

## Original Research Article

# A comparative evaluation of three port versus standard four port laparoscopic cholecystectomy in SGRRIMHS and SMIH Dehradun

Pradeep Singhal, Amulya Aggarwal\*, Syed Altamash, Ajay Kumar Verma

Department of General Surgery, SGRRIMHS and SMIH, Dehradun, Uttarakhand, India

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**\*Correspondence:**

Dr. Amulya Aggarwal,

E-mail: [dramulyaaggarwal90@gmail.com](mailto:dramulyaaggarwal90@gmail.com)

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### ABSTRACT

**Background:** Cholelithiasis is one of most common condition requiring surgical intervention specially in females in Indo-Gangetic belt. Techniques of cholecystectomy have evolved from open to laparoscopic procedures. Efforts have been made to perform it with lesser ports for better operative outcomes like less complications and better cosmetic appearance. This study aims to compare the postoperative outcomes of 4 port versus 3 port laparoscopic cholecystectomy.

**Methods:** This is a prospective comparative study. 104 patients for 4 port laparoscopic cholecystectomy and 110 patients for 3 port cholecystectomy were allocated randomly. Preoperative assessment was done in both the groups and Informed consent was taken. Intra operative parameters like duration of surgery, blood loss, surgical complications were assessed. Postoperative follow up was done at 1 week, and scar assessment at 2 weeks. Findings were entered in Microsoft Excel and analyzed using SPSS by applying t-test and chi-square test.

**Results:** Female: male ratio was 14:1 and age varied between 32-51 years. The mean operative time was in 3 port was 64.6 min and 56.42 min in 4 port ( $p < 0.05$ ). Complications like conversion to open procedure, bleeding from liver bed, cystic artery bleeding and port site infections were comparable in both groups. Analgesic requirement was significantly less after 24 hours in 3 port ( $p = 0.02$ ).

**Conclusions:** 3 ports cholecystectomy is better in terms of lesser postoperative pain, cosmetic outcome, hospital stay, lesser assistance. The authors recommend 3 ports LC as a routine procedure in gallstone diseases.

**Keywords:** Laparoscopic cholecystectomy, 3 port, 4 port, Lap chole

### INTRODUCTION

Biliary diseases constitute majority of gastrointestinal disorders. Among these cholelithiasis is the common cause leading to general ill health especially in females and require surgical intervention for complete cure.<sup>1</sup> The incidence of gall stone disease in males is about 8.2%.<sup>2</sup> Among females, the prevalence is further high with multiple pregnancies and obesity as well as in older patients. Epidemiological studies have clearly shown a linear relationship between increasing age and prevalence

of cholelithiasis. Moreover, its prevalence has become more apparent since the introduction of ultrasonography.

Laparoscopic cholecystectomy, first performed by Prof Dr Med Erich Mühe of Böblingen, Germany, on September 12, 1985, continues to be the gold standard in management of cholelithiasis.<sup>3</sup> The introduction of laparoscopic surgery for gall stone diseases has revolutionized its treatment because of its advantages like lesser post-operative pain, lesser incidence of surgical site infection, shorter hospital stay and better cosmesis as

compared to open cholecystectomy. As this technique was performed routinely, modifications were made time to time in order to make it comparatively less invasive and more cosmetic.

Traditionally LC is performed using four port techniques.<sup>4,5</sup> It is expected that any decrease in the size or number of stab incisions (ports) may provide better results added to aforementioned advantages of laparoscopic cholecystectomy. However, some surgeons have argued that smaller is not necessarily better.<sup>6</sup> While many others proved that reducing the number and size of port incisions give more favorable results.<sup>7-12</sup> The study aims to assess the feasibility of three-port LC and compare its advantages and disadvantages with respect to the standard four-port technique.

## METHODS

This is a prospective comparative study performed on ultrasound proved cases of cholelithiasis admitted in the Department of Surgery, Shri Guru Ram Rai Institute Of Medical And Health Sciences, Dehradun (Uttarakhand) for elective surgeries from September 2018 to April 2019. The study comprised of 214 cases of either sex in the age group of 18 to 60 years. All patients with jaundice, radiologically proved choledocholithiasis, Malignancy, Previous upper abdominal surgery, acute cholecystitis and acute gallstone induced pancreatitis, empyema gall bladder, perforation gall bladder, patients who were not fit for laparoscopic surgery on anesthetic grounds, were excluded from the study.

Preoperative assessment included detailed history, clinical examination and relevant investigations like Complete blood count, Blood sugar, Renal function tests, Liver function tests, Coagulation profile, ECG, Chest X-ray and ultrasonography of abdomen.

