methods

The present randomized controlled trial was conducted in Mahatma Gandhi Institute of Medical Sciences, Sevagram, which is a rural medical college, located in Central India. The study was carried out over a 2-year period between October 2010 and November 2012, after obtaining clearance from the institutional ethical committee. Sixty consecutive patients with symptomatic gallstones were included in the study.

The inclusion criteria for the subjects included in this study were patients of either sex and age above 18 years who had ultrasonographically documented symptomatic cholelithiasis. Pregnant females and patients with acute cholecystitis, presence of previous scars in the upper midline or right subcostal region, and suspicion of gallbladder malignancy and those who are found unfit for general anesthesia were excluded.

An informed written consent for participation in the study was obtained from all the patients included in the study. Sixty patients included in this study (17 males and 43 females), between 18 and 70 years of age (mean age 41.2 ± 13.1 years), were randomly assigned to two groups by using sealed envelope containing information regarding placement into group A or B. In group A ($n=30$), patients underwent conventional laparoscopic cholecystectomy, and in group B ($n=30$), patients underwent SILC. All procedures were performed under general anesthesia following standard aseptic protocols. Single senior surgeon with professional experience of about 25 SILC and over 100 conventional laparoscopic cholecystectomies performed all the surgeries to avoid variability.

The other investigator, blinded to the groups of patients, independently recorded the body image and cosmetic scores using the body image questionnaire. The body image questionnaire consists of two parts: the body image scale and the cosmetic scale. The body image scale measures patients' perception and satisfaction with their bodies after surgery, and it is calculated by reverse scoring and summing the responses to questions 1 through 5; it ranges from 5 to 20 with a higher number representing greater body image perception. The cosmetic scale assesses satisfaction with surgical scars and is calculated by simply summing responses to questions 6–8, for a score range of 3–24, with a higher score indicating greater cosmetic satisfaction [15–17].

Only conventional instruments were used in both groups to keep the surgery cost-effective, considering the rural background of the patients.

Conventional Laparoscopic Cholecystectomy

All patients were placed in a supine position with the table tilted towards the left of the patient. Pneumoperitoneum was created using closed Veress needle method. The intra-abdominal pressure during laparoscopy was kept between 12 and 14 mmHg by CO₂ insufflation. LC was done using two 10-mm trocars inserted in the umbilical region and epigastrium, and two 5-mm trocars inserted in the right upper quadrant and right lumbar region. The cystic artery and duct were clipped. Gallbladder was dissected from the bed using coagulation shears. Fascial wounds were closed using absorbable sutures, and the skin was closed using nonabsorbable sutures.

SILC Technique

The patients were placed in a supine position with the surgeon and first assistant on the left side and the second assistant on the right side. The umbilicus was grasped at its base and everted. A skin incision of about 2 cm was made within the umbilical fold. The SILS™ Port (Covidien, USA) was inserted, and pneumoperitoneum was created using CO₂. The intra-abdominal pressure during laparoscopy was kept between 12 and 14 mmHg by CO₂ insufflation. One 10-mm and two 5-mm trocars were placed through the SILS port.

The patient was tilted to the left side. The gallbladder was sutured to the anterior abdominal wall by passing the suture through its fundus (puppeteering). The dissection was performed using the conventional laparoscopy instruments. The cystic duct and artery were clipped. The gallbladder was dissected from the bed using coagulation shears. Hemostasis was achieved, and the gallbladder was delivered from the central port site. Fascial defects were closed by absorbable sutures, and the skin was closed by nonabsorbable sutures.

Special attention was paid towards the reconstruction of the umbilicus in both the groups. The intraoperative data collection included estimation of operative time, estimated blood loss, any addition of laparoscopic ports other than SILS port, and conversion to open cholecystectomy.

The postoperative cosmetic outcome was evaluated via the body image questionnaire at 7- and 30-day interval. The Student's *t* test and chi-square test were used for assessing the statistical significance.

Results

Demographic characteristics of the patients in two groups are given in Table 1. Both the groups were comparable with respect to the age of the patient, number of members of either sex, body mass index, and the preoperative diagnosis.

