

## Three Port versus Conventional Four-Port Laparoscopic Cholecystectomy: A Comparative Study

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### ABSTRACT

**Objective:** To compare the complications among patients undergoing three-port versus four-port laparoscopic cholecystectomy at our tertiary care hospital.

**Study Design:** Comparative cross-sectional study.

**Place and Duration of Study:** Department of Surgery, Combined Military Hospital, Quetta Pakistan, from Feb to Oct 2021.

**Methodology:** Study was conducted on 200 patients who underwent laparoscopic cholecystectomy for any benign gall bladder pathology during the study period. Patients were randomly divided into two groups. Group-A underwent a three-port laparoscopic cholecystectomy, while Group-B underwent a four-port laparoscopic cholecystectomy. Post-operative pain, surgical site infection, duration of hospital stay, and conversion to open method were compared in both groups.

**Results:** Out of 100 patients included in the final analysis, 33 were male, and 67 were female. The mean age of patients who underwent laparoscopic surgery for benign gall bladder pathologies in our study was  $42.95 \pm 9.47$  years. 43(43%) underwent three ports, while 57(57%) underwent four port laparoscopic cholecystectomy. Duration of hospital stay was statistically significantly less in patients with three-port laparoscopic surgery than in patients undergoing four-port laparoscopic cholecystectomy ( $p$ -value $<0.05$ ).

**Conclusion:** Three-port laparoscopic cholecystectomy emerged as a better option than conventional four-port cholecystectomy in our study population in terms of the shorter duration of hospital stay. All other complications were not significantly different in both groups.

**Keywords:** Four port laparoscopy, Laparoscopic cholecystectomy, Three port laparoscopy

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## INTRODUCTION

Surgeons have been evolving in terms of expertise for abdominal surgeries in the last few years.<sup>1</sup> Though open and conventional methods have not become obsolete, surgeons have preferred the use of minimally invasive methods in most of the surgeries.<sup>2</sup> Laparoscopic cholecystectomies have replaced open cholecystectomy in many surgical centres of the world, but still, much work has been going on to refine the laparoscopic method and make it more efficient and less invasive.<sup>3</sup>

The laparoscopic method of cholecystectomy is under constant evolution. The number of ports, size of ports and other parameters have been reviewed repeatedly by clinicians and researchers to provide the best combination.<sup>4,5</sup> Still, there is no set guideline for the number of ports used for routine cholecystectomy procedures, and no combination is free from adverse effects or complications.<sup>6</sup>

Surgeons across the globe have been trying hard to reduce the complications related to laparoscopic cholecystectomy and make this procedure minimally invasive. Hajong *et al.* performed a study to compare three-port against two-port laparoscopic cholecystectomy techniques and to see whether there is any advantage in using one technique over the other. They revealed that lower pain scores and better cosmetic results were obtained with the port method.<sup>7</sup> Ciftci *et al.* formulated an interesting question: Is the fourth port routinely required for laparoscopic cholecystectomy? They then published that the port method was equally safe and feasible compared to the port method.<sup>8</sup> Besler *et al.* compared left-hand three-port videoscopes, left-hand four-port videoscopes and standard four-port videoscopes in laparoscopic cholecystectomy. They revealed that three-port laparoscopic cholecystectomy was equally reliable and effective as was four-port laparoscopic cholecystectomy. An added benefit was that it was more feasible and cost-effective.<sup>9</sup>

Laparoscopic surgery is less evolved in our part of the world due to the lesser number of trained

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surgeons. However, in the last few years, more and more centres have been incorporating this method and replacing conventional open surgeries with laparoscopic ones. A recent study published in Pakistan Armed Forces Medical Journal concluded that three-port LC has less painful advantages, fewer analgesic requirements, and reduced hospital stay without compromising the safety and efficacy.<sup>10</sup> Limited local data has been available regarding this aspect of laparoscopic cholecystectomy. Therefore, we planned this study to compare the complications among patients undergoing three-port versus four-port laparoscopic cholecystectomy at our tertiary care hospital.

**METHODOLOGY**

The comparative cross-sectional study was conducted at the Combined Military Hospital, Quetta Pakistan, from February to October 2021, after approval from the Ethical Review Board Committee (letter no: CMH QTA-IRB/036). WHO sample size calculator was used sample size using the population prevalence proportion of complications in laparoscopic surgery as 6%.<sup>11</sup> Non-probability Consecutive sampling technique was used to gather the sample.

**Inclusion Criteria:** All patients aged 18 to 65 years, who underwent laparoscopic management for benign gall bladder pathologies were included.

**Exclusion Criteria:** Patients with uncontrolled diabetes, hypertension, or any other physical illness, patients with a known gallbladder carcinoma or any other solid or haematological malignancy, those undergoing redo surgeries were excluded.

Written informed consent from potential participants, patients who were undergoing laparoscopic management of benign gallbladder diseases were included in the study. Patients were randomly divided into two groups via lottery method before the surgery. Group-A underwent a three-port procedure, while Group-B underwent a four-port laparoscopic cholecystectomy. Each patient was given routine analgesia and antibiotic cover per the hospital protocol and condition. Laparoscopic cholecystectomy was performed by three port or four port method by a consultant surgeon via set protocols. The treating surgeon recorded postoperative complications within one week of surgery on a proforma designed for this study. Post-operative pain was considered significant if rated >6 on the visual analogue scale score.<sup>12</sup> The consultant surgeon diagnosed surgical site infection based on clinical and laboratory findings.

All statistical analyses were performed using the Statistics Package for Social Sciences version 24.0(SPSS-24.0). Frequency and percentages were calculated. The mean and standard deviation for age were calculated. The Pearson chi-square test, was used to look for differences in various complications among the study groups, by keeping the *p*-value<0.05 as significant.

