ORIGINAL ARTICLE

Number of Ports in Laparoscopic Cholecystectomy: 3 or 4?

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ABSTRACT

Aim: To compare 3 ports versus conventional 4 ports laparoscopic cholecystectomy.
Design of the Study: It was a randomized controlled trial.
Place and Duration of Study: This study was carried at the Department of Surgery, Sir Ganga Ram Hospital, Lahore over 6 months from March 2017 to September 2017.
Methods: The study involved 100 patients with symptomatic gallstone disease. These patients were randomly divided into two treatment groups; Group-A underwent conventional 4 ports laparoscopic cholecystectomy while Group-B underwent 3 ports laparoscopic cholecystectomy. Operating time, CBD injury, need for conversion, post-operative pain, length of hospital stay and wound infection were noted and compared between the groups. Written informed consent was taken from every patient.
Results: The mean age of the patients was 41.9±6.8 years having a female predominance with male to female ratio of 1:1.9. The experimental 3 ports laparoscopic cholecystectomy was superior to 4 ports laparoscopic cholecystectomy in terms of significantly lower mean VAS score for pain (2.44±0.61 vs. 4.52±1.07; p-value<0.0001) 24 hours after the surgery. However, there was no significant difference in terms of frequency of conversion to open cholecystectomy (4.0% vs. 2.0%; p-value=0.558), CBD injury (2.0% vs. 0.0%; p-value=0.315), and wound infection (6.0% vs. 8.0%; p-value=0.695).
Conclusion: In the present study, 3 ports laparoscopic cholecystectomy was associated with significantly lesser post-operative pain on visual analogue scale 24 hours after the surgery as compared to conventional 4 ports laparoscopic cholecystectomy without any compromise on safety of the procedure. This advantage of 3 ports LC was unaffected by patient's age, gender, obesity and duration of disease.
Keywords: Laparoscopic Cholecystectomy, 3-Ports, 4-Ports

INTRODUCTION

Cholelithiasis is the formation of stones in the gallbladder which affects approximately 10% of the general population. It is a multifactorial disease and is affected by a number of genetic as well as environmental factors[1]. About 20% to 40% patients remain asymptomatic and rest present to hospital with either biliary colic or complication like biliary pancreatitis[2]. The preferred treatment option for symptomatic gall stones and chronic cholecystitis is cholecystectomy Laparoscopic cholecystectomy (LC) is widely acknowledged as the definitive management for symptomatic gallstone disease[3]. Various prospective randomized control trials have been performed which show laparoscopic cholecystectomy to be superior to open procedure in terms of cosmesis, pain and postoperative recovery[3,4].

With improved experience and advanced instrumentation, many variations in laparoscopic technique have been devised in an effort to improve the outcome, keeping in mind two important concerns of the patients being post-operative pain and cosmesis. Because of the success that has been obtained with traditional LC, surgeons are now striving to be even less invasive by reducing the size of the ports or their number. Theoretically, if surgical trauma is reduced to a minimum, it will lead to improved outcomes in pain management, patient comfort, postoperative complications, and shortened hospital stay[5]. Conventional laparoscopic cholecystectomy is performed by the placement of 4 ports; sub umbilical, sub-xiphoid, Right sub costal and Right lumbar. A newer minimally invasive 3 ports technique has been reported in literature[6]. Multiple studies report that three-port LC hastened patients post-operative recovery by minimizing trauma yet it was safer and comparable to conventional 4 ports techniques in terms of complications like conversion to open procedure, CBD injury and wound infection[7,8]. However, as laparoscopic surgery is dependent upon the operator skills and has steep learning curve, we planned this study to assess the safety and efficacy of 3 ports approach in our setup where we normally performed 4 ports laparoscopic cholecystectomy in routine.

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PATIENTS AND METHODS

This randomized controlled trial was conducted from 25th March to 24th September, 2017 at Surgical Unit 1, Sir Ganga Ram Hospital, Lahore. The sample size of 100 cases (50 each) was estimated using 95% confidence level, 80% power of test with an expected mean pain score of 4±1.5 in 4 ports and 2.5±1 in 3 ports laparoscopic cholecystectomy in patients with symptomatic gall stones[8]. Patients of both genders aged between 18-60 years with symptomatic gall stones (single or multiple attacks of colicky pain), chronic cholecystitis (shrunken fibrosed gall bladder on ultrasound with history of recurrent attacks) were included after taking written informed consent to participate in the study. However, patients with chronic liver disease (having cirrhotic liver on abdominal ultrasound,