Table 1 Demographic data and operative variables

	Group A CLC <i>n</i> =30	Group B SILC <i>n</i> =30	<i>p</i> value
Age (years) ^a	40.2±14.4	42.3±11.81	0.58
Gender (M/F) ^b	7/23	10/20	0.39
BMI ^a	23.43±1.79	23.04±1.81	0.40
Mean operative time (min) ^a	47.73±5.57	69.53±8.96	<0.0001
Mean blood loss (ml) ^a	16±5.62	14.06±3.58	0.11

Data expressed as mean±standard deviation

^a Student's *t* test^b Chi-square test

Operative Data

No extra skin incisions or additional ports were required in either group. No conversions to open surgery were required. The minimum operating time required for SILC was 57 min and the maximum was 88 min (mean 69.53±8.96 min) as compared with CLC, where the minimum time was 39 min and the maximum was 59 min (mean 47.73±5.57 min). Thus, the operating time was significantly higher in the SILC group. The mean blood loss in the CLC group (16±5.62 ml) and SILC group (14.06±3.58 ml) during surgery was statistically comparable (*p*=0.11).

Postoperative Outcome

The mean body image score at 1 week in the CLC group was 8.26±1.08 and in the SILC group was 6.23±0.8. Thus, the scores were significantly higher in the CLC group than those in the SILC group, indicating higher body image perception (*p*<0.0001) (Table 2).

Similarly, the mean body image score at 1-month interval was also higher in the CLC group (8.0±1.31) as compared to that in the SILC group (5.50±0.68) (*p*<0.001).

Table 2 Body image and cosmetic scores

	Group A CLC (<i>n</i> =30)	Group B SILC (<i>n</i> =30)	<i>p</i> value ^a
Score on body image scale ^b			
1 week	8.26±1.08	6.23±0.89	<0.0001
1 month	8.0±1.31	5.50±0.68	<0.0001
Score on cosmetic scale ^c			
1 week	15±1.20	19.56±1.07	<0.0001
1 month	15.63±1.06	21.13±0.57	<0.0001

^a Student's *t* test^b On scale from 5 (best result) to 20^c On scale from 3 to 24 (best result)

The mean cosmetic score at 1 week in the CLC group (5.50±0.68) was significantly lower than that in the SILC group (19.56±1.07) (*p*<0.0001), indicating greater cosmetic satisfaction in the SILC group. The mean cosmetic score at 1-month interval in the CLC group (15.63±1.06) was also significantly lower than that in the SILC group (21.13±0.57) (*p*<0.0001).

Discussion

The progress in laparoscopic surgery offers the patients advantages of preservation of integrity of the abdominal wall, less operative trauma, early recovery, and improved cosmesis [18, 19]. The recent progress in SILC is driven mainly by cosmetic advantages, without the risks and technical limitations associated with NOTES.

The female gender is the most compelling association with gallstone disease especially in the fertile years [20]. In the present study, majority of the patients were female (43 females compared to 17 males), and the mean age in both the groups was <45 years. The younger population, particularly women, is more concerned about the cosmetic outcome of the surgery [21].

In the present study, SILC was associated with better cosmetic results in terms of body image perception and patient's satisfaction with the scars. This may be due to the well-disguised scar in the umbilical fold and shorter total scar length.

The urban population, which is wealthier, are more likely to display greater demand for cosmetic surgery given the positive correlation between disposable income and luxury purchases (i.e., cosmetic surgery) [22]. Studies including the present study have demonstrated the cosmetic outcome of SILC to be superior to that of CLC [23].

The Indian rural population being of lower socioeconomic strata are more concerned about pain relief and getting back to work to earn their livelihood; cosmesis is not their priority. The attire worn by the females in rural India exposes the abdominal area, and any scars are thus visible, which makes them conscious of the scars. SILC surgery by using the transumbilical approach makes the scars virtually invisible by hiding them in the umbilical cicatrix.

From the statistically significant operative time difference (*p*<0.0001), it is obvious that SILC is difficult to perform with the conventional instruments. There was difficulty in achieving the critical view of safety due to inflexible CLC instruments. There were often inadequate retraction, loss of triangulation, unintended movement of hands, clashing of instruments with the telescope and camera head, and lack of maneuverability. Also, the specialized SILC instruments are costlier than conventional instruments. However, considering the fact that all these surgeries were performed in the rural

setup and the patients had severe financial constraints, a conscious effort was made to keep the cost of surgery lower to make it affordable to patients. There were no adverse events during the surgery and in short-term follow-ups. We think that SILC is feasible and cost-effective when performed using the conventional instruments, thus providing better cosmetic outcome without higher operative cost.

The present study shows that the SILC is a feasible option for cholecystectomy even in rural population, where it can provide better cosmesis without adding to the financial burden of the patient. There are several limitations to the study including the limited enrolment number. Because the study is based on a small patient population, further enrolment in prospective randomized controlled trials like these is required to determine if the identified cosmetic advantage by SILC is not offset by other patient outcomes.

