

Three Port Versus Standard Four Port Laparoscopic Cholecystectomy- A Prospective Study

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Abstract

The current study was undertaken to compare the safety, efficacy, cosmesis, cost effectiveness, complication rates and incidence of conversions. In a period of one year 200 patients with symptomatic GB stone disease were randomly divided into group A (100 patients) for three port technique and group B (100 patients) for standard four port technique. The outcomes were assessed based on duration of surgery, complication rates, postoperative pain, cosmesis, hospital stay and conversion rates. The mean operative time was compared and found to be less in group A. Intraoperative and postoperative complications was similar in both groups. The postoperative pain was less in group A. The mean hospital stay was less in group A (1.27 days) than group B (1.95 days). Better cosmetic results and patient satisfaction was observed in group A. 5 patients of group A required fourth port and 3 patients of group B required conversion to open cholecystectomy. The three port technique is a safe and feasible method in hands of an experienced laparoscopic surgeon. Thus it can be recommended as a safe alternative to conventional four ports laparoscopic Cholecystectomy.

Key Words

Laparoscopic Cholecystectomy, Three Port, Four Port Cosmesis

Introduction

The first laparoscopic cholecystectomy (LC) was performed in 1987 by Philip Mouret and later established by Dubois, Perissat, Reddick, and others in 1990's (1-3). Since then, there have been many changes and improvements in the technique. Traditional LC is performed using 4 - port technique. The fourth (lateral) trocar is used to grasp the fundus of the gall bladder so as to expose the Calot's triangle (1, 3, 4). With increasing surgeon experience, LC has undergone many refinements including reduction in port size and number. It has been argued that the fourth trocar may not be necessary, and laparoscopic cholecystectomy can be performed safely without using it (1, 5-8). In India, first case was performed by T.E.Udwadia in Mumbai in 1991 (9). Laparoscopic Cholecystectomy has become the gold standard for treatment of gallbladder stone disease (10).

This is a prospective study over a period of one year of 200 patients, comparing the safety and efficacy in reducing the number of ports from four to three in Laparoscopic Cholecystectomy.

Material and Methods

This study was conducted in the Department of Surgery of ASCOMS & Hospital, Jammu, India, for one year. Two hundred patients with symptomatic gallstone disease were admitted for elective surgery and randomized into two groups viz. group A (100 pts) subjected to the three port technique and group B (100 pts) subjected to the conventional four port technique. The patients were initially evaluated and worked up in the out-patient department including ultrasound abdomen and then admitted for surgery after taking an informed consent. All patients were screened and those who were

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not fit for general anesthesia ASA Grade IV, patients with significant portal hypertension, acute pancreatitis, uncorrectable coagulopathies, suspected/ proven malignancy and choledocholithiasis were excluded from the study group. The patients of both groups were given the same kind of anesthesia with a standard protocol. Prophylactic dose of antibiotic was given just prior to induction. Urinary bladder was emptied before shifting to operation room. Operative room was set up in accordance with American technique viz., surgeon standing on left side with his first (camera) assistant, while second assistant (in group B) and staff nurse standing on the right. Primary placement of 10mm umbilical (camera) port by blind method. Second 10mm (main working port) is inserted in epigastrium; another 5mm (accessory working) port placed in the mid-clavicular line just below the right costal margin and fourth 5mm port is inserted in group B patients in the anterior axillary line at the level of umbilicus. In group A the technique of cholecystectomy was same except the use of fundal retraction port in group B. A negative suction drain (optional) was inserted through mid-clavicular port (group A) and mid-axillary port (group B) in cases of bile/stone spillage. The outcomes were measured in terms of operating time, conversion rate, intra-operative complications, immediate post-operative complications, pain score, analgesic requirement and hospital stay. Conversion rate included conversion to standard four-port technique or open cholecystectomy (OC) in group A and conversion to OC in group B. Intra-operative complications include gall bladder wall perforation, bile leak, bleeding from liver bed, iatrogenic liver injury and bile duct injury. Postoperative analgesia was recorded by VAS (11) and number of analgesics required. In all patients the same analgesics, initially intravenous analgesics during the hospital stay and on discharge oral analgesics were used on need basis. Pain score was measured using visual analog score (VAS) every 12 and 24 hourly. A VAS score 1-3 is called as low pain score (mild) and 4-10 as high pain score (severe).

Statistical tests

The Student's t test, chi square test, Z test with standard deviation was used to evaluate the difference in each parameter. A p value <0.05 was considered statistically significant. Statistical Package for Social Science version 11.5 for Windows (SPSS, Chicago, Illinois) was used for statistical analysis.