Before the procedure, fully informed written consent was taken. Additionally, patient's consent for conversion to an open procedure in case of difficulty was obtained. The patients were operated under general anesthesia.

The patients were randomly divided into two groups:

Group A: Four port LC (n=104)

Group B: Three port LC (n=110)

### *Operative technique*

#### *Four port laparoscopic cholecystectomy*

In group 1 four ports were placed, 1st 10 mm supra-umbilical port for camera, 2nd 10 mm epigastric port for dissection and 3rd 5 mm port right laterally in the mid-clavicular line for retraction and 4th 5 mm port in the anterior axillary line just below costal margin. Anatomy of Calot's triangle identified. Cystic duct and cystic artery were separated clipped doubly and divided in

between. The gall bladder was separated from the liver bed by hook electro-cautery and hemostasis secured. Using irrigation and suction the liver bed was closely scrutinized and dealt with as necessary. After removal of gall bladder from epigastric port, liver bed was inspected once again. The ports were removed under vision and ports sites were sutured and sterile dressing was applied of all the four ports.

#### *Three port laparoscopic cholecystectomy*

The three-port technique involved inserting a 10 mm trocar just above the umbilicus through which the 30° viewing telescope were introduced. Another 10 mm trocar was inserted in epigastric area below the xiphisternum and finally, a 5 mm trocar at the right hypochondrium mid clavicular line 3 cm below the costal margin. The procedure was conducted from the left side of the patient together with the assistant holding the camera while the TV monitor was located on the upper right side of the patient and the nurse on the lower right side of the patient. The operating surgeon held the dissecting instruments with his right hand through the 10 mm trocar while gall bladder held at the infundibulum with a grasper through the 5 mm trocar; moving the infundibulum right and left or back and forth to display the Calot's triangle, blunt dissection was used for adequate display of the cystic duct and cystic artery. The cystic duct and cystic artery were cut between clips and the gall bladder was then dissected from its bed and extracted through the epigastric port. The ports were removed under camera vision. The ports sites were then sutured and sterile dressing was applied of all the three ports.

Postoperatively, patients were monitored for pulse, blood pressure, pain, temperature, respiratory rate, appearance of bowel sounds, biliary peritonitis, ileus, jaundice, color and quantity of discharge from drain (if any), number of days after which drain (if any) was removed.

Discharge of patient from hospital was based on clinical grounds. After discharge all patients were examined at surgical outpatient department at one week and two weeks. Patient's satisfaction on scar was reviewed 2 weeks after surgery in OPD.

The results were entered in Microsoft Excel version 16. Data analysis was done using SPSS version 23. Statistical tests were applied for assessment of significance of association. Quantitative data was expressed in mean and standard deviation and compared using t-test. Categorical data was expressed using proportion and percentages and compared using chi-square test. A p value of less than 0.05 was taken as significant.

## RESULTS

In our study total 214 patients underwent LC, out of which 104 were through 4 ports and 110 were through standard 3 ports LC and following are the results:

- Gall stone disease is found to be more common in the age group of 32-51 years.
- Cholelithiasis is found to be more common in females as found in our study where the ratio of female to male was 14:1.

The mean time duration of 4 port LC was 56.42 minutes and 64.6 minutes for 3 ports LC. The difference in both groups was found to be statistically significant ( $p < 0.05$ ) with operative time in Group B being higher than Group A (Table 1).

**Table 1: Comparison of mean operative time of LC in both groups.**

	Group	n	Mean	Std. deviation	P value
<b>Operative time (in minutes)</b>	A (4 ports LC)	104	56.423	8.5488	0.000
	B (3 ports LC)	110	64.600	10.3907	

**Table 2: Comparison of intra operative findings and complications of LC in both groups.**

Sl. No.	Parameter (complications)	Group A (4 port)	Group B (3 port)	P value
		N (%)	N (%)	
1.	Conversion to open procedure	4 (3.8)	1 (0.9)	0.15
2.	Bleeding from the liver bed	33 (31.7)	30 (27.3)	0.47
3.	Cystic artery bleeding due to slippage of clip	8 (7.7)	6 (5.5)	0.50
4.	Content leak from gall bladder	24 (23.1)	27 (24.5)	0.80
5.	Bile duct injury	0	0	
6.	Trocar related injury	0	0	
7.	Ileus	0	0	
8.	Pneumothorax	0	0	
9.	Port site infection	5 (4.8)	8 (7.3)	0.22

