

Comparative Study of Three Port Versus Four Port Laparoscopic Cholecystectomy for Acute Calculus Cholecystitis

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ABSTRACT

Objective: To compare laparoscopic cholecystectomy These 3 port versus 4Port terms of Post time taken for operation, pain score following operation, stay, and frequency of complications after surgery.

Study Design: Randomized controlled trial.

Place and Duration of Study: This study was conducted at the Department of General Surgery, Central Park Teaching Hospital, and Lahore from 1st July 2018 to 31st March 2019.

Materials and Methods: One hundred and twenty two diagnosed cases of acute calculous cholecystitis were included and divided into two equal groups of 61 patients each. Patients in group A underwent laparoscopic cholecystectomy by using 3 ports while patients in B Group underwent laparoscopic cholecystectomy by using 4 ports. Both the groups were analyzed in terms of mean operative time, postoperative pain according to visual analogue scale, mean hospital stay and frequency of post-operative complications including rate of conversion to open surgery, port site infection, injury to CBD and bile leak.

Results: The operative time was of 37.13±8.07 minutes in Group A while it was 43.87±7.16 minutes in B Group (p=0.001). The difference between both the groups in regard of mean pain score according to VAS at twelve and twenty four hours after surgery was statistically significant (p<0.05). There was no sufficiently great difference between both the groups in terms of stay in the hospital (p=0.260) and frequency of converted to open surgery (0.154), injury to bile duct (p=0.315), wound infection (p=0.559) and bile leak (p=0.433).

Conclusion: Three port laparoscopic cholecystectomy is better than the standard 04 port lap cholecystectomy in terms of less operative time and pain following surgery with a comparable safety profile.

Key Words: Acute calculous cholecystitis, four port laparoscopic cholecystectomy, Stay following surgery, Time taken for surgery, three port laparoscopic cholecystectomy.

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INTRODUCTION

Gall stone disease is one of the most common presentations to the surgery departments with a prevalence ranging from 5-20% worldwide. The disease is more prevalent in the developed countries.^{1,2}

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In Pakistan, the prevalence of gall stone disease is around 10.2%.³ Laparoscopic cholecystectomy is the preferred procedure in the management of symptomatic gall stone disease and acute cholecystitis.⁴ Since the start of laparoscopic cholecystectomy in 1989, quite a few variations and modifications in the surgical technique have been tried to improve patient outcomes.⁵ Laparoscopic cholecystectomy has been attempted using 1 to 4 ports by surgeons across the globe with variable results.⁶ Single port and 2 port techniques have not been able to gain approval of majority of laparoscopic surgeons due to added technical difficulty and increased frequency of associated complications. However 3 and 4 port techniques have been employed in the management of acute cholecystitis routinely. In patients presenting with acute cholecystitis, the conventional technique employing 4 ports still remains the most widely practiced technique.⁷ In the 3 port laparoscopic cholecystectomy, the additional port inserted to pull the fundus of gall

Bladder upwards and outwards in omitted. The benefit of 3 port technique are that it is associated with better cosmesis, reduced cost, decreased postoperative pain and analgesic requirements and early return to work.⁸ The reluctance of making three port technique as the gold standard in cases of acute cholecystitis is driven by the longer learning curve required, the difficulty in dissection in cases of long or thick walled gall bladder and dense adhesions with frozen Clot's triangle to name a few.⁸⁻¹⁰.

MATERIALS AND METHODS

This randomized controlled trial was conducted on a total of 122 patients diagnosed as cases of acute calculus cholecystitis from 1st July 2018 to 31st March 2019 who underwent laparoscopic cholecystectomy in the Department of Surgery, Central Park Teaching Hospital Lahore. The inclusion criteria included all patients of acute calculus cholecystitis of both genders having age between 20-60 years, BMI ranging from 21-35 Kg/m², and having ASA class from I-III. The exclusion criteria comprised of patients with choledocholithiasis, other causes of obstructive jaundice, acute pancreatitis, deranged coagulation profile, chronic liver disease, ischemic heart disease, empyema gall bladder, mucocele gall bladder, gall bladder malignancy, ASA class IV and V, chronic renal failure and patients having history of endoscopic retrograde cholangiopancreatography (ERCP) within two weeks of surgery. Lottery method was used to divide the patients into two equal groups of 61 patients each. Group A patients underwent laparoscopic cholecystectomy by using three ports. Two 10 mm ports (epigastric and umbilical) while one 5 mm port (right hypochondrial) was inserted to perform the procedure. Patients in Group B were operated by using the standard four port technique in which apart from the above mentioned ports, another port is inserted (right lumbar) to perform laparoscopic cholecystectomy. The diagnosis of acute calculus cholecystitis was confirmed by ultrasonography before including patients in the study.