Results

In this present study, a total of 200 patients, 100 patients in group (three port) A and 100 patients in group (standard four port) B were included. Both the groups were similar with regard to demographic characteristics (*Table 1*). In our present study, mean operative times were: Group A 54.65 ± 23.55 min.; Group B 57.76 ± 30.80 min. The mean operative time in Group A (3port) was less but difference was not statistically significant ($p > 0.05$) (*Table 3*). The incidence of conversions in our study groups and reasons for conversion were: Group A (3 port) had five conversions to 4 port method; reasons were difficult anatomy of Calot's Triangle; distended Hartmann's pouch obscuring the anatomy; tortuous right hepatic artery; long cystic duct joining the common hepatic duct at a lower level; intra-hepatic gallbladder with a wide cystic duct. No conversions of 3port to open. Group B (4 port) had three conversions to open method; due to thick vascular adhesions of inflamed gallbladder with duodenum, stomach and transverse colon; hour glass gallbladder with long cystic duct in which there was cystic artery bleed due to slippage of clips applied on the stump of artery which could not be controlled laparoscopically; anomalous leash of vessels overlying the cystic duct. The intra-operative complications in our present study are described in *Table 2*. There was no case of CBD injury and no intra/postoperative mortality. The postoperative complications in our present study groups are depicted in *Fig 1*. The requirement of analgesics in two groups was in range of one to two injections (inj. Diclofenac/ inj. Tramadol). 61 patients of group A and 66 patients of group B required analgesia in the postoperative period ($p > 0.05$). There were no patients with postoperative bile leak/ jaundice, respiratory/cardiovascular complications. There were 12 port site infections in group A and 11 in group B ($p > 0.05$). In present study the mean VAS was higher in group B (3.04 ± 1.91) versus group A (2.23 ± 1.69) (*Table 4*). The postoperative hospital stay in our present study was a mean stay of 1.27 days in group A versus 1.71 days in group B ($p < 0.05$). The cosmetic effect of surgery was evaluated after one week of surgery by asking the patient to assess aesthesia. All patients in both groups were satisfied with the cosmesis except in patients who underwent conversions to open method. The cost benefit ratio of reducing the number of ports lies in the fact that second assistant surgeon is not required, requires lesser number of ports, less instrumentation in form of fundus grasper which reduces the cost of surgery. In our study

Table I. Distribution of Mean Age in Relation to Sex in two Groups

Sex	Group A			Group B		
	No. of Patients	Mean (age in years)	S.D.	No. of Patients	Mean (age in years)	S.D
Male	15	47.8	15.99	34	47.59	13.73
Female	85	38.71	13.94	66	51.33	11.72
Total	100	40.08	14.64	100	50.66	12.56

Table 2. Intra-operative complications in the Two Study Groups

Intra-operative findings	Group A N= 100	Group B N= 100	Chi square value	P Value
GB perforation	25	18	1.46	>0.05
Stones spillage	22	12	3.54	>0.05
Bleeding from the liver bed	32	44	3.06	>0.05
Cystic artery bleeding due to slippage of the clip	0	3	-	-

Table3. Mean Operative Times in the Two Groups

Sex	Group A				Group B			
	No. of Pts	Mean (minutes) X1	S.D.	No. of Pts	Mean (minutes) X2	S.D.	Z value	P value
Male	15	48.61	21.04	34	61.26	28.32	1.73	>0.05
Female	85	55.71	23.81	66	55.95	31.86	0.05	>0.05
Total	100	54.65	23.55	100	57.76	30.80	0.8	>0.05

instruments were reusable and this also would further reduce the cost of surgery in 3 port group.

Discussion

In the era of laparoscopic surgery, less postoperative pain and early recovery are major goals to achieve better patient care and cost effectiveness. Several studies demonstrated that less post operative pain was associated with reduction in either size or number of ports (1, 12, 13). The use of fourth trocar is considered unnecessary by some surgeons while few of them used futures to retract gallbladder fundus. In our present study we have experienced the almost same demographic

profile as in other studies (14-17). Intraoperative gallbladder perforation is a common complication encountered in LC and its incidence lies between 16% and 33%. Its incidence in the study of Harsha HS *et al* (2013) was more favorable than in other studies and even less in the three port group (13, 18). Our study reported GB perforation of 25 in three port and 18 cases of four port ($p>0.05$). Furthermore, the results of three port technique were more favorable in that it reduced pain, so that fewer analgesic injections were needed for pain control. Similar results were shown by a study conducted in Ireland, Nepal and other places (1, 12-14, 19). In