**Table 3: Comparison of post-operative analgesia requirement in both groups.**

Sl. No.	Parameter (complications)	Group A (4 port)	Group B (3 port)	P value
		N (%)	N (%)	
1.	Analgesic requirement after 12 hours post-op	72 (69.2)	70 (63.6)	0.38
2.	Analgesic requirement after 24 hours post-op	30 (28.8)	19 (17.3)	0.02

**Table 4: Comparison of mean duration of hospital stay in both groups.**

	Group	N	Mean	Std. deviation	P value
<b>Mean hospital stay (in days)</b>	A (4 ports LC)	104	1.98	1.132	0.03
	B (3 ports LC)	110	1.68	0.918	

The proportion of intraoperative complications such as conversion to open procedure, bleeding from liver bed, cystic artery bleeding and content leak from gall bladder were found to be similar in both groups with  $p > 0.05$ , further, there were no cases of bile duct injury, trocar related injury or ileus in either of the groups.

Bleeding from the liver bed was a common post-operative complication in 4 ports as well as 3 ports LC, as 31.7% of the patients in Group A and 27.3% of the patients in Group B had this complication.

The incidence of port site infection was similar in both the groups ( $p > 0.05$ ). There were no cases of pneumothorax. 3 port LC had less number of ports so there was better cosmetic appearance. 3 port LC required lesser number of assistants, so less manpower and less expensive. There was no mortality in both the groups (Table 2).

Post-operative analgesic requirement at 12 hours postoperatively were similar in both groups ( $p > 0.05$ ). However, proportion of patients requiring post-operative analgesia at 24 hours were lower in Group B as compared to Group A and this difference was found to be statistically significant ( $p = 0.02$ ) (Table 3).

The mean duration of hospital stay postoperatively differed significantly in both the groups, Group A patients had to stay for 1.98 days on an average and Group B had to stay for 1.68 days ( $p < 0.05$ ) (Table 4)

## DISCUSSION

Cholecystectomy is the commonest operation of biliary tract and 2nd most common operative procedure performed today.<sup>13</sup> The technique of open cholecystectomy was first performed by a German surgeon Carl Langenbuch through cadaveric dissection

on July 15, 1882.<sup>14</sup> Since then, many surgeons around the world tried different modifications in incision to lessen post-operative pain and achieve better cosmesis. Considering such, another alternative is performance of surgery through a small incision less than 5 cm long in sub costal area called Minilap cholecystectomy. The main advantage of this procedure over conventional open cholecystectomy is that the patient is discharged early. Also, the analgesic requirement is less.<sup>15</sup>

Furthermore, micro-cholecystectomy with smaller incision is reported to be more superior to the above two approaches. These good results supposed to be due to decrease surgical trauma of the muscle cutting incisions.<sup>16,17</sup>

The standard four port approach is currently followed by the majority of surgeons.<sup>4,18</sup> The use of the fourth trocar which is generally used for fundus retraction in the American technique seemed unnecessary by some surgeon.<sup>19,20</sup> Many researchers have proved that reducing the number and size of port incisions have more favorable results.<sup>7-12</sup>

The results comparing both groups in our study were similar to standard literature in terms of age, sex, USG findings, operating time, conversion to open LC, need for 4th port in 3 ports LC, complications and mean hospital stay.

The mean operative time of 4 port LC was 56.42 min and for 3 ports LC is 64.60 min and it was statistically insignificant. Conversion rate of 3 ports LC to open cholecystectomy was 0.9%. Adhesion and bleeding were the major cause of conversion. And on applying relevant statistical test it is found to be insignificant.

Conversion of 3 ports LC to 4 ports LC was done in two patients i.e. 1.81% mainly because of dense adhesions.

Mean hospital stay in 3 port LC was 1.68 days which when compared with 4 port LC found to be statistically significant difference between them.

The post-op pain and analgesic use was less in 3 ports LC as measured by visual analogue scale (VAS). Less no. of scars in 3 ports LC gives better cosmesis, supported by many studies like Endo et al, Trichak, AI Nafeh et al, Kumar et al, Chalkoo et al.<sup>12,21-24</sup> And also decrease in no. of assistants decreased manpower and cost, supported by Chalkoo et al.<sup>24</sup>

## CONCLUSION

The authors are of the opinion that 3 ports LC is technically better, safe, achieved comparatively better results with less post-operative pain with lesser requirement of analgesia, less number of scars, so yielding cosmetically better output, less assistance, less hospital stay so imposing less financial burden on the

patient. If properly accomplished, use of only 3 ports does not add to any excessive complications. The authors recommend 3 ports LC as a routine procedure in gall stone diseases.

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