serum bilirubin ≥1.2 mg/dl, positive for HbsAg or anti-HCV, episodes of hematemesis), choledocholithiasis (evidence of stones in common bile duct on abdominal ultrasound), obstructive jaundice (evident by obstruction of distal common bile duct along with clinical appearance of jaundice), empyema gallbladder (described by distended gall bladder on abdominal ultrasound with fever ≥101ºF and guarding in right hypochondrium), acute cholecystitis (described by pericholecystic fluid and gall bladder wall edema on abdominal ultrasound with clinical presentation of fever ≥101Fº) were excluded. Operating time, CBD injury and need for conversion to open cholecystectomy were noted during the surgery. Following surgery, post-operative pain was recorded after 24 hours using visual analogue scale. Patients were given standard post-operative care consisting of antibiotics and analgesics and wound infection was labeled if there was redness around the wound with discharge and fever (≥101ºF) up to 7 days after the surgery. Patients were discharged home when they were passing flatus, tolerating oral food and mobilized. Length of hospital stay was noted in days from the day of surgery till discharge. All this data was noted on a predesigned proforma along with demographic details of the patient. Patient's age, BMI, duration of disease, VAS score for pain, operating time and length of hospital stay has represented by Mean±SD. Independent sample t-test has been used to compare mean operating time, VAS score and length of hospital stay between the two groups taking p≤0.05 as significant. Patient's gender, CBD injury, need for conversion and wound infection has been shown in frequency and percentage. Chi-square test has been applied to compare the frequency of CBD injury, conversion to open procedure and wound infection between the two groups taking p≤0.05 as significant.

RESULTS

The demographic information of the patients included in this study has been summarized in Table-I. Both the study groups were comparable in terms of mean age, mean BMI, mean duration of disease and distribution of various subgroups based on gender and BMI as shown in Table-II.

The experimental 3 ports laparoscopic cholecystectomy was superior to 4 ports laparoscopic cholecystectomy in terms of significantly lower mean VAS score for pain (2.44±0.61 vs. 4.52±1.07; p-value<0.0001) 24 hours after the surgery. However there was no significant difference in terms of frequency of conversion to open cholecystectomy, CBD injury, wound infection and mean operating time and mean length of hospital stay as shown in Table-III.

Table I: Demographic features of studied patients

Characteristics	Participants
Age (years)	41.9±6.8
Gender	
Male	35 (35.0%)
Female	65 (65.0%)
BMI (Kg/m^2)	28.9±3.5
Non-Obese	55 (55.0%)
Obese	45 (45.0%)
Duration of Disease (months)	10.4±3.2

Table-II: Demographic features of study Groups (*n=100)*

Characteristics	4 Ports LC (n=50)	3 Ports LC (n=50)	P value
Age (years)	41.7±6.9	42.1±6.7	0.747
Gender			
Male	17 (34.0%)	18 (36.0%)	0.793
Female	33 (66.0%)	32 (64.0%)	
BMI (Kg/m^2)	28.5±3.5	29.4±3.5	0.176
Non-Obese	29 (58.0%)	26 (52.0%)	0.546
Obese	21 (42.0%)	24 (48.0%)	
Duration of Disease (months)	10.3±3.1	10.6±3.3	0.617

Both the study groups were comparable on chi-square and independent sample t-tests

Table-III: Comparison of various outcome measures between the study groups (*n=100)*

Characteristics	4 Ports LC (n=50)	3 Ports LC (n=50)	P value
Operating Time (minutes)	45.6±3.8	45.7±3.8	0.835
Pain (VAS score)	4.52±1.07	2.44±.61	<0.0001*
Length of Stay (days)	2.16±0.91	2.10±1.02	0.756
Conversion to Open	1 (2.0%)	2 (4.0%)	0.558
CBD Injury	0 (0.0%)	1 (2.0%)	0.315
Wound Infection	4 (8.0%)	3 (6.0%)	0.695

*The observed difference was statistically significant on independent sample t-test

DISCUSSION

During the past decade, laparoscopic cholecystectomy has gained enormous popularity among the surgeons and the patients alike and has become the gold standard treatment for symptomatic gallstone disease[3-5]. Due to its minimally invasive nature, it causes least post-operative pain and decreased analgesic requirements which enable speedy recovery with added benefits of cosmesis[5,6]. It has been performed through 4 abdominal ports conventionally. Recently the focus has shifted to 3 ports in an attempt to further improve the cosmesis and post-operative recovery[7,8]. As the local evidence was limited, need for the present study was felt.

In the present study, the mean age of the patients undergoing laparoscopic cholecystectomy was 41.9±6.8 years. A similar mean age of 41.2±10.4 years has been reported by Jamil et al[9] (2014) among patients undergoing laparoscopic cholecystectomy at Bahawal Victoria Hospital Bahawalpur. A comparable mean age of 40.2±3.3 years has been reported by Faizi et al[10] (2013) among such patients presenting at Nistar Hospital Multan. Chhajed et al[11] (2018) reported similar mean age of 41.8±11.6 years in Indian such patients. Arafa et al[12] (2019) reported similar mean age of 41.1±6.9 years in Egyptians such patients while Kirkil et al[13] (2015) reported it to be 42.4±14.7 years in Turkey. Jee et al[14] (2016) reported similar mean age of 42.5±11.6 years among patients undergoing laparoscopic cholecystectomy in Malaysia.

