



## TO COMPARE THE CLINICAL OUTCOME OF THREE PORT VERSUS FOUR PORT LAPAROSCOPIC CHOLECYSTECTOMY

<b>Madan Gopal Bhardwaj*</b>	Post Graduate Resident. (Dept of General Surgery, PGIMS, Rohtak). *Corresponding Author
<b>HansRaj Ranga</b>	Senior Professor, (Dept of General Surgery, PGIMS, Rohtak).
<b>Bhavinder K Arora</b>	Professor (Dept of General Surgery, PGIMS, Rohtak).
<b>Sachin Bhardwaj</b>	Post Graduate Resident. (Dept of General Surgery, PGIMS, Rohtak).

### ABSTRACT

Symptomatic gall stone disease is a common biliary pathology, and the gold standard management being four port laparoscopic cholecystectomy. Studies have however shown that the fourth port required to retract the gall bladder can be omitted and laparoscopic cholecystectomy can be safely performed by a three-port technique. We performed a randomized control trial at our institute to confirm. For this study 46 patients consented, 16 were placed the three-port group and 30 in the four-port group. Results showed that patients in the three-port group had lesser hospital stay, lesser requirement of analgesics, lower pain score [on the Numerical rating scale] and faster resumption of work. We draw the conclusion that laparoscopic cholecystectomy with three-ports can be safely performed.

**KEYWORDS :** Laparoscopic cholecystectomy, three port

### INTRODUCTION

Gallstones are the most common biliary pathology.<sup>1</sup> In India, the gallstone disease is relatively common with an overall prevalence in the order of 10-20 per cent<sup>2</sup> and is predominantly a female disease. Among males the geriatric age group is more susceptible.<sup>3</sup>

Abdominal pain is the most common symptom. Most patients with gallstone symptoms describe a constant and often severe pain in the right upper abdomen, epigastrium, or both, often persisting for 30 to 120 minutes. Symptoms are frequently reported in the epigastrium. This is usually called midline pain; however, pain occurs in the back and right shoulder in up to 60% of patients, with involvement of somatic fibers.<sup>4,5</sup>

In any year, approximately 1% to 3% of patients with gallstones experience a gallstone related complication.<sup>6</sup> These complications include acute cholecystitis, choledocholithiasis, gall stone ileus, acute pancreatitis, acute cholangitis, obstructive jaundice, empyema of gallbladder, perforation can occur in patients with or without symptoms. Patients without previous symptoms from gallstones have a slightly lower 10- year cumulative risk of complications— 3% to 4% vs approximately 6% in patients who have had gallstone-related symptoms.<sup>7</sup>

Transabdominal ultrasonography reliably documents the presence of cholelithiasis. Even in the absence of frank stones, so-called sludge found in the gallbladder on ultrasonography, with appropriate symptoms, is consistent with biliary colic.<sup>8</sup>

Carl Langenbuch performed the first successful cholecystectomy at the Lazarus hospital in Berlin on July 15, 1882.<sup>9</sup> Erich Mühe performed the first laparoscopic cholecystectomy on September 12, 1985 in Böblingen, Germany. Mühe designed his own surgical laparoscope, which he called the "Galloscope", in 1984.<sup>10</sup> The Society of American Gastrointestinal and Endoscopic Surgeons formally recognised Mühe as the first surgeon to perform a laparoscopic cholecystectomy in 1999.<sup>11</sup>

For cholelithiasis, standard treatment of choice is laparoscopic cholecystectomy with reduced postoperative morbidity, complication rate, quicker post-operative recovery.<sup>12</sup>

While performing the standard cholecystectomy the 4<sup>th</sup> port is

used to grasp the fundus of the gall bladder. Various studies have shown that the procedure can be carried out safely without the need of the 4<sup>th</sup> port meanwhile reducing post operative pain, analgesia requirement, hospital stay and needing an assistant less at the time of surgery.<sup>13,14,15,16</sup>

So, we conducted a randomised controlled study to compare the clinical outcome of three-port and four-port laparoscopic cholecystectomy.