References

- De U (2004) Evolution of cholecystectomy: a tribute to Carl August Langenbuch. *Indian J Surg* 66(2):97–100
- Reynolds W Jr (2001) The first laparoscopic cholecystectomy. *JSL* 5(1):89–94
- Johnson CD (2001) ABC of the upper gastrointestinal tract. Upper abdominal pain: gall bladder. *BMJ* 323(7322):1170–3
- Nijhawan S, Barajas-Gamboa JS, Majid S, Jacobsen GR, Sedrak MF, Sandler BJ et al (2013) NOTES transvaginal hybrid cholecystectomy: the United States human experience. *Surg Endosc* 27(2):514–7
- Bresadola F, Pasqualucci A, Donini A, Chiarandini P, Anania G, Terrosu G et al (1999) Elective transumbilical compared with standard laparoscopic cholecystectomy. *Eur J Surg* 165(1):29–34
- Navarra G, Pozza E, Occhionorelli S, Carcoforo P, Donini I (1997) One-wound laparoscopic cholecystectomy. *Br J Surg* 84(5):695
- Bucher P, Ostermann S, Pugin F, Morel P (2009) E-NOTES appendectomy versus transvaginal appendectomy: similar cosmetic results but shorter complete recovery? *Surg Endosc* 23(4):916–7
- Navarra G, Ascanelli S, Sortini D, Soliani G, Pozza E, Carcoforo P (2002) Laparoscopic transabdominal suspension sutures. *Surg Endosc* 16(9):1378, author reply 9
- Rao PP, Bhagwat SM, Rane A (2008) The feasibility of single port laparoscopic cholecystectomy: a pilot study of 20 cases. *HPB* 10(5):336–40
- Hirano Y, Watanabe T, Uchida T, Yoshida S, Tawaraya K, Kato H et al (2010) Single-incision laparoscopic cholecystectomy: single institution experience and literature review. *World J Gastroenterol* 16(2):270–4
- Tacchino R, Greco F, Matera D (2009) Single-incision laparoscopic cholecystectomy: surgery without a visible scar. *Surg Endosc* 23(4):896–9
- Bucher P, Pugin F, Buchs NC, Ostermann S, Morel P (2011) Randomized clinical trial of laparoendoscopic single-site versus conventional laparoscopic cholecystectomy. *Br J Surg* 98(12):1695–702
- Phillips MS, Marks JM, Roberts K, Tacchino R, Onders R, DeNoto G et al (2012) Intermediate results of a prospective randomized controlled trial of traditional four-port laparoscopic cholecystectomy versus single-incision laparoscopic cholecystectomy. *Surg Endosc* 26(5):1296–303
- Vilallonga R, Barbaros U, Sumer A, Demirel T, Fort JM, Gonzalez O et al (2012) Single-port transumbilical laparoscopic cholecystectomy: a prospective randomised comparison of clinical results of 140 cases. *J Minim Access Surg* 8(3):74–8
- Park SK, Olweny EO, Best SL et al (2011) Patient-reported body image and cosmesis outcomes following kidney surgery: comparison of laparoendoscopic single-site, laparoscopic, and open surgery. *Eur Urol* 60(5):1097–104
- Steinemann DC, Raptis DA, Lurje G et al (2011) Cosmesis and body image after single-port laparoscopic or conventional laparoscopic cholecystectomy: a multicenter double blinded randomised controlled trial (SPOCC-trial). *BMC Surg* 11:24
- Tugcu V, Ilbey YO, Mutlu B, Tasci AI (2010) Laparoendoscopic single-site surgery versus standard laparoscopic simple nephrectomy: a prospective randomized study. *J Endourol* 24(8):1315–20
- Cuesta MA, Berends F, Veenhof AA (2008) The “invisible cholecystectomy”: a transumbilical laparoscopic operation without a scar. *Surg Endosc* 22(5):1211–3
- Shaffer EA (2005) Epidemiology and risk factors for gallstone disease: has the paradigm changed in the 21st century? *Curr Gastroenterol Rep* 7(2):132–40
- Harris DL, Carr AT (2001) Prevalence of concern about physical appearance in the general population. *Br J Plast Surg* 54(3):223–6
- Wimalawansa S, McKnight A, Bullocks JM (2009) Socioeconomic impact of ethnic cosmetic surgery: trends and potential financial impact the African American, Asian American, Latin American, and Middle Eastern communities have on cosmetic surgery. *Semin Plast Surg* 23(3):159–62
- Wang Z, Huang X, Zheng Q (2012) Single-incision versus conventional laparoscopic cholecystectomy: a meta-analysis. *ANZ J Surg* 82:885–889
- Vemulapalli P, Agaba EA, Camacho D (2011) Single incision laparoscopic cholecystectomy: a single center experience. *Int J Surg* 9(5):410–3