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Original Research Article

Single-Incision versus Conventional Four-Port Laparoscopic Cholecystectomy: A Prospective Randomized Comparative Study

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Conflict of interest: Nil

Abstract

Background: Single-incision laparoscopic cholecystectomy (SILC) has been proposed as an evolution of conventional laparoscopic cholecystectomy (CLC) with the potential benefit of improved cosmesis. However, its clinical advantage over the standard four-port technique remains debated.

Objective: To compare SILC and CLC with respect to operative time, postoperative pain, morbidity, recovery, and cosmetic outcome.

Methods: A prospective randomized study was conducted on 60 patients with uncomplicated cholelithiasis. Patients were allocated to SILC (n=30) or CLC (n=30). Standard laparoscopic instruments were used in both groups. Operative parameters, postoperative pain (VAS), complications, hospital stay, return to activity, and cosmetic satisfaction were evaluated.

Results: Mean operative time was significantly longer in the SILC group. Early postoperative pain at 6 hours was higher in SILC, while pain scores thereafter were comparable. No significant difference was observed in postoperative morbidity, hospital stay, or recovery time. Cosmetic satisfaction was significantly better in the SILC group.

Conclusion: SILC is a safe and feasible alternative to conventional laparoscopic cholecystectomy in selected patients, offering superior cosmetic results without additional morbidity.

Keywords: Single-incision laparoscopic cholecystectomy (SILC), Conventional laparoscopic cholecystectomy (CLC), Postoperative Pain, Morbidity, Recovery, Cosmetic Outcome.

Introduction

Laparoscopic cholecystectomy has become the standard surgical treatment for symptomatic gallstone disease.

Continuous refinement of minimally invasive techniques has led to the development of single-incision laparoscopic cholecystectomy, aimed at reducing access trauma and improving cosmetic outcomes [1].

Despite increasing popularity, SILC poses technical challenges such as loss of triangulation and instrument crowding.

The present study was undertaken to objectively compare SILC with conventional four-port laparoscopic cholecystectomy using conventional instruments in a tertiary care teaching hospital [2].

Materials and Methods

This prospective randomized comparative study was conducted in the Department of General Surgery of a Tertiary Hospital in WB. Sixty patients with uncomplicated symptomatic cholelithiasis were enrolled after informed consent. Patients were randomized into two groups: SILC (n=30) and CLC (n=30). Patients with acute cholecystitis, choledocholithiasis, pregnancy, BMI ≥25, significant comorbid illness, or prior upper abdominal surgery were excluded. Operative time, postoperative pain (VAS at 6, 12, 24, and 36 hours), postoperative complications,

duration of hospital stay, time to return to normal and heavy activity, cosmetic satisfaction at three months, and port-site hernia were assessed.

Results

The demographic profiles of both groups were comparable, with a female predominance. Mean operative time was significantly longer in the SILC group compared to the CLC group. Postoperative pain at 6 hours was significantly higher in the SILC group; however, pain scores at 12, 24, and 36 hours did not differ significantly. There was no statistically significant difference between the groups in terms of postoperative complications, duration of hospital stay, or time to return to routine and strenuous activity.

Cosmetic satisfaction scores were significantly superior in the SILC group.

Table 1: Demographic Distribution of Patients

Parameter	SILC (n=30)	CLC (n=30)
Mean age (years)	26.17	27.47
Male	8	9
Female	22	21

Table 2: Operative Time Comparison

Group	Mean Operative Time (min)	p value
SILC	80.13 ± 6.69	<0.05
CLC	54.53 ± 10.79	

Table 3: Postoperative Pain Scores (VAS)

Time	SILC	CLC	p value
6 hours	58.97	50.17	<0.05
12 hours	29.33	28.73	>0.05
24 hours	15.70	15.30	>0.05
36 hours	7.13	7.27	>0.05