### AIMS

To compare the clinical outcome of three port versus four port laparoscopic cholecystectomy

### OBJECTIVES

To study the operative duration time,

- duration of hospital stay,
- the complication rate,
- requirement of analgesics and
- post operative pain in 3 port and 4 port laparoscopic cholecystectomy

### MATERIAL AND METHODS

The present prospective randomized study was conducted in the Department of Surgery, Pt. B.D. Sharma PGIMS, Rohtak. A total of 46 patients consented for the study. The study was conducted between February 2020 to February 2022. Patients in the age group 18-65 years with ultrasound proven symptomatic gall stone disease, adenomyomatosis, of either sex attending surgical outdoor were recruited in this study

The cases were allocated to two randomized study groups. Group A (16 patients) underwent 3 port laparoscopic cholecystectomy as per technique. Group B (30 patients) underwent conventional 4 port laparoscopic cholecystectomy as per technique. Patients that had choledocholithiasis with or without cholangitis on ultrasound, morbidly obese patients, concurrent medical problems making them ineligible for general anaesthesia / ASA > grade 2 were excluded from the study.

Detailed history was taken, and examination carried out on all patients. A detail clinical health evaluation was done in all the patients. Consent for participation in the study, as well as, for surgery was obtained from all the patients. The patients were admitted a day prior to the day of surgery. Surgeries were performed by the same operating surgeon.

Standard four port laparoscopic cholecystectomy was performed as per technique and three port laparoscopic cholecystectomy was performed using a port at the epigastrium, another at the umbilicus and a port at the mid clavicular line beneath the costal margin. The fourth port that is usually placed at the anterior axillary line to grasp the fundus and retract the gall bladder meanwhile lifting the right lobe of liver was not used.

**Inclusion Criteria:**

Age group 18-65 years, patient having symptomatic gall stone disease

**Exclusion Criteria:**

Cholelithiasis with or without cholangitis, very obese patient, medical problems/ASA> grade 2.

**RESULTS**

**Demographic Data**

Out of 46 patients that consented to participate in the study 16 underwent 3-ports and 30 underwent 4-ports lap cholecystectomies. The age range of the 3-port group was from 27 to 62 years and for the 4-port group was from 28 to 69 years. The average for age of the 3-port group was 35.19 years and for the 4-port group was 44.97 years. The p value for the same was 0.16.

The entire 3-ports group comprised female patients the 4-ports had a total of 27 females along with 3 males. The p value for the same was 0.19.

The gall bladder was imaged using ultrasound in all the participants and in the three-port group it was found that 12 patients had multiple stones, one had adenomyomatosis and 3 had a single stone. In the four-port group it was found that 22 patients had multiple stones, 7 had a single stone and one had WES complexes. The p value was evaluated to 0.51.

During the pre-operative period, the C.B.D. was evaluated for presence of dilatation, stones, any other intra-cholelithic pathology and the diameter of the C.B.D. was estimated. We found that in the three-port group the average C.B.D. diameter was 6.51mm, ranging from 6 to 8mm. The C.B.D. diameter of the four-port group was estimated to be 7.5mm ranging from 6 to 9mm. The overall p value was 0.001.

	3 port	4 port	P value
Age	36.19±10.439	44.97±11.731.	0.16
<b>Gender distribution</b>			
Males	-	3 [10%]	0.19
Females	16 [100%]	27 [90%]	
<b>Ultrasound findings</b>			
Single stone	3[18%]	7[23.3%]	0.51
Multiple stone	12[75%]	22[73.3%]	
Adenomyomatosis	1[6.2%]	0	0.001
WES Complexes	0	1[6.2%]	
C.B.D. size	6.5±0.5mm	7.5mm±0.9mm	0.001
I.H.B.R.D. status	NIL	NIL	0.46

**Per-operative Findings**

The operative duration of three port and four-ports group were estimated and it was discovered that in the three port group the range was from 45 mins to 2 hours making the mean to be 1 hour 17 minutes for the three port group, in the four-ports group however it was 60 mins for the average amount of time required, which ranged from 50 min to 70 mins. The p value was 0.4.

