

Research Article**Single Incision Laparoscopic Cholecystectomy: An Alternative to Conventional Laparoscopic Cholecystectomy**Neeraj Rajauriya¹, Sunil Agarwal², Mukesh Singh Narwaria³, Achal Gupta⁴¹PG student, Department of Surgery, G.R. Medical College, Gwalior (M.P.).²Associate Professor, Department of Surgery, G.R. Medical College, Gwalior (M.P.)³Assistant Professor, Department of Surgery, G.R. Medical College, Gwalior (M.P.)⁴Professor and Head, Department of Surgery, G.R. Medical College, Gwalior (M.P.)***Corresponding author**

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Abstract: Cholecystectomy is the most common major abdominal procedure performed in now a days. In 1987, laparoscopic cholecystectomy was introduced by Philippe Mouret in France and quickly revolutionized the treatment of gallstones. Today, laparoscopic cholecystectomy is the treatment of choice for symptomatic gallstones. The recent focus has been on the development of single-port and single-incision laparoscopic surgery (SILS) to further minimize the invasiveness of laparoscopic surgery by reducing the number of incisions. SILS can be performed using refinements of existing technology, and surgeons can perform SILS without any new instruments, specific competence, or training. SILS may offer the advantages of reducing postoperative pain, and virtually scarless surgery. The study was a prospective randomized study done in the department of surgery in our institution for a period of one year. Total 50 patients diagnosed with cholelithiasis were alternatively randomized to undergo either SILC (n=25) or CLC (n=25). The mean operative time measured as the time required to insert the trocar and close the wound, was 107.84 minutes for SILC (SD=13.74 min) and 79.96 minutes for CLC (SD=19.93 minutes). Out of 25 patients undergoing SILC, 4 patients (16%) were converted to CLC while in 25 patients undergoing CLC, 2 patients (8%) were converted to open approach. The mean postoperative pain score as assessed on VAS scale was 4.36, 2.24 and 1.68 on day 1,2 and 3 respectively for SILC and for CLC, it was 6.60, 4.8 and 2.44 for day 1,2 and 3 respectively. The mean postoperative analgesic requirements (mg of diclofenac sodium) was 225,129 and 33 mg on day 1,2 and 3 respectively for SILC respectively while for CLC, it was 225, 159 and 54 mg on day 1,2 and 3 respectively. The mean hospital stay for both CLC and SILC was 3 days. The most common complication seen in SILC group was persistent pain in 12% of patients while in CLC group, persistent pain and wound infection was present in 20% of patients respectively. Cosmetic outcomes of SILC was significantly far superior than CLC it can be concluded that SILC can be done in patients desiring a better cosmetic outcome and are willing to undergo a longer surgery as compared to CLC.

Keywords: Cholecystectomy, Single Incision Laparoscopic Cholecystectomy, gallstone Laparoscopic Cholecystectomy

INTRODUCTION

Cholecystectomy is the most common major abdominal procedure performed in now a days. Carl Langenbuch performed the first successful cholecystectomy in 1882 and for more than 100 years, it was the standard treatment for symptomatic gallstones. Open cholecystectomy was a safe and effective treatment for both acute and chronic cholecystitis. In 1987, laparoscopic cholecystectomy was introduced by Philippe Mouret in France[1] and quickly revolutionized the treatment of gallstones. Laparoscopic cholecystectomy offers a cure for gallstones with a minimally invasive procedure, minor pain and scarring, and early return to full activity. Today, laparoscopic cholecystectomy is the treatment of choice for symptomatic gallstones. Since the introduction of laparoscopic cholecystectomy as the gold standard procedure to remove the gallbladder, many surgeons have attempted to reduce the number and size of ports in laparoscopic cholecystectomy to decrease parietal trauma and improve cosmetic results.[2] The recent

focus has been on the development of single-port and single-incision laparoscopic surgery (SILS) to further minimize the invasiveness of laparoscopic surgery by reducing the number of incisions.[2] SILS was described as early as 1992 by Pelosi et al[3] who performed a single-puncture laparoscopic appendectomy, and in 1997, by Navarra et al[4] who performed a laparoscopic cholecystectomy via two transumbilical trocars and three transabdominal gallbladder stay suture. SILS can be performed using refinements of existing technology, and surgeons can perform SILS without any new instruments, specific competence, or training. SILS may offer the advantages of reducing postoperative pain, and virtually scarless surgery.[2] In this study, we have compared the outcomes of conventional laparoscopic cholecystectomy (CLC) and Single Incision Laparoscopic Cholecystectomy(SILC).

MATERIAL AND METHODS

The study was a prospective randomized study

done in the department of surgery in our institution for a period of one year. Total 50 patients diagnosed with cholelithiasis were alternatively randomized to undergo either SILC (n=25) or CLC (n=25). The patients were informed about the two procedures and chances of conversion. Patients were kept fasting overnight and the surgery was performed under general anesthesia. Routine laparoscopic instruments were used to perform SILC.