**RESULTS**

Out of 100 patients in the final analysis, 33% were male and 67% were female. The mean age of patients who underwent laparoscopic surgery for benign gall bladder pathologies in our study was 42.95±9.47 years. Table-I summarises the general characteristics of the study participants. 43% underwent three ports, while 57% underwent four port laparoscopic cholecystectomy. The presence of gallstones 67% was the most common indication of the procedure, followed by gall bladder polyps (22%). 85% surgeries went smoothly and were not converted to open cholecystectomy, while 15% surgeries were converted to open cholecystectomy.

Table-II summarises the results of the statistical analysis. The duration of hospital stay was statistically significantly less (*p*-value:0.015) in patients with three-port laparoscopic surgery compared to patients undergoing four-port laparoscopic cholecystectomy. In contrast, post-operative pain (*p*-value: 0.252), surgical site infection (*p*-value: 0.722) and conversion to open method of cholecystectomy (*p*-value:0.383) were not significantly different in patients undergoing three or four-port laparoscopic cholecystectomy.

**Table-I: Characteristics of Patients Undergoing Laparoscopic Cholecystectomy (n=100)**

Study Parameters	n(%)
<b>Age (years)</b>	
Mean±SD	42.95±9.47 years
Range (min-max)	20 years-64 years
<b>Gender</b>	
Male	33(33%)
Female	67(67%)
<b>Indications of Laparoscopic Cholecystectomy</b>	
Gall Stones	67(67%)
Gall Bladder Polyps	22(22%)
A Calculous Cholecystitis	07(7%)
Others	04(4%)
<b>Conversion to Open Cholecystectomy</b>	
No	85(85%)
Yes	15(15%)
<b>Technique Used</b>	
Three Port Technique	43(43%)
Four Port Technique	57(57%)

**Table-II: Comparison of Various Complications Among Study Groups (n=100)**

Complications	Three port Laparoscopic Cholecystectomy	Four Port Laparoscopic Cholecystectomy	p-value
<b>Significant Postoperative Pain</b>			
No	35(81.4%)	51(89.4%)	0.252
Yes	08(8.6%)	06(10.6%)	
<b>Surgical Site Infection</b>			
No	40(93.1%)	54(94.7%)	0.722
Yes	03(6.9%)	03(5.3%)	
<b>Duration of hospital stay</b>			
<3 days	40(93.1%)	43(75.4%)	0.015
>3 days	03(6.9%)	1(24.6%)	
<b>Conversion to Open Method</b>			
No	35(81.4%)	50(87.7%)	0.383
Yes	08(8.6%)	07(12.3%)	

## DISCUSSION

Conventional open surgery has been replaced by the laparoscopic method for most abdominal surgery and gynaecological procedures.<sup>13</sup> Many centres around the world have evaluated this method and have proven its safety and efficacy in various surgeries of the abdominal region.<sup>14</sup> There could still be many innovations which could be tried to make the laparoscopic method more effective with reduced complications. Reducing the number of ports is one method that has been under debate for a long time among surgeons across the globe. In our study, we tried to compare common immediate and short-term complications among patients undergoing three- and four-port laparoscopic cholecystectomy at Combined Military Hospital Quetta.

Evers *et al.* conducted a study to assess safety, patient-reported outcome measures and feasibility of Single-incision laparoscopic cholecystectomy versus conventional four-port laparoscopic cholecystectomy. They concluded that lesser post-operative and better cosmetic results were observed in patients undergoing the single incision method. However, no solid conclusion or recommendation could be inferred from their data set.<sup>15</sup> Our study was slightly different as we compared three and four-port methods of laparoscopic cholecystectomy and found that both methods were equally efficacious with similar complication profiles. A randomised controlled clinical trial in a community-based teaching hospital in eastern Nepal conducted by Kumar *et al.* compared three-port versus standard four-port laparoscopic cholecystectomy. They concluded that three-port laparoscopic cholecystectomy resulted in less

individual port-site pain and similar clinical outcomes with fewer surgical scars and without any increased risk of bile duct injury compared with 4-port laparoscopic cholecystectomy.<sup>16</sup> Our results were slightly different. Post-operative pain was not statistically significantly different in both groups, but the three-port groups had less hospital stay after the surgery.

Hajong *et al.* compared the technical feasibility, safety and benefit of Single Incision Laparoscopic Cholecystectomy (SILC) versus Conventional Four Port Laparoscopic Cholecystectomy. They revealed that patients of the SILC group had less post-operative pain, fewer analgesic requirements ( $p < 0.05$ ), shorter hospital stays and earlier return to normal activity.<sup>17</sup>

A meta-analysis and trial sequential analysis of three-port vs four-port laparoscopic cholecystectomy by Hajibandeh *et al.*<sup>18</sup> concluded that three-port laparoscopic cholecystectomy was comparable with the four-port technique in terms of procedural and morbidity outcomes and may be associated with less post-operative pain, shorter length of hospital stay and shorter time to return to normal activities. Our results were in line with results generated by this meta-analysis as patients undergoing three-port procedures have fewer chances of a hospital stay for more than three days compared to patients undergoing four-port laparoscopic cholecystectomy.

## LIMITATIONS OF STUDY

We studied short-term complications in a small set of patients. No data was generated regarding the difficulty of the gall bladder or the cost-effectiveness of methods.

## CONCLUSION

Three-port laparoscopic cholecystectomy emerged as a better option when compared to conventional four-port cholecystectomy in our study population in terms of lesser duration of hospital stay. All other complications were not significantly different in both groups.

**Conflict of Interest:** None.

## Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

ZS & MSA: Conception, study design, drafting the manuscript, approval of the final version to be published.

TM & MZ: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

SI & MZ: Data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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