International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

Original Research Article.

Two-Port Laparoscopic Cholecystectomy Using Alligator Grasper Versus Standard Four-Port Cholecystectomy

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ABSTRACT

Introduction: The two-port laparoscopic cholecystectomy (LC) has been reported to be safe and feasible with a higher patient satisfaction score than the conventional four-port LC. We have done a study to compare the outcome of two-port laparoscopic cholecystectomy using alligator grasper versus conventional four-port laparoscopic cholecystectomy.

Methods and Materials: The present prospective and comparative study was done on 100 patients of either sex who were admitted to the department of surgery in a tertiary care centre for cholecystectomy. we compared the outcome of two-port laparoscopic cholecystectomy using alligator grasper v/s conventional four-port laparoscopic cholecystectomy in terms of safety of the procedure, operating time, postoperative pain, hospital stay, cosmesis, complications and need for conversion to open surgery.

Results: It was observed that two port LC was better than four-port LC in terms of operative time, cosmesis, post op stay. But time taken for surgery was more in case of two-port.

Conclusions: Two-port laparoscopic cholecystectomy (LC) is a safe procedure when performed with experience. The present study found that two-port laparoscopic cholecystectomy is better in terms of pain score, cosmesis outcome and less post-op stay for the procedure.

Keywords: Two-Port, Laparoscopic Cholecystectomy, Four-Port.

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Article History:

Received: 27-11-2021, **Revised:** 29-12-2021, **Accepted:** 25-01-2022

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2022.8.1.012	

INTRODUCTION

Patients with asymptomatic Gall stone disease can be observed but those with symptoms or with complications need cholecystectomy which may be open or laparoscopic. Nowadays Laparoscopic cholecystectomy has become the gold standard in the treatment of symptomatic Gall stone disease.[1] The need of having minimal surgical trauma has led to the evolution of laparoscopic surgery.[2] Standard laparoscopic cholecystectomy is performed using four trocars. With refinement in laparoscopic surgery, it has been shown that LC can be safely performed using three ports, a two port technique and even through a single incision.[3-5] The two-port LC has been reported to be safe and feasible with a higher patient satisfaction score than the conventional four-port LC.[4] Two ports LC has become possible by using two traction sutures/alligator graspers; one on the fundus of gallbladder and another on the Hartmann's pouch. Nevertheless, the two-port technique is technically more demanding because of the limited operative field and space and should only be used to remove the simple, uncomplicated gall bladder.[6]

We have done a study to compare the outcome of two-port laparoscopic cholecystectomy using alligator grasper v/s conventional four-port laparoscopic cholecystectomy in terms of safety of the procedure, operating time, postoperative pain, hospital stay, cosmesis, complications and need for conversion to open surgery.

MATERIALS AND METHODS

The present prospective and comparative study was done on 100 patients of either sex who were admitted to the department of surgery in a tertiary care centre for cholecystectomy after approval of the ethics committee. A total of 130 patients were recruited for the study and 30 patients were lost to consent, follow up or adverse outcomes.

Inclusion criteria included All symptomatic gall bladder stone patients with age > 12 years

Exclusion criteria included patients with Previous major abdominal surgeries, patients with features of acute cholecystitis with mass

formation, choledocholithiasis, pancreatitis and malignancy on clinical and USG examination. A USG abdomen was done in each patient to confirm the gallbladder calculi, to measure its wall thickness, common bile duct (CBD) diameter and stones and features of acute inflammation or malignancy.

An informed written and verbal consent explaining that he/she has understood the procedure was obtained at least one day before surgery. Patients were divided into two groups on basis of simple randomisation at the time of admission:

Group A: Patients who underwent standard four-port LC

Group B: Patients who underwent two-port mini-LC.

Procedure: All patients were operated on under general anaesthesia in the supine position.

Two-port mini-LC:

Following the placement of a 10mm umbilical port, one 5-mm epigastric port was placed. Two special 2.3-mm alligator graspers were inserted in the anterior axillary and mid clavicular line on the right side transabdominally for grasping the fundus and hartmann's pouch of the gallbladder for its retraction and manipulation, respectively. In some patients, due to some reasons like bleeding, adhesions etc., when there was difficulty in proceeding with two ports, additional port(s) were used, or the procedure was converted to open cholecystectomy. Follow-up of the patients was done for 30 days after surgery.