Requirement for placing subhepatic drains was evaluated in both the groups. 2 out of 16 patients in the three-port group required a sub-hepatic drain. 17 patients in the four-ports group out of a total of 30 required placement of a drain. The p value for the same was 0.004.

Blood loss was evaluated in both the groups and none of the groups had a blood loss that required any kind of blood transfusion or a re-exploration of the wound.

Conversion of three port cholecystectomy to four-port or to an open cholecystectomy was evaluated and it was discovered that all the patients underwent three-port safely without the need for a conversion. On the contrary, four-ports group required two conversions to open cholecystectomy for anatomical anomalies and rest of the patients underwent four-ports cholecystectomies safely. The p value for the same was 0.29.

Out of the entire three port group none of the patients sustained a bile duct injury. In the four-ports group one patient developed bile leakage in the four-ports group and was later referred for stenting of the C.B.D. The p value for the same 0.14.

	3 port	4 port	P value
Duration of surgery	77.18±23.23	50±10	0.4
Bile duct injury	0[0%]	1[3.33%]	0.14
blood loss from cystic artery/ major vessel	0[0%]	0[0%]	0.004
Other visceral injury	0[0%]	0[0%]	
Drain placement	2[12.5%]	2[6.6%]	0.29
Need of additional port	0	-	0.29
Converted to open	0	2[6.7%]	

**Post Operative Findings**

The patients were quizzed regarding their pain based on the N.R.S. scale [ranges from 1-10]. It was found that three-port group had a range from a minimum of 4 to 6 on the N.R.S. scale, the mean was evaluated to be 4.56 with the standard deviation to be 0.89. In the four-ports group it was also found that the range was from 4 to 8 and the mean to be 6.2 with the standard deviation of 1.06. The average of both the groups was 5.63 with the standard deviation of the entire study was 1.27. The p value was 0.001.

Hospital stay was calculated for both the groups, and it was discovered that the 3-port group had a hospital stay from a range of 1 to 3 days making the average number of days a patient of the three-port group stayed in the hospital 1.68 with the standard deviation of 0.602. In the four-port group it was discovered that the mean number of days a patient stayed at the hospital was 1.83 with the range being from 1-4 days, 16 of the patients stayed a total of 2 days. The p value was 0.13.

	3 port	4 port	P value
N.R.S. Score	4.59±0.89	6.2±1.06	0.001
Hospital stay	1.68±0.602 days	1.83 days	0.13
Analgesia requirement	2.5±0.51 [injectable doses]	2.9±0.23 [injectable doses]	0.12
Work resumption	3.75±0.77	5.89±1.5	0.001
<b>FOLLOW UP</b>			
15 <sup>th</sup> day	0	2 [6.7%]	0.29
30 <sup>th</sup> day	0	2 [6.7%]	

**DISCUSSION**

Overall, the three-port group had a relatively shorter hospital stay, post operative pain conversion rate, analgesic requirement, better work resumption after surgery.

The duration of surgery in both these groups was clocked and it was discovered that in the three port group the operative time was higher, lesser number of drains were required and none of the of the patients sustained any injury. In the four port group however a single patient had a bile duct injury.

In a study done by Arora et al the operative time, vomiting and hospital stay were similar. This epigastric port was the site of infection in both the groups. The cosmetic results and patient's satisfaction to laparoscopic cholecystectomy in both the groups was equal. The overall results of three ports

laparoscopic cholecystectomy to four ports cholecystectomy were comparable.<sup>16</sup>

Harsha et al performed a similar study and found that overall intra-operative complications occurred more with four-port group than in the three-port group with same success rate as the four-port one. Furthermore, the results of three-port technique were more favourable in that it reduced pain, so that fewer analgesic injections were needed for pain control.<sup>17</sup>

#### CONCLUSION:

Laparoscopic cholecystectomy can be safely performed with three ports.