We observed a female predominance with a male to female ratio of 1:1.9 among patients undergoing laparoscopic cholecystectomy. Bhurt et al[15] (2020) reported similar female predominance (M:F; 1:1.9) among patients undergoing laparoscopic cholecystectomy at Services Polyclinic Hospital, Islamabad. A similar female

predominance among such patients has also been reported by Faizi et al.[10] (2013) who reported it to be 1:1.9 at Nishtar Hospital Multan. Our observation also matches with that of Pal et al.[16] (2019) who also observed similar female predominance among cholecystectomy patients with male to female ratio of 1:1.8 at Aga Khan University Hospital Karachi. A similar female predominance has also been reported by Ozkardes et al.[17] (1:2) and Kirkil et al.[13] (1:2.1) among Turkish such patients. Similar female predominance has also been reported by Chhajed et al.[11] (1:2) in India and Jee et al.[14] (1:1.8) in Malaysia. In the present study, mean VAS score for pain 24 hours after the surgery was significantly lower in patients undergoing 3 ports LC. In a similar trial in Indian patients undergoing laparoscopic cholecystectomy, Kumar et al.[18] (2016) also reported similar reduction in mean VAS score for post-operative pain with 3 ports approach (2.80±0.81 vs. 3.60±0.80; p-value<0.001). Our observation is also in line with 2 other Indian studies where Bari et al.[19] in 2019 (2.30±1.02 vs. 2.86±1.18; p-value<0.05) and Harsha et al.[20] in 2013 (2.20±1.11 vs. 2.96±0.84; p-value=0.008) also reported similar difference in mean VAS score for post-operative pain. Ruiz-Tovar et al.[8] (2013) in a similar Spanish study also observed significantly lesser pain with 3 ports approach (2.5±1 vs. 4±1.5; p-value=0.002).

We observed that there was no significant difference between 3 and 4 ports LC in terms of frequency of conversion to open cholecystectomy (4.0% vs. 2.0%; p-value=0.558), CBD injury (2.0% vs. 0.0%; p-value=0.315), wound infection (6.0% vs. 8.0%; p-value=0.695) and mean operating time (45.7±3.8 vs. 45.6±3.8 minutes; p-value=0.835) and mean length of hospital stay (2.10±1.02 vs. 2.16±0.91 days; p-value=0.756).

In a similar local study, Mirza et al.[21] (2017) didn't observe any significant difference between 3 versus 4 ports LC at PAEC Hospital, Islamabad in terms of mean operating time (40.6±12.3 vs. 39.2±16.2 minutes; p-value=0.369) and mean length of hospital stay (2.13±0.57 vs. 2.17±0.34 days; p-value=0.471) in line with the present study. Our observations are also in line with those of Harsha et al.[20] (2013) who also observed similar comparable results between 3 and 4 ports laparoscopic cholecystectomy in India in terms of frequency of CBD injury (0.0% vs. 0.0%), mean operating time (44.0±7.2 vs. 47.6±6.6 minutes; p-value=0.073) and mean length of hospital stay (1.72±0.68 vs. 2.24±0.52 days; p-value=0.004). Bari et al.[19] (2019) in another similar trial in India, also didn't report any significant difference between 3 and 4 ports laparoscopic cholecystectomy in terms of frequency of conversion to open cholecystectomy (0.0% vs. 0.0%), CBD injury (0.0% vs. 0.0%) and mean operating time (29.3±4.6 vs. 30.7±4.0 minutes; p-value=0.108) and mean length of hospital stay (2 vs. 2 days). Similar comparable frequency of conversion to open cholecystectomy (5.7% vs. 5.4%; p-value=1.00) and wound infection (5.7% vs. 8.5%; p-value=0.43) has also been reported by Koirala et al.[22] (2019) in Nepal. They also reported similar insignificant difference in terms of mean operating time (31.2 vs. 31.3 minutes; p-value=0.85) and length of hospital stay (1.2 vs. 1.5 days; p-value=0.07). In a similar study involving Egyptian patients with cholecystitis undergoing cholecystectomy Mohamed et al.[23] (2020) reported comparable frequency of conversion to open cholecystectomy (2.2% vs. 4.1%; p-value=0.29), wound infection (2.2% vs. 2.0%; p-value=0.88) and mean operating time (43.3±18.6 vs. 40.2±20.1 minutes; p-value=0.07) and mean length of hospital stay (1.17±0.13 vs. 1.32±0.21 days; p-value=0.41) between 3 and 4 ports approach.

The present study adds to the already published international as well as local research evidence on the topic. In the present study, we found that 3 ports approach during laparoscopic cholecystectomy significantly reduced post-operative pain without jeopardizing the safety of the procedure which advocates its preferred use in future surgical practice. The strengths of the present study were its large sample size of 100 cases along with randomized study design and strict exclusion criteria. We also stratified that data for various effect modifiers. A very strong limitation to the present study was that we didn't compare the two approaches in patients with acute cholecystitis where the dissection may be problematic and 3 ports approach may be difficult. Such a study would help us in determining better approach among such cases and is highly recommended in future clinical research.

CONCLUSION

In the present study, 3 ports laparoscopic cholecystectomy was associated with significantly lesser post-operative pain on visual analogue scale 24 hours after the surgery as compared to conventional 4 ports laparoscopic cholecystectomy without any compromise on safety of the procedure. This advantage of 3 ports LC was unaffected by patient's age, gender, obesity and duration of disease and therefore advocates it in future surgical practice.

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