Four-port LC was done with standard procedure.

To compare the two groups, the following data was used:

1. Time of operation: Counted from “skin to skin”, i.e., from the first incision to the end of the closure of the final wound.
2. Any difficulty faced during two-port or four-port laparoscopic cholecystectomy
3. Feasibility of the procedure.
4. Conversion from two-port LC to four-port LC/open cholecystectomy.
5. Complications: CBD injury, hepatic injury/bleed, biliary/stone spillage, bowel injury, vascular injury or any other complication up to 30 days post-operatively
6. Post-operative pain: Site; severity of pain as assessed by Visual Analog Scale (VAS) at 2, 4, 6, 8,12 and 24 hours.
7. Analgesia requirement of the patient.
8. Lengths of postoperative hospital stay (in hours).
9. Back to normal routine
10. Acceptability of the procedure.
11. Any late complication or adverse outcome.
12. Cosmesis: Assessed at the end of 30 days by the patient and independent nurse in the ward/OPD. Each was asked to rate cosmesis on a scale of 1 (worst) to 10 (best). The mean of both the patients' score and the nurse's score was taken as the final score.

These findings were recorded on proforma. The patients in two subgroups were compared and results were evaluated.

The results of observations of individual patients were pooled in two groups and analyzed. Statistical analysis was performed using Statistical Program for Social Sciences (SPSS) software version 20.0 Chicago, Illinois, USA. For categorical variables, the chi-square test was used for analysis.

‘**p’ value**: A difference between two groups that would have arisen by chance is ‘p’ value. If it was less than 0.05, it was considered significant, ‘p’ value less than 0.01 was considered highly significant. If it was more than 0.05, it was considered non-significant.

Table 1: Distribution of patients according to age and sex

Variables		Group A(four-port)	Group B(two-port)	*P value*
AGE (Mean ± SD)		46.14±13.75	42.06±14.58	0.1634 (NS)
SEX	**Male**	9(18%)	9(18%)	1.00 (NS)
	Female	41(82%)	41(82%)	

Table 2: Intra-operative findings in Group A and Group B

Intra-operative findings	Group A(four-port)		Group B(two-port)	
	Frequency	Percent	Frequency	Percent
Adhesions (including omental)	6	12%	1	2%
Bleeding from liver bed	2	4%	2	4%
Use of drains	5	10%	8	16%
Major bile duct injury	0	0%	0	0%
Converted to open	1	2%	0	0%
Converted to 4-port	NA	NA	2	4%

Table 3: Time taken for Cholecystectomy, Cosmesis score and Post-op Stay Duration in Group A and Group B

Variables	Group A(four-port)		Group B(two-port)		*P* value
	Mean score	SD	Mean score	SD	
Time for cholecystectomy	44.76 mins	10.14	52.80	14.43	0.0017 (S)
Cosmesis	5.6	1.30	7.11	1.36	<0.0001 (S)
Post-op Stay	2.25 days	0.66	1.9 days	0.53	0.0043 (S)

Table 4: Post-operative pain score in Group A and Group B

Time lapse (Hrs)	Group A(four-port)		Group B(two-port)		*P*-Value	Sig.
	Mean	SD	Mean	SD		
6	5.44	1.26	4.66	0.98	0.0008	S
12	4.42	1.03	3.14	0.92	< 0.0001	S
18	3.06	0.93	2.18	0.82	< 0.0001	S
24	2.08	0.92	1.48	0.68	0.0003	S

RESULTS

The present study was conducted with the objective to compare two port laparoscopic cholecystectomy using alligator grasper versus conventional four port laparoscopic cholecystectomy.

We observed that the mean age in group A was 46.04±13.75 years whereas the mean age in control group was 42.06±14.58 years. Maximum number of individuals was in the age group of 31-40 years in the group A and 21-30 years in the group B.

Statistically, there was no significant difference in mean age of both the groups (p= 0.1634). Hence, both the groups were comparable. Statistical analysis showed that the difference between the two groups was not significant (*P* Value 1).

We observed no statistical difference between both the groups in terms of intra operative findings and complications.

