CLINICAL STUDY

Comparison of 3-Port versus 4-Port Laparoscopic Cholecystectomy – A Prospective Comparative Study

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ABSTRACT

Laparoscopic cholecystectomy (LC) is the gold standard treatment for gallstones. Since its inception in 1987, it has undergone various changes, with reduced number of ports from standard 4-port LC to 3-port LC being one of them. Three-port LC has been shown to be equal to standard 4-port LC in terms of safety, complications, pain and hospital stay. We conducted a prospective comparative study amongst these two techniques. Three-port LC was found to be superior in terms of less postoperative pain, less need of analgesia, shorter hospital stay and ease of dissection. We concluded that 3-port LC is a better operative technique than 4-port LC.

Keywords: Three-port laparoscopic cholecystectomy, benefits, safety

Standard laparoscopic cholecystectomy (LC) is done by using 4 trocars. Exposing Calot's triangle for satisfactory anatomical details is of paramount importance in safe and proper surgery. The fourth (lateral) trocar is used to grasp the fundus of the gallbladder so as to expose Calot's triangle. The use of the fourth trocar, which is generally used for retraction of the fundus in the American technique, was found unnecessary by some surgeons[1] and LC can be performed safely without using it. With widespread advent of LC, comes the advent of reduction in port size[2]. Most of these studies have demonstrated the advantages of 3-port LC including less postoperative pain, early hospital discharge and less analgesic requirement. We did a prospective comparative clinical study to investigate the safety, and benefit of 3-port LC versus standard 4-port LC in our setup. Benefits associated with 3-port LC were compared in terms of pain on visual analog scale (VAS), requirement of analgesia and hospital discharge.

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MATERIAL AND METHODS

This was a comparative prospective study performed in the Dept. of Surgery, from January 2014 to January 2015. A total of 50 patients, diagnosed to have gallstone disease and confirmed on ultrasound examination, who were willing to participate in the study and gave valid consent, were included in the study. They were allocated into two groups of 3-port LC and 4-port LC with 25 patients in each group.

Exclusion Criteria

Patients with suspected common bile duct stones, history of obstructive jaundice, gallstone pancreatitis, acute cholecystitis.

Preoperative work-up was carried out, which included complete history, clinical examination, and standard laboratory investigations for the fitness for surgery, including ultrasonography of abdomen and liver function tests.

In standard 4-port technique, one 10 mm umbilical port for camera was made after creating capnopneumoperitoneum with closed technique, 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

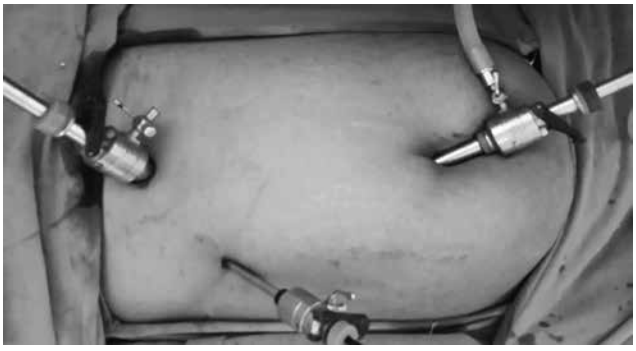

Figure 1. Three-port positions.

umbilicus were used. In 3-port technique, the 4th port (which was put at right anterior axillary line at the level of umbilicus) was not used (Fig. 1).

The outcomes were measured in terms of operating time, conversion rate, intraoperative complications, pain score, analgesic requirement, and hospital stay. Intraoperative complications include gallbladder wall perforation, bile leak, bleeding from liver bed, iatrogenic liver injury, and bile duct injury. In all patients, the same analgesics were used. Pain score was measured using 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 Analysis

The Student's *t*-test was used to evaluate the difference in each parameter. A p value <0.05 was considered statistically significant. Statistical package for Social Science version 19.0 for Windows (SPSS, Chicago, Illinois) was used for statistical analysis.