Surgery was performed by a surgeon with minimum five years' experience in lap cholecystectomy. The operative time was recorded in minutes from the time of incision till the application of last skin suture. During the surgery, the number of patients in which there was injury to the bile ducts, bleeding from the liver bed, perforation of gall bladder leading to spillage of bile, and conversion of laparoscopic procedure to open surgery was documented. All patients were taught to express their post-operative pain according to the visual analogue score (VAS) on a scale of 1-10 depending upon severity. Pain was measured after 12 and 24 hours after surgery. The hospital stay was also recorded in terms of number of hours stayed in the hospital after surgery. Patients were also followed on the 7th and 14th postoperative for development of any surgical site infections. Data of all patients was entered and analyzed by using SPSS version 25. Independent sample T test was used for comparing quantitative variables while Chi square test was applied to compare

all qualitative variables taking p value of ≤ 0.05 as statistically significant.

RESULTS

The overall mean age of patients included in the study was 43.5 ± 9.88 years with a range between 23-60 years. Our study sample showed a female predominance with 95 patients (77.87%), while 27 patients (22.13%) were males. The mean overall BMI of patients included in the study was 27.99 ± 2.93 kg/m². The distribution of patients in terms of age, gender and BMI in both groups is shown in Table 1. The difference between the two groups was statistically significant.

After anesthesia fitness, 48 patients (39.34%) were classified as ASA Class I, 64 patients (52.46%) was classified as ASA Class II and the rest 10 patients (8.2%). The distribution of patients according to ASA class between the groups (depicted in bar graph below)

Table No. 1: Patient's Demographics

Variable	Group A	Group B	P value
Gender			
Male	13(21.31%)	14(22.95%)	0.827
Female	46(75.41%)	47(77.05%)	
Age (years)	43.48 ± 10.67	43.52 ± 9.18	0.978
BMI (kg/m ²)	27.79 ± 2.84	28.19 ± 3.04	0.445

Table No. 2: Comparison of outcomes in both groups

Variable	Group A	Group B	P value
Operative time (minutes)	37.13 ± 8.07	43.87 ± 7.16	0.001
VAS at 12 hours	3.90 ± 1.01	3.28 ± 0.88	<0.001
VAS at 24 hours	1.75 ± 0.92	2.31 ± 1.01	0.003
Hospital stay (days)	1.38 ± 0.64	1.27 ± 0.35	0.260
Overall Complications	11 (18.03%)	8 (13.11%)	0.454
Conversion to Open	2 (3.28%)	-	0.154
Surgical Site Infection	1 (1.64%)	2 (3.28%)	0.559
Bile duct Injury	1 (1.64%)	-	0.315
Bile leak/ Gall bladder perforation	10 (16.39%)	7 (11.48%)	0.433

Yielded a non-significant statistical difference ($p=0.341$). The mean operative time of the study sample was 40.50 ± 7.38 minutes. Comparison of operative time between groups is given in Table 2. There is a statistically significant difference between the two bundle of patients in terms of mean operation time ($p=0.001$). Postoperatively patients were asked to express their pain according to visual analogue score at 12 and 24 hours after surgery. The overall mean VAS score at 12 hours in all the patients was 3.59 ± 0.99 while it was 2.03 ± 1.05 at 24 hours after surgery. The comparison of mean VAS between both groups is also presented in Table 2. The mean hospital stay was 1.38 ± 0.64 days in three port group versus a mean

hospital stay of 1.27 ± 0.35 days in four port bundle of patients with the difference being statistically insignificant ($p=0.454$). Large number of our patients were discharged on the day one postoperatively in both groups. As regards the complications, 11 patients (18.03%) developed complications in three port group while only 8 patients (13.11%) developed complications in four port groups respectively. The difference was statistically insignificant ($p=0.454$). Two patients (3.28%) in three port group were required to be converted to open surgery while lap cholecystectomy was accomplished in rest of the patients in four port group. Out of the 2 cases, one patient was converted to open surgery due to iatrogenic CBD injury managed by repair over a T-tube while the second patient was converted to open cholecystectomy due to difficult anatomy and dense adhesions in the Clot's triangle. Only 1 patient (1.64%) in three port group and 2 patients (3.28%) in four port group developed superficial SSI with the difference being statistically insignificant (0.559). The port site involved in all cases was epigastric port and patients were successfully treated with oral antibiotics. During dissection, gall bladder perforation leading to bile leak was noted in 10 patients (16.39%) in three port group while 7 patients (11.48%) in four port, the difference was again statistically insignificant ($p=0.433$).

DISCUSSION

Laparoscopic cholecystectomy has brought a revolutionary change in the practice of surgery with an increase in the number of patients willing to undergo surgery nowadays.¹² Any effort aimed at improvement of the practice of laparoscopic cholecystectomy is therefore of significant importance. In this study, we found that laparoscopic cholecystectomy could be safely accomplished via the three port technique in experienced hands.

