



A PROSPECTIVE COMPARATIVE STUDY OF THREE-PORT VERSUS CONVENTIONAL FOUR-PORT LAPAROSCOPIC CHOLECYSTECTOMY

General Surgery

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ABSTRACT

Introduction: Laparoscopic cholecystectomy has become the gold standard for managing symptomatic gallstone disease. Recent innovations have focused on minimizing surgical trauma, including reducing the number of ports. This study aimed to compare the outcomes of three-port laparoscopic cholecystectomy with the conventional four-port technique. **Materials And Methods:** This prospective comparative study was conducted over 18 months at a tertiary care center in Jaipur, India. A total of 100 patients with chronic calculous cholecystitis were randomized into two groups: Group A (n=50) underwent three-port laparoscopic cholecystectomy and Group B (n=50) underwent four-port laparoscopic cholecystectomy. Variables analyzed included operative time, intraoperative and postoperative complications, postoperative pain (VAS scale), hospital stay, and time to return to normal activity. **Results:** The mean age of patients in Group A was younger than in Group B (48 ± 13 vs. 54 ± 10 years, $p < 0.01$). Mean operative time was slightly longer in the three-port group (64.8 ± 21.6 min vs. 57.1 ± 15.5 min, $p = 0.044$). Postoperative pain scores were significantly lower in the three-port group on postoperative days 0, 1, and 3 ($p < 0.05$). Mean hospital stay was shorter (1.1 vs. 1.3 days, $p = 0.022$) and return to normal activity was earlier in the three-port group ($p < 0.01$). No major complications or conversions to open surgery occurred in either group. **Conclusion:** Three-port laparoscopic cholecystectomy is a safe and effective alternative to the four-port technique, with benefits of reduced pain, shorter hospital stay, and quicker recovery, without increasing complication rates.

KEYWORDS

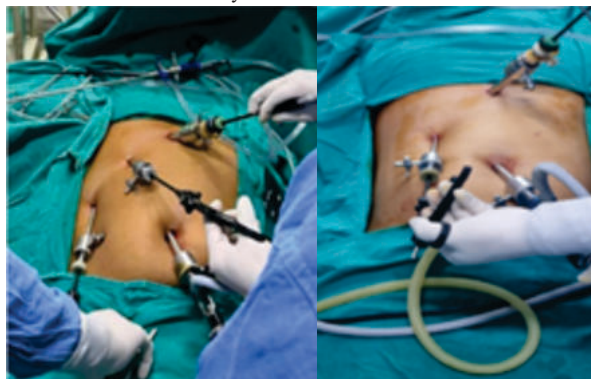
Laparoscopic cholecystectomy; Three-port; Four-port; Gallstone disease; Postoperative pain; Minimally invasive surgery

INTRODUCTION

Laparoscopic cholecystectomy (LC) has revolutionized the management of symptomatic gallstone disease and is now the gold standard surgical treatment. Innovations in technique have aimed to reduce postoperative pain, enhance cosmetic outcomes, and shorten recovery time. One such innovation is reducing the number of ports used in LC.

The conventional four-port technique involves an additional lateral port for fundal traction. In contrast, the three-port technique omits this port and relies on modified instrument handling or suture traction. Previous studies have suggested comparable safety and efficacy between the two techniques, with some benefits in postoperative outcomes for the three-port method.

This study was undertaken to compare three-port and four-port laparoscopic cholecystectomy in terms of operative time, intraoperative and postoperative complications, pain, hospital stay, and return to normal activity.



MATERIALS AND METHODS

Study Design And Setting

A prospective, comparative study was conducted in the Department of General Surgery, Mahatma Gandhi Medical College & Hospital, Jaipur, over 18 months (April 2023 – September 2024) after obtaining institutional ethics committee approval.