CLC was performed by using 4 ports; two 10 mm ports at transumbilical and epigastric region and two 5mm ports. SILC was performed by a single transumbilical incision using conventional laparoscopic instruments. The final outcomes of the patients were compared.

RESULTS

A total of 50 patients were divided into two groups; one undergoing SILC and another undergoing CLC. Patients' characteristics are shown in Table 1.

The mean operative time measured as the time required to insert the trocar and close the wound, was 107.84 minutes with SD 13.74 minutes for SILC and 79.96 minutes with SD of 19.93 minutes for CLC. Out of 25 patients undergoing SILC, 4 patients (16%) were converted to CLC while in 25 patients undergoing CLC, 2 patients (8%) were converted to open approach. The reasons for the conversion in both the groups were dense adhesions at Calot's triangle while in SILC, an additional reason was obesity leading to the swording of instruments. No patient was converted from SILC to open approach.

Table 1: Table showing the patients' characteristics.

| S.No | Factor | Patient data |
|------|---------------------|--|
| 1 | Age | Most common age group=41-50 yrs |
| 2 | Sex | M:F= 1:9 |
| 3 | Operative technique | SILC=25 patients CLC=25 patients |
| 4 | Clinical feature | Pain in right hypochondrium=100% patients Nausea and vomiting=60% of patients Fever=20% of patients. |

Table 2: Comparison of patient outcome after SILC and CLC in present study

| Parameters | SILC | CLC | P value |
|--|------------------|---------------|---------|
| Duration of surgery(min) | 107.84 | 79.96 | <0.0000 |
| Conversion rate(%) | 16 (SILC to CLC) | 8 (CLC to OC) | 0.113 |
| Pain score (VAS) | | | |
| Day1 | 4.36 | 6.60 | <0.0000 |
| Day2 | 2.24 | 4.8 | <0.0000 |
| Day 3 | 1.68 | 2.44 | <0.004 |
| Postoperative analgesic requirement (mg of diclofenac) | | | |
| Day1 | 225 | 225 | -- |
| Day 2 | 129 | 159 | <0.024 |
| Day3 | 33 | 54 | <0.225 |
| Length of hospital stay (days) | 3 | 3 | 1.000 |
| Wound infection (%) | 00 | 04 | |
| Persistent pain (%) | 12 | 20 | |
| Bile leak (%) | 00 | 00 | |
| Cosmetic outcome (Grades of surgical scar) | | | <0.0001 |
| Grade 1 | 18 | 3 | |
| Grade 2 | 5 | 18 | |
| Grade 3 | 2 | 4 | |

The mean postoperative pain score as assessed on VAS scale was 4.36, 2.24 and 1.68 on day 1,2 and 3 respectively for SILC and for CLC, it was 6.60, 4.8 and 2.44 for day 1,2 and 3 respectively. The mean postoperative analgesic requirements (mg of diclofenac sodium) was 225,129 and 33 mg on day 1,2 and 3 respectively for SILC respectively while for CLC, it was 225, 159 and 54 mg of diclofenac sodium on day 1,2 and 3 respectively. The mean hospital stay for both CLC and SILC was 3 days. The most common complication seen in SILC group was persistent pain in 12% of patients while in CLC group, persistent pain and wound infection was present in 20% of patients respectively.

Statistical analysis:

On statistical analysis, there was a significant difference in the outcomes of SILC and CLC (p value<0.05) with regard to operating time (SILC>CLC), postoperative pain score and postoperative analgesic requirement (SILC<CLC), cosmetic appearance of the wound (SILC better than CLC) while there was no significant difference with regard to hospital stay and conversion rate.

DISCUSSION

Langenbuch introduced cholecystectomy, i.e. removal of the gallbladder with the stones in 1882[5,6]. This operation soon became the common surgical procedure. The first laparoscopic cholecystectomy was performed by Eric Mühe in 1986[7]. Three years later, it was introduced in Sweden and only a few years after that it became the "Gold standard" for elective treatment of symptomatic gallstone disease[8,9]. Laparoscopic surgery has always had a focus on minimizing surgical trauma and improving cosmesis. Whilst by definition it is less invasive than open surgery, it still requires incisions for port placement as well as an extraction site. Each of these is painful, impacts on the final cosmetic appearance and has the potential for bleeding, inter-fascial haematoma formation, visceral injury, sub-costal nerve irritation and in the long-term, incisional hernia development. Cosmesis is increasingly demanded by increasingly discerning patients. NOTES is an experimental surgical technique whereby scarless abdominal operations can be performed with an endoscope and instruments passed through a natural orifice (mouth, urethra, anus etc), then through an internal incision in the stomach, vagina, bladder or colon, thus avoiding any external incisions or scars[10]. The goal is to reduce postoperative pain and recovery time as much as possible, and improve cosmetic results for the patient. As a bridge between traditional laparoscopic surgery and NOTES, the recent focus has been on the development of single-port and single-incision laparoscopic surgery (SILS) to further minimize the invasiveness of laparoscopic surgery by reducing the number of incisions.[2] SILS was described as early as 1992 by Pelosi *et al*[3] who performed a single-

