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Original Research Article

A Study of Three-Port versus Four-Port Laparoscopic Cholecystectomy

Alakh Narayan[1], Jawed Akhtar[2], Pranava Dutta Verma[3], Rajnish Chandran[4], Vivek Vaibhav[5]

[1]Assistant Professor, Department of General Surgery, NMCH ,Patna
[2]Assistant Professor, Department of General Surgery, NMCH, Patna
[3]Professor, Department of General Surgery, NMCH, Patna
[4]Assistant Professor, Department of General Surgery, NMCH, Patna
[5]Junior Resident, 3rd Year PG, Department of General Surgery, NMCH, Patna

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Corresponding Author: Dr. Rajnish Chandran
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Abstract:

Background and Objectives: Kelling introduced a visualizing scope for the first time in the peritoneum of a dog, it was a landmark in the history of surgery The objective of this study was to investigate the technical feasibility, safety and benefit of three-port laparoscopic cholecystectomy (LC) over the conventional standard four-port LC as routine setup.

Materials and Methods: A total of 50 patients willing to participate in the study with valid consent were allocated into two groups bycomputer generated chit system. The first group, three-port LC group consisted of 25 cases and the second group, the standard four-port LC group consisted of 25 cases were analyzed for the following outcome measures namely conversion rates, operating time, intra-operative complications, post-operative pain score, analgesic requirement and hospital stay.

Conclusion: three-port LC is technically safe and feasible with less post-operative pain score, less analgesic requirement, less hospital stay with comparable operating time and complications when compared to four- port LC. Three-port is also associated with less scars and cosmetic superiority.

Keywords: laparoscopic cholecystectomy, Standard port laparoscopic cholecystectomy, Three-port laparoscopic chole- cystectomy.

Introduction

In 1901, when Kelling introduced a visualizing scope for the first time in the peritoneum of a dog, it was a landmark in the history of surgery. [1] However, it took another eight decades for a perfected laparo-scopic technique to be implemented, when for the 1 time, Mouret performed a successful laparoscopic cholecystectomy (LC) in 1987 and later established by Dubois and Perissat in 1990. [2,3] LC is now the gold standard treatment of symptomatic gallstone disease. [4] Standard LC is performed by using four trocars. [5,6] The fourth trocar is used to retract the liver for better exposure of Calot's triangle (French technique) or to grasp the fundus of the gall bladder, pulling upward and outward to expose Calot's triangle (American technique). [7] In recent years, many investigators have attempted to improve the established technique of LC. The goal has been to minimize the invasiveness of this procedure by re-ducing the number and size of-ports, arguing that the fourth trocar may not be necessary and LC can be performed safely without it. Fortunately, several studies have reported three-port LC was technically possible. [7,8]

Our aim of this study was to investigate the technical feasibility, safety and benefit of three-port LC versus conventional four-port LC as a routine procedure in our set up.

Materials and methods

This was simple comparative study performed in the Surgical Gastroenterology and Minimal Access Surgery unit, Department of Surgery, at Nalanda Medical College and Hospital Patna, Bihar. Study duration of Two years. The study was carried out after obtaining approval from Institutional Ethical Committee.

A total of 50 patients were diagnosed to have gall stone disease and confirmed on ultrasound examination, who are willing to participate in the study and giving valid consent were included in the study. They were allocated into two groups by computer generated simple random sampling method into three-port LC group and four-portLC group each 25 patients.

Patients with suspected common bile duct stones, history of obstructive jaundice, gallstone pancreatitis, acute cholecystitis or endoscopic retrograde cholangiopancreatography in the last 1 week were excluded from the study. Pre-operative work-up was carried out, which included complete history, clinical examination and standard laboratory investigations for the fitness of surgery including ultrasonography of abdomen. All patients were given the same anesthetic drugs with standard anesthetic protocol for induction and maintenance (Propofol, isoflurane, nitrous oxide, oxygen, atracurium). In standard four-port technique one 10 mm umbilical port (camera port), another 10 mm epigastric port 5 cm below the xiphisternum (main working port), one 5 mm port in the right midclavicular line 5 cm below the right costal margin (accessory working port) and another 5 mm port i.e., the fourth port in the right anterior axillary line at the level of umbilicus were used. In three-port technique the fourth port was not used otherwise the procedure remained the same as the standard technique The outcomes were measured in terms of operating time, conversion rate, intra-operative complications, immediate post-operative complications mainly nausea and vomiting, pain score, analgesic requirement and hospital stay. Conversion rate included conversion to standard four-port technique or open cholecystectomy (OC) in three-port group and conversion to OC in standard laparoscopic technique. Intra-operative complications include gall bladder wall perforation, bile leak, bleeding from liver bed, iatrogenic liver injury and bile duct injury. In all patients the same analgesics, initially parenteral analgesics during the hospital stay and on discharge oral analgesics were used on need basis (Injection diclofenac sodium 75 mg/dose and tablet aceclofenac sodium 100 mg/dose). 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).