Sample Size And Groups

A total of 100 patients diagnosed with chronic calculous cholecystitis

were randomized into:

- **Group A (n=50):** Underwent three-port laparoscopic cholecystectomy
- **Group B (n=50):** Underwent conventional four-port laparoscopic cholecystectomy

Inclusion Criteria

- Age 18–75 years
- Diagnosed chronic calculous cholecystitis
- Fit for general anesthesia

Exclusion Criteria

- Acute cholecystitis, mucocele, pyocoele
- Carcinoma gallbladder
- Cirrhosis, portal hypertension
- Coagulopathy
- Generalized peritonitis

Surgical Techniques

Both procedures followed standard laparoscopic protocols using the American technique. The only difference was omission of the lateral 5-mm port in Group A.

Postoperative Care

Patients were mobilized and started on oral liquids after 8 hours. Pain was assessed using the Visual Analogue Scale (VAS). Outcomes measured included operative time, complications, hospital stay, and time to return to normal activity.

Statistical Analysis

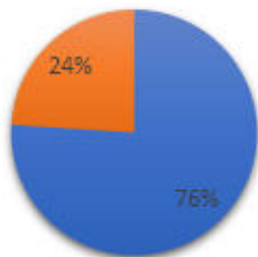
Data were analyzed using SPSS version X. Means and standard deviations were compared using t-tests; categorical variables were analyzed using chi-square or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

RESULTS

The study cohort comprised predominantly female patients (76%). The mean age was significantly lower in Group A (48 ± 13 years) compared with Group B (54 ± 10 years) ($p < 0.01$). The mean operative duration was longer in Group A (64.8 ± 21.6 minutes) than in Group B (57.1 ± 15.5 minutes) ($p = 0.044$). Intraoperative complication rates were comparable between the groups: liver bed injury occurred in 6% of Group A and 4% of Group B ($p = 0.436$), while gallbladder perforation with bile spillage occurred in 4% and 2%, respectively.

($p=0.617$). No common bile duct injuries or conversions to open surgery were observed in either group. Postoperative pain scores were significantly lower in Group A on POD 0, POD 1, and POD 3 (all $p<0.05$), with no significant difference by POD 5. One seroma was noted in Group A (2%), and no surgical site infections occurred in either group. Group A demonstrated a shorter mean hospital stay (1.1 vs. 1.3 days; $p=0.022$) and an earlier return to normal activities ($p<0.01$) compared with Group B.

GENDER DISTRIBUTION



■ FEMALE ■ MALE

Variable	GROUP	N	Mean	SD	p-value
Operative Time(In Min)	A (4PORT LC)	50	64.8	21.6	0.044
	B (3PORT LC)	50	57.1	15.5	.

			PROCEDURE		Total
			3 PORT	4 PORT	
Common Bile Duct Injury	NO	COUNT	50	50	100
		%	100%	100%	100%
TOTAL		COUNT	50	50	100
		%	100%	100%	100%

			Procedure		Total
			3 PORT	4 PORT	
Content Spillage And Gall Bladder Perforation	YES	COUNT	3	1	4
		%	6%	2%	4%
	NO	COUNT	47	49	96
		%	94%	98%	96%
TOTAL		COUNT	50	50	100
		%	100%	100%	100%

DISCUSSION

The evolution of laparoscopic surgery has focused on minimizing invasiveness while maintaining safety. Reducing the number of ports is one such advancement.

In our study, the three-port technique had a slightly longer operative time, possibly due to the technical adjustments required. However, the difference was statistically significant but clinically acceptable.

Postoperative pain was significantly less in the three-port group on the initial postoperative days, likely due to fewer incisions and less muscle disruption. Early ambulation and oral intake were similar in both groups, but reduced pain translated into earlier return to normal activity.

Complication rates including liver bed injury and bile spillage were low and not significantly different. No bile duct injuries or conversions were seen, supporting the safety of both techniques in experienced hands.

Our results align with other studies that demonstrate the feasibility and benefits of reduced port laparoscopic cholecystectomy.

CONCLUSION

Three-port laparoscopic cholecystectomy is a safe and effective alternative to the conventional four-port technique. It offers advantages of reduced postoperative pain, shorter hospital stay, and quicker return to routine activity without compromising surgical safety. This approach may be preferred in selected patients where cosmetic outcome and early recovery are priorities.

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