

Comparative Study of Single-incision Laparoscopic Cholecystectomy with Four-port Conventional Laparoscopic Cholecystectomy: A Single-center Experience

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ABSTRACT

Aims and objective: To assess the feasibility of single-incision laparoscopic cholecystectomy (SILC) with conventional laparoscopic instruments and to compare it with four-port conventional laparoscopic cholecystectomy (LC) regarding various intraoperative and postoperative factors.

Materials and methods: This is a prospective randomized controlled study carried out at Santosh Medical College and Hospitals, Ghaziabad from March 2014 to September 2015. This study included 60 patients with cholelithiasis who were divided into two groups of 30 patients each. Group I was offered four-port conventional LC and group II underwent SILC.

Results and observations: Cholelithiasis was commonly seen in young females. Single-incision laparoscopic cholecystectomy took more operating time than conventional LC due to more operative difficulty. Outcome of SILC was 79.6% (23 of 30). However, postoperative complications and pain (measured by visual analog scale scoring system) were almost the same in both groups. Cosmetic outcome was better in SILC group.

Conclusion: Single-incision laparoscopic cholecystectomy has no added advantage over conventional LC, but it can be performed in selected patients for better cosmetic results.

Keywords: Cholelithiasis, Intraoperative factors, Laparoscopic cholecystectomy, Postoperative factors, Single-incision laparoscopic cholecystectomy.

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INTRODUCTION

Laparoscopic cholecystectomy (LC) is the gold standard treatment for cholelithiasis all over the world. This operation is conventionally performed using four ports into the abdomen.¹ The tendency of minimizing surgical trauma encourages the use of new approaches in laparoscopic surgery.² In recent years, successful attempts to reduce the number of traditionally used four ports have been reported. Reducing the number of ports has been shown to improve cosmetic outcomes.^{3,4} Later, three-port and two-port LC were described, which have been reported as safe and feasible.^{3,4}

In the new era of minimal access surgery, the preferred outcomes under consideration are not only the safety, but also the quality, which is often defined by pain and cosmetic results. Scarless surgery is the ultimate goal of laparoscopic surgery.⁵⁻⁷ Single-incision laparoscopic cholecystectomy (SILC) can be performed using refinements of existing technology, and surgeons can perform SILC without any new instruments, specific competence, or training.⁵⁻⁷ Natural orifice transluminal endoscopic surgery (NOTES)^{8,9} is now being performed at many centers across the globe, which eliminates all possibility of scar formation.

Single-incision laparoscopic cholecystectomy was described as early as 1992 by Pelosi et al,¹⁰ who performed a single-puncture laparoscopic appendectomy, and in 1997, by Navarra et al,¹¹ who performed an LC via two transumbilical trocars and three transabdominal gallbladder stay sutures. The objective of this study was to compare conventional four-port LC with SILC regarding various intraoperative and postoperative factors.

AIMS AND OBJECTIVE

To assess the feasibility of SILC with conventional laparoscopic instruments and to compare it with four-port conventional LC regarding various intraoperative and postoperative factors.

MATERIALS AND METHODS

This prospective randomized controlled study was conducted in the Department of General Surgery at

Santosh Medical College and Hospital, Ghaziabad from March 2014 to September 2015. During the study, 60 patients with symptomatic gallstones were included and divided into two groups by chit method. Patients with acute attack of cholecystitis and gallbladder carcinoma were excluded. Group I patients (n = 30) were treated by standard four-port LC and group II patients (n = 30) were treated by SILC. Patients were informed about the SILC technique and consent was obtained regarding conversion to standard four-port LC/open cholecystectomy. All patients were evaluated for intraoperative complications, difficulty encountered during operation, postoperative pain, operative time, postoperative complications, hospital stay, and cosmetic outcome. We used IBM Statistical Package for Social Sciences (SPSS) version 17.0 for data analysis. Pain was measured as continuous variable using visual analog scale (VAS, a 0–10 cm scale). Cosmetic outcome was assessed on the basis of examination of scar seen on outpatient department basis at an interval of 1st, 6th, and 12th week.

The surgery in both the groups was performed by a general surgeon having more than 10 years of experience in minimal access surgery. In group I standard four-port LC was performed. All cases were operated under general anesthesia.

In group II, a single infraumbilical 20 mm incision was made through which one 10 mm camera port and two 5 mm working ports were sent by open technique. An additional 2/0 polypropylene suture on straight needle was introduced through the abdominal wall to retract the fundus of gallbladder. The gallbladder was removed from the camera port by using a 5 mm telescope through the adjacent working port. Abdominal wall was closed with interrupted vicryl 2/0 and skin was closed by subcuticular technique using 3-0 prolene.

OBSERVATIONS AND RESULTS

Out of 60 patients, 49 were females. There were 23 (76.6%) and 26 (86.67%) females in groups I and II respectively. The mean age of the patients was 38.53 ± 8.46 years and 38.46 ± 7.15 years in groups I and II respectively.