Table 4: Cosmetic Outcome at 3 Months

Group	Mean VAS Score	p value
SILC	0.50 ± 0.63	<0.05
CLC	2.07 ± 0.58	

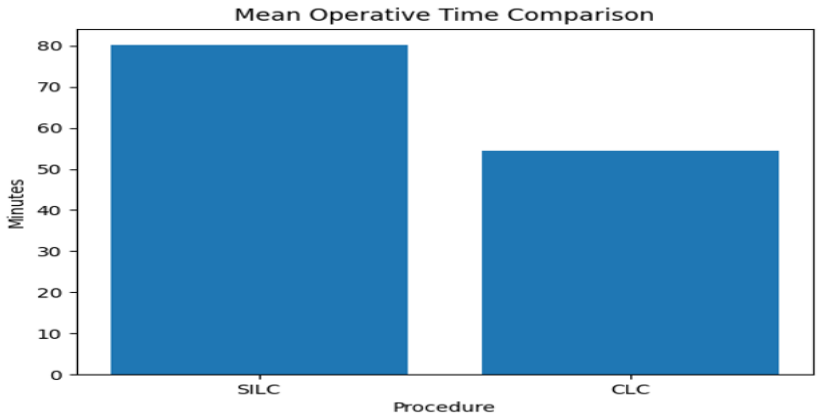

Figure 1: Mean Operative Time Comparison

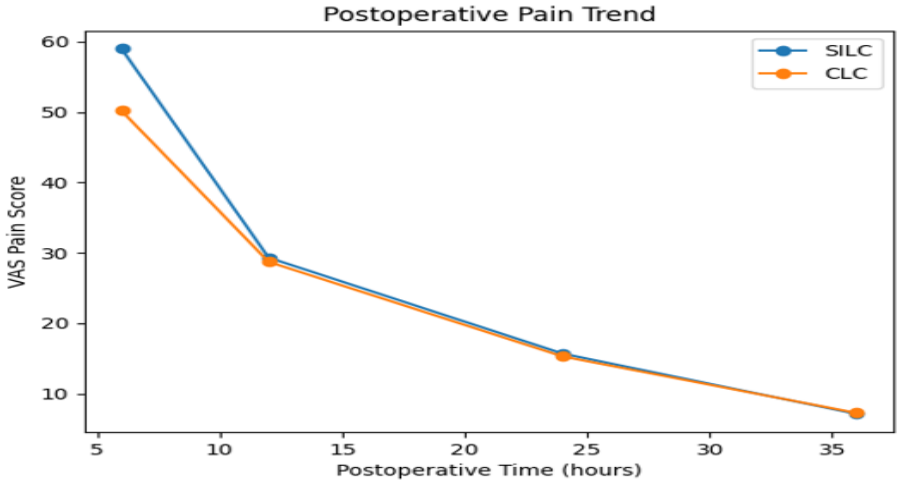

Figure 2: Postoperative Pain Trend

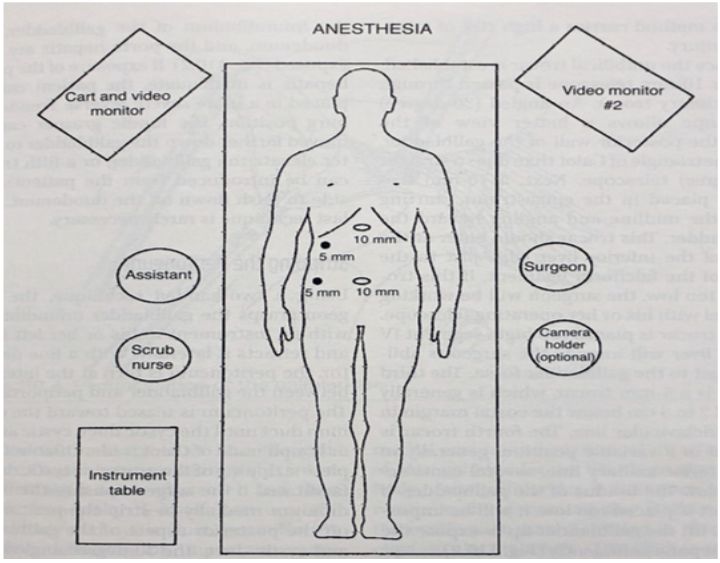

Figure 3: Port placement in conventional four-port laparoscopic cholecystectomy (credit Fischer's Mastery of Surgery, 7th Edition, Vol.-2).

Figure 4: Single-incision transumbilical port placement with traction sutures.

Discussion

The present study demonstrates that single-incision laparoscopic cholecystectomy can be performed safely using conventional laparoscopic instruments. The longer operative time observed in SILC reflects technical limitations inherent to single-site access, particularly during the learning phase [3-5].

Early postoperative pain was marginally higher in SILC, likely due to increased umbilical manipulation. However, this difference was

transient. The most consistent benefit of SILC was improved cosmetic satisfaction, which is increasingly relevant in patient-centered surgical care [6, 7].

Conclusion

Single-incision laparoscopic cholecystectomy is a safe and effective alternative to conventional four-port laparoscopic cholecystectomy in carefully selected patients. While operative time and early pain may be higher, the procedure offers superior cosmetic outcomes without increased morbidity.

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