It was seen that the mean time taken for the completion of cholecystectomy was 44.76±10.14 minutes in Group A whereas 52.80±14.43 minutes in Group B.

We observed that difference in cosmesis score is statistically significant between group A and group B. it was better in two port cases.

We observed that the mean duration of post-operative stay was 2.25±0.66 days and 2.10±0.53 days in Group A and Group B respectively.

We observed that the mean post-operative pain scores of various timelines were at 6 hours, the pain score was 5.44 ± 1.26 and 4.66 ± 0.98 in Group A and Group B respectively. At 12 hours, the pain score was 4.42 ± 1.03 and 3.14 ± 0.92 in Group A and Group B respectively. At 18 hours, the pain score was 3.06 ± 0.93 and 2.18 ± 0.82 in Group A and Group B respectively. And, at 24 hours, the pain score was 2.08 ± 0.92 and 1.48 ± 0.68 in Group A and Group B respectively.

So, we observed that mean post operative pain was more in group A compared to group B which is statistically significant.

DISCUSSION

Gallstones are increasing in prevalence due to changes in lifestyle and dietary habits, especially in the developing world. It is mostly asymptomatic, being detected incidentally on imaging. Cholecystectomy is one of the commonest abdominal procedures these days. With the advancement in the technological know-up backed up with better imaging techniques, the procedure has become increasingly more sophisticated with better outcomes in terms of morbidity and mortality with reduced number and size of ports.[7]

The present study was conducted with the objective to compare two-port laparoscopic cholecystectomy using alligator grasper versus conventional four-port laparoscopic cholecystectomy.

Demographic Distribution

Age Distribution: Mean age of presentation of patients in Group A was 42.06±14.58 years whereas in Group B was 46.14±13.75 years. Maximum patients were in the age group of 2130 years in Group A and 31-40 years in group B (Table-1).

Our results were found to be similar to the study conducted by Wani et al in 2014 reported that the mean age in the two-port group was 39.55 ± 14.117 years and in the four-port group was 38.89 ± 11.394 years.[8] Another study conducted by Prasad et al in 2019 also found that the mean age was 35.81 ± 16.1 years in two-port LC and 36.84 ± 26.14 years in four-port LC.[7]

Gender Distribution: In our study the male: female ratio is 1:4.5. It shows a female preponderance in patients may be due to the influence of female sex hormone, the muscle may relax, biliary passage dilates, and duodenal content of pancreatic secretion regurgitates into the gallbladder and promote conditions that favour the formation of gallstones(Table-1).[9] The results of the present study were comparable to the study conducted by Choudhary et al in 2019 in which the baseline characteristics of patients revealed that out of 60 patients, the male: female ratio was 1:4.[10]

Another randomized control study conducted by Prasad et al (2019) found that percentage of females in 2 port LC was 97.97% and 90.91% in 4 port LC.[7]

We concluded that there was no statistically significant difference in both groups as far as age and gender distribution is concerned.

Time Taken for Cholecystectomy: In the present study, the mean time taken in the completion of cholecystectomy was 44.76±10.14 minutes in Group A and 52.80±14.43minutes in Group B (Table-3). We concluded that in our study time taken for completion of the procedure was more in twoport as compared to four-port laparoscopic cholecystectomy.

The results of the present study are comparable to the study conducted by Prasad et al (2019) who reported a mean time of surgery of 2 port LC is 62.09+10.6 min and of 4 port LC 57.15+8.2 min.[7]

Wani et al in 2014 reported the mean operative time required in the two-port group was 46.66 ± 14.47 minutes and in the four-port group was 48.79 ± 8.336 minutes.[8] Elwan et al (2013) reported the mean operative time to be 39.142 min for the two-port group and 36.285 min for the four-port group.[11] Poon et al (2003) reported a mean operating time of 54.6 ± 24.7 minutes for the two-port group and 66.9 ± 33.1 minutes for the four-port group.[4]

The operative time of the procedure varies with different studies depending on the operative difficulty based on the status of the gallbladder, adhesions around the gallbladder fossa and elsewhere in the abdomen, Calot's triangle and cystic duct anatomy.[12]