Results

In this study, a total of 50 patients, 25 patients each in three-port group and standard four-port group were included. The results were calculated using SPSS version20 for windows. Both groups were similar with regard to demographic characteristics [Table 1].

Table 1: Demographic data of the study groups

Parameter	Three-port mean ± SD)	Four-port (mean ± SD)	*P* value
Age in years	39.10±13.93	40.48±11	0.862
Weight in kg	53.64±9.60	54.08±8.15	0.704
Sex ratio(male:female)	8:17	4:21	0.185

The port configuration in three-port group is presented in Figure 1.

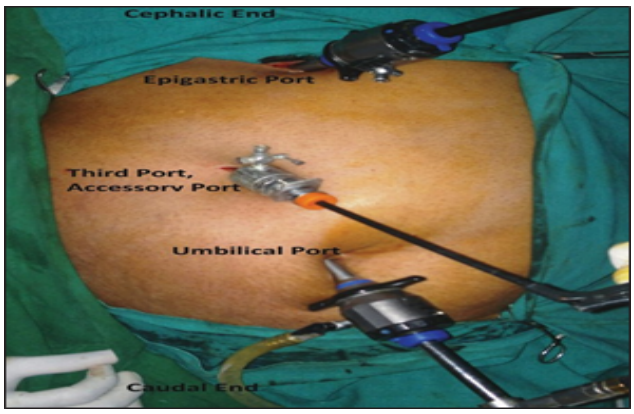

Figure 1: Three-port configuration

The conversion rate was nil in both groups. The mean operating time in three-port group (44.00 ± 7.217 min) and four-port group (47.60 ± 6.633) was comparable (P = 0.073). The outcome of the study is presented in Table 2.

Table 2: Comparison of the study variables in bothgroups

Parameter	Three-port	Four-port	*P* value
Operating time in min	44.00±7.217	47.60±6.633	0.073
Intra-operative complications	9	11	0.761
Post-operative pain score on visual analogue scale	2.20±1.108	2.96±0.841	0.008*
Analgesic injection	2.72±0.737	3.48±0.653	0.0001*
Analgesic tablet	4.00±0.816	4.72±0.678	0.001*
Hospital stay	1.72±0.678	2.24±0.523	0.004*

The intra-operative complications are summarized in Table 3.

Table 3: Intra-operative complications in bothgroups

Parameter	Group A	Group B	P value
Gall bladder wall perforation	3	4	0.691
Bile leakage – not clinically significant	3	3	1.00
Bleeding from liver bed	3	4	0.691
Iatrogenic liver injury	0	0	—
Bile duct injury	0	0	—

The pain score and hospital stay are summarized in Figures 2 and 3.

Discussion

In the era of laparoscopic surgery, less post-operative 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. [9,10]

Intra-operative gallbladder perforation is a common complication encountered in LC and its incidence lies between 16% and 33%.[11] In our study, perforation of gallbladder occurred in three patients of the three-port group (12%) versus 4 (16%) in the four-port group. Its incidence in our study was more favorable than in other studies and even less in the three-port group. The overall intra-operative complications occurred more with four- port group than in the three-port group.

The results show that the three-port technique yieldsthe same success rate as the four-port one. 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. The three-port group took fewer analgesic tablets compared with the four-port group, which was statistically significant ($P = 0.001$).

Similar results were shown by a study conducted in Ireland, Nepal and other places. [7-10] The hospital stay was statistically significant in our study group (P = 0.004), patients in three-port group were had shorter hospital stay compared to four-port group. The post-operative 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-port LC, which does not correlate with previous studies. [3,7] 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 gallbladder repeatedly fell toward the area of dissection in Calot's triangle. This finding was consistent with the study conducted in Nepal. [6] However, all the results suggest that the three-port LC technique was not difficult to master and could be safely performed by trained personnel. [5,9] In the beginning of the study, we used a stay suture from the abdominal wall in difficult cases. Difficulty may also be in obese patients due to heavy liver, but fortunately these patients are rare in our set up. 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. [11] 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. We did not experience any bile duct injury in our study.

Conclusion

We conclude that the three-port LC technique is feasible, safe and has similar clinical outcomes to thoseof the conventional four-port LC. There is no increase in the bile duct injuries but a reduced need for analgesics and less number of hospital stay. It can be a viable improvisation of LC.

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