#### REFERENCES

1. Williams NS, O'Connell PR, McCaskie A, editors. Bailey & Love's short practice of surgery. CRC press; 2018 Apr 27.
2. Khuroo MS, Mahajan R, Zargar SA, Javid G, Sapru S. Prevalence of biliary tract disease in India: a sonographic study in adult population in Kashmir. *Gut*. 1989 Feb 1;30(2):201-5.
3. Sachdeva S, Khan Z, Ansari MA, Khaliq N, Anees A. Lifestyle and gallstone disease: scope for primary prevention. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*. 2011 Oct;36(4):263.
4. Festi D, Sottili S, Colecchia A, Attili A, Mazzella G, Roda E, Romano F, MICOL Research Group. Clinical manifestations of gallstone disease: evidence from the multicenter Italian study on cholelithiasis (MICOL). *Hepatology*. 1999 Oct;30(4):839-46.
5. Berhane T, Vetthus M, Hausken T, Olafsson S, Sondenaa K. Pain attacks in non-complicated and complicated gallstone disease have a characteristic pattern and are accompanied by dyspepsia in most patients: the results of a prospective study. *Scandinavian journal of gastroenterology*. 2006 Jan 1;41(1):93-101.
6. Friedman GD. Natural history of asymptomatic and symptomatic gallstones. *The American journal of surgery*. 1993 Apr 1;165(4):399-404.
7. Friedman GD, Raviola CA, Fireman B. Prognosis of gallstones with mild or no symptoms: 25 years of follow-up in a health maintenance organization. *Journal of clinical epidemiology*. 1989 Jan 1;42(2):127-36.
8. Townsend C.M., Everson B.M., Beauchamp R.D., Mattox K.L., Sabiston Textbook of Surgery the biological basis of modern surgical practice, 21st edition, Elsevier 2021
9. Jamagin WR, Belghiti J, Blumgart LH. Blumgart's surgery of the liver, biliary tract, and pancreas. Elsevier Saunders; 2012.
10. Litynski GS. Erich Mühe and the rejection of laparoscopic cholecystectomy (1985): a surgeon ahead of his time. *JLS: Journal of the Society of Laparoendoscopic Surgeons*. 1998 Oct;2(4):341.
11. Al-Azawi D, Hussain N, Rayis AB, McMahon D, Hehir DJ. Three-port versus four-port laparoscopic cholecystectomy in acute and chronic cholecystitis. *BMC surgery*. 2007; 7(1):8.
12. Cerci C, Tarhan OR, Barut I, Bülbül M. Three-port versus four-port laparoscopic cholecystectomy. *Hepato-gastroenterology*. 2007 Jan 1;54(73):15-6.
13. Leggett PL, Bissell CD, Churchman-Winn R, Ahn C. Three-port microlaparoscopic cholecystectomy in 159 patients. *Surgical endoscopy*. 2001 May;15(3):293-6.
14. Kumar M, Agrawal CS, Gupta RK. Three-port versus standard four-port laparoscopic cholecystectomy: a randomized controlled clinical trial in a community-based teaching hospital in eastern Nepal. *JLS: Journal of the Society of Laparoendoscopic Surgeons*. 2007 Jul;11(3):358.
15. Wikipedia contributors. (2021, May 25). Laparoscopy. In Wikipedia, The Free Encyclopedia. Retrieved 12:56, June 9, 2021, from <https://en.wikipedia.org/w/index.php?title=Laparoscopy&oldid=1024978108>
16. Arora B. A Comparative Study of Three Ports Vs. Four Ports Laparoscopic Cholecystectomy.
17. Harsha HS, Gunjiganvi M, Singh CA, Moirangthem GS. A study of three-port versus four-port laparoscopic cholecystectomy. *Journal of Medical Society*. 2013 Sep 1;27(3):208.