

Safety and Effectiveness of Three-Port Laparoscopic Cholecystectomy: A Prospective Study

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Abstract: *Laparoscopic cholecystectomy currently stands as the gold standard in the treatment of symptomatic biliary lithiasis. Surgeons are now striving to be even less invasive by reducing the size of the ports or their number. The present comparative study was conducted to evaluate the feasibility of reducing port number without compromising the safety in cases of laparoscopic cholecystectomy. All the results suggest that the three port laparoscopic cholecystectomy technique can be safely performed by trained personnel.*

Keywords: Laparoscopic cholecystectomy, Cholelithiasis, Gall stone disease

1. Introduction

Cholelithiasis is the most common and important cause of biliary tract disease. Clinical presentation ranges from asymptomatic to highly morbid gangrenous cholecystitis, choledocholithiasis and gall stone pancreatitis [1]. The surgical management of gallstone disease is cholecystectomy [2]. Conventional Laparoscopic Cholecystectomy (CLC) is performed by using four trocars. The fourth trocar is used to retract the liver for better exposure of Calot's triangle (French technique) or to grasp fundus of the gall bladder, pulling upward and outward to expose Calot's triangle (American technique) [3]. With increasing surgical expertise, it has been argued that the fourth trocar may not be necessary and laparoscopic cholecystectomy can be performed safely without using it [4]. Several studies have demonstrated that less post-operative pain is associated with a reduction in either size or number of ports [5]. A prospective clinical study was done to explore the feasibility of reducing port number without compromising the safety in cases of laparoscopic cholecystectomy and to evaluate the real outcomes associated with it in terms of operating time, peri-operative complications, post-operative pain, length of hospital stay and patient satisfaction.

2. Material and Methods

The present study was carried out from March, 2016 to Dec, 2017 on consecutive hundred (100) patients of age between 18–75 years with symptomatic cholelithiasis admitted to our institute for elective cholecystectomy. Patients were allotted by lottery method into three port laparoscopic

cholecystectomy (03PLC) or four port laparoscopic cholecystectomy (04PLC) study group (50 cases in each study group). BMI more than 35, previous upper abdominal surgery, acute cholecystitis, bile duct stones, gall stone pancreatitis, ASA grade > II, pregnancy, Mirizzi's syndrome, suspected gall bladder malignancy, immunocompromised patients were excluded from the study.

All the patients underwent routine blood examination including liver function test and any additional test required for pre-anaesthetic checkup. After obtaining proper consent, surgery was performed under general anesthesia. Nasogastric/oro-gastric tube was used to decompress the stomach; pneumoperitoneum was created using veress needle at umbilicus and intraperitoneal pressure of 12–14 mm of Hg was attained.

First 10 mm port was inserted into the abdomen through periumbilical region. The laparoscopic (0-degree scope) view was established and then, the abdominal cavity was visually explored. Patient was placed in reverse Trendelenburg position (30°) with 15° to left to clear the abdominal organ from gall bladder and subsequent ports were inserted under direct vision of camera [6], [7]. Second 10 mm port and third 5 mm port was placed in sub-xiphoid location and right sub-costal region respectively.

Additional 4th port was placed in right anterior axillary line at the level of umbilicus in cases where 04PLC was being performed or as per the requirement while performing 03PLC. This port was used to elevate the fundus of

gallbladder toward the right shoulder; this retraction provided exposure to the infundibulum and porta hepatis.

The gallbladder infundibulum was retracted inferolaterally to open the Calot's triangle. Calot's Triangle was exposed and dissected. Cystic duct and artery were identified, secured with clips and divided. Dissection to mobilize gall bladder from liver bed was then performed. After cholecystectomy, gallbladder was extracted through 10mm epigastric port with/without using a specimen bag. The decision of placing the drain was taken as per the spillage of bile or bleeding from gall bladder fossa. The fascial incision (10mm port in epigastric region) was closed by No.1 vicryl and skin was approximated. The specimen extracted was sent for histopathological examination.

Injection Ciprofloxacin 200 mg single dose was given at the time of induction of anesthesia. Subsequent antibiotic dose was given in the case of spillage of bile, empyema and mucocele gall bladder. The gallbladder fossa was infiltrated with five ml of injection bupivacaine 0.25%. Tablet Diclofenac 50 mg was given twice a day routinely to all patients during post-operative period. Rescue analgesia in the form of injection Diclofenac 75 mg intramuscular was given to the patients with break through pain as rated on visual pain score (VAS) which was further recorded.

The patient was discharged when he/she was pain free (drain removed if placed) and was accepting orally. Assessment of scar and patient satisfaction of the procedure was done on follow up visits at 8th post operative day and six weeks after surgery.

Data was recorded, compiled and subjected to statistics analysis. All statistical analysis was conducted using SPSS 21.0 version statistical software. The level of significance was set at 0.05. The data was expressed in mean \pm standard deviation or median range. The continuous variables were compared with the student t-test or Mann-Whitney U-test, Kolmogorov-Smirnov t-test as appropriate, whereas categorical variables were compared with χ^2 test or Fisher exact test as appropriate. Statistically significant result was defined as p value less than 0.05.