The mean age of our patients was 43.5 ± 9.88 years. A study by Kumar et al from India in 2018 reported a similar mean age of 42.6 years in patients undergoing laparoscopic cholecystectomy.¹⁰ Two studies from Pakistan by Sheikh et al¹³ and Shah et al¹⁴ reported a comparable mean age of 46 years and 44 ± 12.9 years. In our study, 77.87% patients were females. A study by Harsha et al reported that 76% patients undergoing laparoscopic cholecystectomy comprised of females.¹¹ In the studies by Kumar et al¹⁰ and Shah et al¹⁴, a higher percentage of 87.8% and 88% patients respectively were females.

In our study, we found a significant reduction in the mean operative time in the three ports group ($p=0.001$). Shah et al¹⁴ also reported a mean operative time of 43 minutes in three port group versus 51 minutes in four port groups respectively which was statistically significant ($p=0.002$). On the contrary, Sheikh et al¹³ reported a mean operative time of 46.0 ± 11.0 minutes in three port group versus 47.5 ± 16.6 minutes in four port groups respectively, the difference being statistically insignificant ($p=0.443$). Mirza et al¹⁵ also reported a mean operative time of 40.64 ± 12.29 minutes in three port group versus 39.17 ± 16.23 minutes in four port

group which was also statistically insignificant ($p=0.369$).

There was statistically significant less pain in the three port group as per the VAS at 12 and 24 hours after surgery ($p<0.05$). Kumar et al¹⁰ also reported that there was significantly less pain in patients in the three port group at 6 and 24 hours after surgery as compared to the four port group ($p=0.000$). Harsha et al¹¹ also reported comparable results with significantly less pain reported in the three port group as compared to the four port group ($p=0.008$). However, Mirza et al¹⁵ reported that there was no significant difference between the two groups in terms of postoperative pain ($p=0.323$).

No difference was observed between the two groups in terms of hospital stay that reach statistically significant level ($p=0.260$). Comparable results were reported in studies by Kumar et al¹⁰ ($p=0.820$), Mirza et al¹⁵ ($p=0.471$) and Koirala et al¹⁶ ($p=0.218$). Contrary to our findings, Sheikh et al¹³ reported that mean hospital stay was 2.6 ± 1.08 days in three port group versus 3.6 ± 1.42 days in four port group, which was statistically significant ($p=0.0001$).

Bile leak during dissection of gall bladder from liver bed due to perforation was the most common complication observed in our patients which was successfully managed by suction and irrigation. Kumar et al¹⁰ also reported that the frequency of bile leak was 29.3% in three port group versus 16.7% in four port group with the difference being statistically insignificant ($p=0.17$). Harshast al¹¹ also reported results which were comparable to our study.

No difference was observed between the two groups that reach statistically significant level in terms of SSI (0.559). Kumar et al¹⁰ ($p=0.39$) and Shah et al¹⁴ ($p=0.125$) also reported similar results. Similarly there was no difference between the two groups that reach statistically significant level in terms of CBD injury in our study ($p=0.315$). Kumar et al¹⁰ also reported that there was no significant difference amongst the two groups in terms of bile duct injury with the frequency being 2.2% in three port group versus 0% in the four port group ($p=0.694$).

Finally the conversion to open from laparoscopic procedure in our study was also not significant. Similar to our results, a study by Mayir et al¹⁷ from Turkey also reported that the frequency of conversion to open surgery was 1% in three port group while none of the patients in four port group required conversion to open surgery ($p=0.480$). Kumar et al¹⁰ reported that the conversion rate to open surgery was 2.2% in three port group versus 6.7% in four port group, however the difference was statistically insignificant ($p=0.135$).

Three port laparoscopic cholecystectomy was found to be superior to the standard four port technique in terms of decreased operative time and less postoperative pain while having a comparable safety profile. Another advantage of the three port laparoscopic technique is that it can be promptly converted to standard four port technique if need arises.^{18,19} The procedure is also cheaper and cost effective as compared to four port technique.²⁰ However the procedure requires considerable skill and expertise especially during

dissection in patients having impacted stones in the Hartmann's pouch, dense adhesions, and difficult anatomy of the Clot's triangle.^{10,19} Four port laparoscopic cholecystectomy is still the most commonly practiced technique employed by surgeons in our country. However further studies with systemic reviews and meta-analysis on the comparison of these two techniques consisting of larger samples and assessment of the cost-benefit ratio will help in validation of the better technique.

CONCLUSION

Three port laparoscopic cholecystectomy is better than the standard four port laparoscopic cholecystectomy in experienced hands. The former technique requires less operative time and is associated with significantly less postoperative pain. It has a comparable safety profile to four port laparoscopic cholecystectomy.

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