Fig I. Postoperative Complications in Two Groups

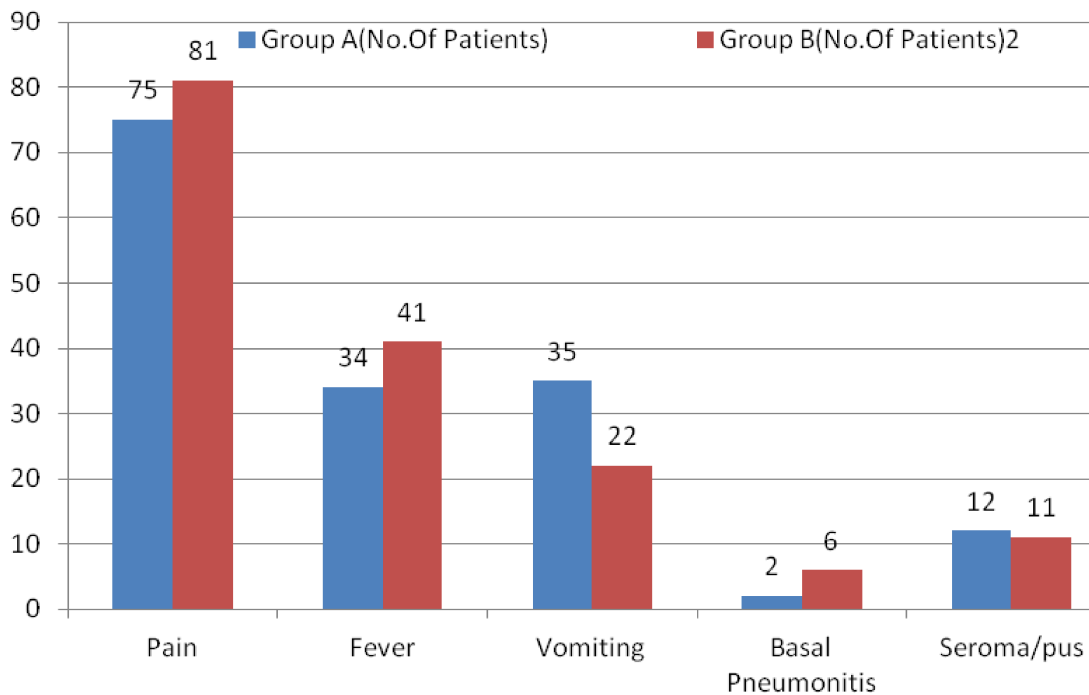


Table 4. Visual analogue Score in the Two Groups

Sex	No. of Pts	Group A Mean (cm) X1	S.D.	No. of Pts	Group B Mean (cm) X2	S.D.	Z value	P value
Male	15	2.6	1.99	34	3.12	1.64	0.56	>0.05
Female	85	2.16	1.62	66	3	2.07	2.71	<0.05
Total	100	2.23	1.91	100	3.04	1.69	3.12	<0.01

present study postoperative analgesia requirement were almost similar in both the groups. The overall intraoperative complications in our study occurred with almost equal rate with both the techniques ($p>0.05$). The results show that the three port technique yields the same success rate as the four port one. The postoperative nausea and vomiting were comparable in both groups. We believe that with defined protocols, both techniques can be safely performed. It was also interesting that mean operative time was shorter for three ports LC, which does not correlate with previous studies (13, 19, 20). One explanation for the shorter operative time in the three - port group is that less time was spent on the establishment

and subsequent closure of the additional port. One finding consistently noted in our study was that three port LC was slight difficult to perform with long gallbladder with a long peritoneal fold. This was because the fundus of gall bladder repeatedly fell toward the area of the dissection in calot's triangle. This finding was consistent with the study conducted in Nepal (13, 21). Trichak S. & Gupta A. et al reported VAS score to be less in 3 port than in 4 port group which correlated with our study ($p<0.01$) (15, 17). Gorini P.(22) mentioned advantage of 3 port method as an apparent reduction in cost (1,340,000 in 3 port versus. 1,636,000 Italian lira in 4 port); reduction of expenses for surgical ports and related instruments

assessed at about 18% and calculated that for every 5.5 operations, instruments for one additional cholecystectomy are entirely funded (22). However all the results suggest that the three port LC technique was not difficult to master and could be safely performed by trained personnel (12, 13, 15). Conversion to standard four port laparoscopic procedure should be undertaken wherever necessary. The most important aspect of any surgical procedure is its safety and complications. Some surgeons have expressed concerns about the safety of the three port technique, arguing that it may lead to a higher percentage of bile duct injuries (13, 18). However, bile duct injury can be avoided if the gallbladder is gripped at the infundibulum, retracted laterally and beginning the dissection at infundibulum-cystic duct junction rather than cystic duct-common bile duct junction.

Conclusion

It is recommended that three port method of laparoscopic cholecystectomy is a safe procedure with no extra complications in the hands of an experienced surgeon. Secondly it is recommended that the surgeon should not hesitate to put fourth port to ensure safe completion of Surgery. The conversion should not be taken as failure of the method but as a method for safe completion of the procedure.

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