OBSERVATIONS

On comparing the two groups, we made the following observations (Table 1):

- Operating time: Mean operating time was 38.3 minutes in 3-port group while it was 41.0 minutes in the 4-port group. There was no significant difference in operating time in our study (p = 0.06).
- Conversion rate: Both the groups were equal in terms of conversion rate as it was zero in both of them.
- Intraoperative complications: There were two gallbladder wall perforations in 4-port group and no perforation in 3-port group; this was statistically significant (p = 0.02). There was no bleeding from liver bed on comparing both groups, no iatrogenic liver injury in both the groups and fortunately no bile duct injury was found.

Table 1. The Overall Endpoints of the Study

Findings	3-Port group	4-Port group	P value
Operating time (minutes)	38.3	41.0	0.06 (not significant)
Conversion rate	Nil	Nil	NA
Intraoperative complications			
Perforation of gallbladder only	0	2	0.02 (significant)
Bleeding	0	0	NA
Hepatobiliary injuries	0	0	NA
Pain score	1.8	2.9	0.01 (significant)
Analgesic requirement (number)	3.6	5.2	0.001 (significant)
Hospital stay (days)	1.3	2.4	0.02 (significant)

- Pain score: VAS on the scale of 1-10 was used. Mean score in 3-port group was 1.8, while it was 2.9 in 4-port group. This was statistically significant (p = 0.01). Three-port group had better outcome in terms of 4-port group when compared on the basis of VAS. The more pain experienced in 4-port group was probably due to more tissue trauma while putting the 4th port and putting the visceral peritoneum on more stretch.
- Analgesic requirement: Analgesic requirement was high in 4-port group. Patients in 4-port group required 5.2 injection of IV diclofenac 75 mg/2 mL/patient, while the mean requirement in 3-port group was of 3.6 injections/patient. This was statistically significant (p = 0.001), hence the analgesic requirement was significantly less in 3-port group.
- Hospital stay: Mean hospital stay was 1.3 days in 3-port group as most of the patients were discharged on the next day of surgery and it was 2.4 days in 4-port group.

DISCUSSION

At present, LC is the treatment of choice for gallbladder stones[3]. Less postoperative pain and early recovery are major goals to achieve better patient care and cost-effectiveness. These goals; however, cannot be compromised for patient safety. Since Slim et al reported that 4th port is not necessary in their 710 cases of LC, several studies have shown the technical feasibility,

Figure 2. Cystic duct completely dissected in Calot's triangle.

Figure 3. Cystic duct clipped and ready to be cut; cystic artery seen at the back of scissor.

safety, less pain, and early hospital discharge with the 3-port LC[4,5]. In our study, we demonstrated that the advantages of 3-port LC were less intraoperative complications (perforation of gallbladder only), less pain, significantly reduced need for analgesia, and shorter hospital stay. Operating time was not significantly different in the two groups in our study.

In our experience, perforations of gallbladder while dissection occurred in 4-port group because of undue and strong traction on fundus of gallbladder by assistant; there is more stretch on the tissues of gallbladder making them prone to perforation. Most of the studies comparing these two techniques conclude that there are either no or equal intraoperative complications, but we could prove that gallbladder perforation and subsequently bile spillage was more in 4-port group. Another surgical aspect that we observed is that the operating surgeon has full control while doing dissection of Calot's triangle and posterior and anterior peritoneal folds were dissected easily. So, skeletonization of cystic duct and artery becomes very easy, because there is no stretch on gallbladder and it is more mobile for dissection (Figs. 2 and 3).

Less pain and significant reduction of analgesia has been a strong push for reduced port surgery. Our study is in accordance with most of the other studies[2,5-7]. Less tissue dissection in abdominal wall, low stretch on visceral peritoneum significantly reduce the postoperative pain and shorten the hospital stay.

Significant reduction in pain and requirement of analgesia translates into shorter hospital stay in 3-port LC group. The reduction in hospital stay has been proved by many of the studies[5,7]. Three-port LC technique is easy to perform as compared to 4-port LC and can be safely performed after good training in LC.

CONCLUSION

We conclude that the 3-port LC technique is feasible, safe and has better outcomes as compared to those of the standard 4-port LC in terms of postoperative pain, need for analgesia, and shorter hospital stay. The surgical technique is easy and dissection much easier. It is a better technique over 4-port LC.

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