puncture laparoscopic appendectomy, and in 1997, by Navarra *et al*[4] who performed a laparoscopic cholecystectomy via two transumbilical trocars and three transabdominal gallbladder stay suture. SILS can be performed using refinements of existing technology, and surgeons can perform SILS without any new instruments, specific competence, or training. SILS may offer the advantages of reducing postoperative pain, and virtually scarless surgery.[2] Single port access surgery is a rapidly progressing surgical approach, which allows the performance of standard laparoscopic surgery through a single trans-parietal port instead of the surgeon relying upon multiple port accesses. These approaches all use multi-lumen ports sited through the umbilicus. The single port technique has been described for cholecystectomy[4,11], appendectomy[3,12] and bariatric procedure such as sleeve gastrectomy and gastric banding[13,14]. In our study, the comparison of SILC and CLC is given in Table 2.

In a study by Tsimoyiannis *et al*[15], forty patients (34 women and 6 men) were randomly assigned to two groups. In group A (n = 20) four-port classic laparoscopic cholecystectomy was performed. Patients in group B (n = 20) underwent SILS cholecystectomy. In all patients, preincisional local infiltration of ropivacaine around the trocar wounds was performed. Infusion of ropivacaine solution in the right subdiaphragmatic area at the beginning of the procedure plus normal saline infusion in the same area at the end of the procedure was performed in all patients as well. Shoulder tip and abdominal pain were registered at 2, 6, 12, 24, 48, and 72 h postoperatively using visual analog scale (VAS). Significantly lower pain scores were observed in the SILS group versus the classic laparoscopic cholecystectomy group after the first 12 h for abdominal pain, and after the first 6 h for shoulder pain. Total pain after the first 24 h was nonexistent in the SILS group. Also, requests for analgesics were significantly less in the SILS group, while no difference was observed in incidence of nausea and vomiting between the two groups. They concluded that SILS cholecystectomy, as well as the invisible scar, has significantly lower abdominal and shoulder pain scores, especially after the first 24 h postoperatively, when this pain is nonexistent.

In a study by Lai *et al*[16], 51 patients with symptomatic gallstone or gallbladder polyps were randomized to SILC (n = 24) or 4-port LC (n = 27). Mean surgical time (43.5 vs 46.5 min), median blood loss and mean hospital stay (1.5 vs 1.8 d) were similar for both the SILC and 4-port LC group. There were no open conversions and no major complications. The mean total wound length of the SILC group was significantly shorter (1.76 vs 2.25 cm). The median visual analogue pain score at 6 hours after surgery was similar (4.5 vs 4.0) but the SILC group had a significantly worse pain score on day 7 (1 vs 0). There was no difference in time to resume usual activity

(mean, 5.6 vs 5.0 d). The median cosmetic score of SILC was significantly higher than at 3 months after surgery (7 vs 6). They concluded that SILC was feasible and safe for properly selected patients in experienced hands.

In terms of findings of present study, there was a significant difference in the duration of surgery in between the groups of SILC and CLC with the duration more for SILC as compared to CLC (p value<0.05). there was a significant difference in the postoperative pain score and postoperative analgesic requirement especially in the later postoperative period (p value=<0.05). This is in agreement with the earlier studies done by Tsimoyiannis *et al*[15], who found that there is low postoperative abdomen and shoulder pain score in patients undergoing SILC as compared to CLC. there was no significant difference in the hospital stay between the groups of SILC and CLC (p value=1.00). This is in agreement with a study done by Cao *et al*[17] and Lai *et al*[18]. There was a significant difference in the groups of SILC and CLC with respect to cosmetic stay with the cosmetic outcomes of SILC significantly far superior than CLC(p value<0.0001). This fact has also been documented in other studies as done by Phillips *et al*[19], Lai *et al*[18] and Tsimoyiannis *et al*[15].

After the comparison of the above data, it can be seen that SILC is better than CLC with regard to pain score, postoperative analgesic requirement and cosmetic outcome while it is similar to CLC with regard to hospital stay and conversion rate. There is significant difference in the duration of surgery between CLC and SILC with the time duration being more for SILC as compared to CLC but this time can be due to a learning curve and will be reduced as the experience of the operator increases as documented by Yilmaz *et al*[20].

CONCLUSION

After the analysis of the data, it can be concluded that SILC can be done in patients desiring a better cosmetic outcome and are willing to undergo a longer surgery as compared to CLC.

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Ethical Issue: Ethical clearance was obtained from the Institutional ethical committee.

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