3. Results

Both the groups were stitistically compared with respect to Age, sex and BMI. The outcomes observed have been described in table 1.

Table 1: Comparison of outcomes between both sugeries

	O3PLC	O4PLC	p-value
Mean Operating time	43.82 \pm 4.16	50.26 \pm 4.67	0.000
Mean Pain score at zero hr	8.28 \pm 1.21	8.94 \pm 0.87	0.007
Mean Pain score at 1 hr	7.28 \pm 1.21	8.36 \pm 1.08	0.000
Mean Pain score at 6 hr	4.56 \pm 1.13	5.34 \pm 1.02	0.010
Mean Pain score at 12 hr	2.5 \pm 0.68	3.88 \pm 0.59	0.000
Mean Pain score at 24 hr	1.96 \pm 0.45	2.78 \pm 0.50	0.000
Mean Pain score at 48 hr	1.2 \pm 0.40	2 \pm 0.45	0.000
Hospital Stay (hrs)	34.68 \pm 7.98	49.08 \pm 4.80	0.000

During follow up all patients were satisfied with surgery. In each group, 90% had symptomatic relief. The scar cosmesis, assessed using visual analogue scale, has been described in table 2.

Table 2: Comparison of scar cosmesis

Scar Score	O3 PLC	O4 PLC	p value
V	28	3	0.000
VI	22	35	
VII	0	12	

4. Discussion

In the era of minimally invasive surgery, less post operative pain and early recovery are major goals to achieve better patient care and cost effectiveness. Gall stone disease is a global health problem [8]. The incidence is 10-20% of the whole adult population. The surgical treatment of gall stone disease got revolutionized after introduction of laparoscopic surgery [6]. Since its introduction in the last century laparoscopy has substantially modified the basic concepts and goals of modern surgery, shifting the focus towards reducing operative trauma and recovery time and improving cosmetic results.

Today, laparoscopic cholecystectomy currently stands as the gold standard in the treatment of symptomatic biliary lithiasis [6]. Because of its clear advantages over open cholecystectomy in reducing recovery time, reducing post operative pain, shortening hospital stay and allowing patients an earlier return to everyday living. After the success of traditional O4PLC, surgeons are now striving to be even less invasive by reducing the size of the ports or their number [4], [5]. The present comparative study was conducted to evaluate the feasibility of reducing port number without compromising the safety in cases of laparoscopic cholecystectomy

It was observed that mean operating time was shorter in O3PLC, which does correlate with previous studies [4], [9], [10]. One explanation for the shorter operating time in the three port group is that less time was spent on the establishment and subsequent closure of the additional port. There was no conversion to open procedure in either group but two cases of O3PLC required one additional port because of long gall bladder with adhesion as the fundus of gall bladder repeatedly fell toward the area of dissection in the Calot's triangle.

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 injury [10], [11]. However, bile duct injury can be avoided if the gall bladder is gripped at the infundibulum, retracted laterally and beginning the dissection at infundibulum-cystic duct junction rather than cystic duct-common bile duct junction. In our study, none of the patients developed biliary tract injures. These results were consistent with the study done by Mayir et al [12].

The post operative pain scores were lower throughout the post-operative period in O3PLC group is compared to O4PLC

group, however lowered pain scores were statistically significant at post operative period 06 hours [p value 0.010], 12hrs [p value 0.000], 24hrs [p value 0.000]. These figures are comparable with studies published by Manoj et al, Harsha et al, Al Azawi et al and Wilkinson et al [4], [5], [9], [10].

In patients with three port method, length of hospital stay was less in contrast to four port laparoscopic cholecystectomy (p value is 0.000) and was comparable to other studies performed by Harsha et al and Manoj et al [4], [9]. Shorter hospital stay was because of less pain and fewer requirement of analgesics and was of cost effective benefit of this technique.

We believe that the improved cosmetic effect should not be assessed as primary outcome because it is only a natural consequence of reducing the port number and does not justify increasing the risk of intra operative or post operative complications. More than 90% patients in both groups had assessed their respective procedure as very good, but 10% patients had assessed the procedure as good but no symptomatic relief and none complained of poor outcome of the procedure. Regarding evaluation of cosmetic results, patients in both the groups had accepted their scar as cosmetically good. Scar score was better in three port group.

5. Conclusion

The study concluded that 03 PLC is comparable to 04 PLC (CLC) in terms of operating time, perioperative complications and hospital stay with lowered post operative pain score, better cosmetic outcome and better patient's satisfaction. All the results suggest that that the three port laparoscopic cholecystectomy technique can be safely performed by trained personnel. However more comparative studies on large sample size are required to further validate our results.

6. Limitations

This study was unicentral with small study group. All consultant surgeons involved in this study were expert in minimally invasive surgeries as well, so they did not face much difficulty in doing these procedures.

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