Intraoperative Parameters: There were 13 gall bladder perforations with 8 in the two-port group and 5 in the four-port group. Due to gall bladder perforations, there was bile spillage and drains had to be placed after thorough saline wish. No major bile duct was reported. Two cases of the two-port group were

converted to four-port lap cholecystectomy due to difficult anatomy. One four-port procedure was converted to an open procedure due to dense adhesions. Liver bed bleeding was noticed in 2 cases each in both groups. No significant difference was noticed in both the groups in terms of intraoperative complications. (Table 2) These results are comparable with studies of Wani Et al (2014), Poon et al (2003).[4,8]

Post-operative Pain Score: In our study at 6 hours, the pain score was 5.44± 1.26 and 4.66 ± 0.98 in Group A and Group B respectively. At 12 hours, the pain score was 4.42 ± 1.03 and 3.14 ± 0.92 in Group A and Group B respectively. At 18 hours, the pain score was 3.06 ± 0.93 and 2.18 ± 0.82 in Group A and Group B respectively. And, at 24 hours, the pain score was 2.08 ± 0.92 and 1.48 ± 0.68 in Group A and Group B respectively (Table-4).

We concluded that in our study pain score at 6, 12, 18 and 24 hours was more in four-port as compared to two-port laparoscopic cholecystectomy.

The results of the present study can be compared with a study conducted by Wani et al (2014). They recorded post-operative pain score between two-port and four-port LC as after one hour (2.18 ± 0.8334 vs 1.94 ± 0.9081), after 12 hours (3.71 ± 1.409 vs 4.77 ± 1.196) and 24 hours (2.2 ± 0.8165 vs 2.98 ± 1.295). The results were statistically significant at 1, 12, and 24 hours with P values = 0.019, <0.0001, and <0.0001, respectively.[8] Sreenivas et al (2014) also reported similar results.[13]

Cosmesis Score: In the present study, the mean cosmesis score was 5.6±1.30and 7.11±1.36 in Group A and Group B respectively (Table-3). We concluded that the cosmesis score was more in two ports as compared to four-port laparoscopic cholecystectomy which was found to be statistically significant.

Sreenivas et al (2014) reported cosmesis parameters four-port and the two-port group as 5.90 ± 0.83 and 7.55 ± 1.28 respectively (p-value 0.001).[13] Wani et al (2014), using a different parameter, recorded cosmetic results post-surgery. Cosmesis was assessed by the number and the size of the surgical scars. In the two-port group, there were two fewer scars than that in the four-port group. The average scar size was 2.1 cm in the four-port group (11 mm epigastric and two 5-mm port scars), whereas the average scar size was only 1.1 cm in epigastric in the two-port group.[8] Overall, patients in the two-port group were highly satisfied with the cosmetic outcomes of their surgery.

Duration of Postoperative Stay: In the present study, the mean duration of postoperative stay was 2.25±0.66 days and 1.9±0.53 days in Group A(four-port) and Group B(two-port) respectively (Table-3). We concluded that two port operated had shorter hospital stays due to less post-op pain and complications with results as statistically significant.

Wani et al (2014) reported that the hospital stay was shorter in the two-port group (1.68 ± 0.7769 days) as compared to the four-port group (2.09 ± 0.2876 days), and the results were statistically significant (P-value < 0.0001).[8]

Sreenivas et al (2014) and Prasad et al (2019) also reported similar results.[7,13]

SUMMARY AND CONCLUSION

The present study was conducted with the objective to compare two-port laparoscopic cholecystectomy using alligator grasper versus conventional four-port laparoscopic cholecystectomy. Two-port LC is a safe procedure when performed with experience. The present study found that two-port laparoscopic cholecystectomy is better in terms of pain score, cosmesis outcome and less post-op stay for the procedure.

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Source of Support: Nil. **Conflict of Interest:** None Declared.

Cite this article as: Prem Chand, Sangam Papneja, Rajinderpal Singh, Savijot Singh, Deepak, Jagdeep Singh Brar, Rohit Dihana, Rachan Lal Singhla. Two-Port Laparoscopic Cholecystectomy Using Alligator Grasper Versus Standard Four-Port Cholecystectomy. Int J Med Res Prof. 2022 Jan; 8(1): 52-55.
DOI:10.21276/ijmrp.2022.8.1.012