Various intraoperative factors were studied and comparative analysis was done (Table 1). Intraoperative complications, such as bile/stone spillage and bleeding were seen more in group II ($p < 0.05$). Operative difficulty parameters like instrument crowding, insufficient retraction, and compromised vision were significantly higher in group II ($p < 0.05$). Difficulty in gallbladder extraction was higher in group II ($p < 0.05$). Mean operative time was 48.36 minutes and 64.33 minutes in groups I and II respectively. Thus, there was significantly

Table 1: Comparative analysis of single-incision laparoscopic cholecystectomy with laparoscopic cholecystectomy in terms of intraoperative factors

Intraoperative factors	Standard four-port lap cholecystectomy (n = 30)	SILC (n = 30)	p-value
Bile/stone spillage	2	4	<0.05
Bleeding	2	7	<0.05
Instrument crowding	0	15	<0.05
Insufficient Gallbladder retraction	2	9	<0.05
Compromised vision	1	9	<0.05
Difficult Gallbladder extraction	4	7	<0.05
Conversion to open cholecystectomy	2	2	>0.05
Conversion to four post lap cholecystectomy	0	5	<0.05
Mean operative time in minutes	48.30	64.60	<0.05

higher mean operative time in group II than in group I ($p < 0.05$). Two patients in each group were converted to open cholecystectomy, and five cases of group II were converted to standard four-port LC in view of operative difficulty and inability to proceed with SILC ($p < 0.05$). Successful outcome of SILC was 79.6% (23 of 30).

Incidence of postoperative complications like nausea/vomiting, dyspepsia, fever, jaundice, and surgical site infection was almost similar in both the groups ($p > 0.05$) (Table 2). Mean hospital stay in both groups was similar and statistically insignificant ($p > 0.05$). There was no incidence of bile duct injury and port-site hernia in both groups. Cosmetic outcome at 6th and 12th week was significantly better in group II ($p < 0.05$), judged on the basis of appearance of scar (Table 2).

Table 2: Comparative analysis of single-incision laparoscopic cholecystectomy with laparoscopic cholecystectomy in terms of postoperative factors

Postoperative factors	Standard four-port lap cholecystectomy (n = 30)	SILC (n = 30)	p-value
Nausea/vomiting/dyspepsia	2	3	>0.05
Mean Hospital stay in number of days	1.1	1.07	>0.05
Wound infection	2	3	>0.05
Postoperative jaundice/fever	0	0	–
Cosmetic outcome at 6 weeks	fair	good	<0.05
Cosmetic outcome at 12 weeks	fair	excellent	<0.05

Table 3: Comparative analysis of single-incision laparoscopic cholecystectomy with laparoscopic cholecystectomy in terms of postoperative pain

Pain analysis by VAS scoring	Standard four port lap cholecystectomy	SILC (n = 30)	p-value
Mean VAS at 12 hrs	3.23	3.33	>0.05
Mean VAS at 24 hrs	2.20	2.40	>0.05
Mean VAS at 3rd Day	1.20	1.1	>0.05

The mean VAS score for analysis of pain in postoperative period was almost similar in both the groups done at 12 hours, 24 hours and on 3rd postoperative day ($p > 0.05$) (Table 3).

DISCUSSION

Cholelithiasis is a common condition in India, especially in Northern India. Conventional open cholecystectomy is known for decades, but with advent of laparoscopic surgery, LC has now become the gold standard treatment for cholelithiasis.¹ In the present era, newer techniques have been introduced and now scarless surgery in the form of SILC and NOTES is possible.^{5,8,9}

This study showed a female predominance with a mean age of 38.5 years (18–60), which is comparable to various studies conducted on the similar topic.^{6,7}

Intraoperative complications like biliary spillage and bleeding were significantly higher in the SILC group. Previous studies showed safety and feasibility of SILC with no significant intraoperative complications.¹²⁻¹⁴ Few studies showed increased rate of intraoperative complications in SILC, but these are statistically insignificant.¹⁵ Operative difficulty, such as compromised vision, insufficient retraction, difficult gallbladder extraction, and difficult instrumentation was noticed significantly higher in SILC. Previous few studies had reported similar observations.¹⁵

Mean operative time was significantly higher for SILC as compared with LC due to more operative difficulty in SILC. Few studies and meta-analysis had shown similar results as our study, and some studies had shown similar operative time in SILC.^{12,14,16}

Postoperative complications and mean hospital stay were similar in both groups. There was no incidence of bile duct injury and port-site hernia in both groups. Surgical site infection rates were similar in both groups. These findings are comparable to most of previous studies and meta-analysis available in literature.¹⁷⁻²⁰ Postoperative pain was similar in both SILC and LC in 12 hours, 24 hours, and 3rd postoperative day.²¹ Cosmetic outcome of our cases in SILC group was significantly better than LC at 6th week and 12th week. Most of the observations

made during this study were comparable to previous studies.^{12,15,18} Though SILC seems an good alternative to LC in terms of cosmetic outcome, there are added benefits when compared with LC in terms of postoperative complications, mean hospital stay, and pain. LC has definitely less operative difficulty and mean operative time than SILC. Single-incision laparoscopic cholecystectomy can be offered to selected group of patients.

CONCLUSION

Single-incision laparoscopic cholecystectomy is a promising alternate method for uncomplicated cholelithiasis in terms of cosmetic outcome, but it does not have any major benefits when compared with conventional LC.

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