

## Modified laparoscopic cholecystectomy: A prospective study focusing on the complications and association in comparison to umbilical port diameter

Fareya Usmani, Mehmooda Wasim, Amtullah Sheikh, Syed Muhammad Shafqatullah, Adnan Anwar

### Received:

7th October 2017

### Accepted:

24th November 2017

**Objective:** The objective of this study was to assess the safety and effectiveness of the modified laparoscopic cholecystectomy in terms of complications. Further more it also signified the importance of the size of incision during the surgery and its association with surgical complications

**Study design** Prospective observational study

**Patients and methods:** After taking ethical approval, a prospective observational study conducted from January 2015 till August 2017 for a period of 2.5 years through non-probability convenient sampling technique. The study comprised of a total of 101 patients from the Surgical Department of Sir Syed Hospital, Qayyum-abad Korangi Road Karachi. All the patients who had undergone modified laparoscopic cholecystectomy for symptomatic gallbladder stones with chronic cholecystitis, benign polyp and biliary colic were included in the study. Visual analogue pain scale was used to assess the intensity of pain. The complications were observed and documented. Data was analysed using SPSS version 20.0. The test for normality was applied and Mann Whitney u-test was used to assess the difference. P-value of less than 0.05 was considered as significant.

**Results:** In a total of 101 patients 27(26.7%) were males and 74(73.3%) were females. The mean age of patients was  $38.5 \pm 14.27$ . Patients who had surgical port diameter of 5mm were 53(52.5%) and 10mm were 48(47.5%). No to mild pain was recorded in 47(46.5%) patients, moderate in 32(31.7%) and severe in 22(21.8%) patients. The complication of wound infection was recorded at 5th and 7th post-operative day and found to be present in 7(6.9%) and 4(4.0%) of patients, respectively. Port site hernia was present in 4(3.8%) of patients with 5mm port and 15(14.6%) in patients with 10mm port diameter. Mean value of pain in all the patients was  $4.7 \pm 2.62$ . Males had a mean range of 40.76 and females 54.74 with a substantial p-value of 0.03.

**Conclusion:** The present study concluded that modified laproscopic cholecystectomy is harmless and clinically beneficial procedure. The difference in the visual pain scale of modified laparoscopic cholecystectomy (MLC) in 5 mm and 10 mm port diameter was minor. However substantial variance existed on visual analogue pain scale on gender basis.

**Keywords:** Modified laparoscopic cholecystectomy, complications, visual analogue scale

### Introduction:

The standard laparoscopic cholecystectomy (LC) using 4 ports is performed as the regular treatment for symptomatic gallbladder stones nowadays. The recent evolution in cholecystectomy is the modified laparoscopic cholecystectomy (MLC) using as low as 1 umbilical port, which been proven to be a minimally invasive

technique for management and treatment of benign gallbladder disease by avoiding scarring due to entry point being concealed in the umbilicus.<sup>1</sup> Patients undergoing MLC have the benefit of early post-operative mobilization, decreased pain and early return to daily routine.<sup>2-3</sup> MLC indications have increased substantially to include patients of old age, cirrhosis and those

Sir Syed College of  
Medical Sciences

F Usmani  
M Wasim  
A Sheikh

Jinnah Post-graduate  
Medical centre

SM Shafqatullah  
A Anwar

### Correspondence:

Dr. Mehmooda Wasim,  
Assistant Professor,  
Department of Surgery, Sir  
Syed College of Medical  
Sciences for Girls, ST-32,  
Clifton Block-5, Boating  
Basin, Clifton, Karachi.  
Cell: +92 321-8981154  
Email: drmaha.khans@  
gmail.com

with absolute contraindication to open surgery.<sup>4</sup> MLC is now becoming more of a standard procedure for most cases of cholecystitis and can be performed easily.<sup>5,6</sup> Observation at every step along the procedure with proper application of standardized surgical and medical measures along with adequate skills must be undertaken to decrease risk of complications during the procedure.<sup>7</sup> Sometimes the visualization of Calot's triangle becomes difficult because of inflammation, adhesions of the normal anatomy so it is difficult to find out the "critical view of safety" (CVS) and locate the cystic duct, cystic artery, and increases the risk of complications.<sup>8</sup> Risks of performing LC must be evaluated against any possible benefits on a subjective basis although there is still chances of bleeding because tissues are inflamed and friable so bile leakage and difficulty in removing spilled stones are more common.<sup>9</sup> In addition; the patient may develop continued biliary drainage necessitating ERCP with stenting.<sup>10</sup> According to Tamura et al, modified laparoscopic cholecystectomy has decreased operating time, while post-operatively least complications have been reported. In follow-ups least chances of developing intra abdominal abscess formation.<sup>11</sup> Difficulty in cholecystectomy might be predicted pre-operatively in elderly patients, those with a longer duration of symptoms, co-morbidities such as portal hypertension, ultrasound findings as well as history of choledocholithiasis which makes MLC a much safer alternate due to added advantages in avoiding common bile duct injury and liver bed bleeds.<sup>12-14</sup> It is also indicated in the patients having an obscure anatomy in Calot's triangle, dilated cystic duct, very short cystic duct or in patients with Mirizzi syndrome. However, the retention of stone in common bile duct is still a matter of concern.<sup>15-16</sup> Conversion of MLC to open surgery (laparotomy) is rarely a part of laparoscopic cholecystectomy in order to insure maximum safety to the patient where conversion rates are usually 5 to 7%. The conversion rate decreases with experience. In our centre the main reason for conversion is obscure anatomy in 55%, followed by adhesions in 26%, bleeding in 8%, suspected choledocholithiasis in 4.3%

and failure of progression (5.3%).<sup>17</sup>

The objective of this study was to assess the safety and effectiveness of the modified laparoscopic cholecystectomy (only umbilical port diameter is reduced to 5mm) in terms of complications. Furthermore it also signified the importance of the size of incision during the surgery and its association with surgical complications

#### **Material and methods:**

A prospective observational study conducted for a period of 2.5 years from January 2015 till August 2017 in which patients were selected through non-probability convenient sampling technique. The study comprised of a total of 101 patients from the surgical department of Sir Syed Hospital, Qayyum-abad, Korangi road Karachi. Ethical approval was pursued from institutional review board of Sir Syed Hospital.

Patients were admitted through out patient department. All the patients who had undergone modified laparoscopic cholecystectomy for symptomatic gallbladder stones without acute cholecystitis, benign polyp and chronic cholecystitis were included in the study. We excluded the patients whose modified laparoscopic cholecystectomy was converted into open cholecystectomy, who could not tolerate laparoscopic surgery, patients with acute cholecystitis, jaundice, CBD stones and those with previous major abdominal surgery and those with incomplete data.

Surgery was done by the same surgeon who has more than 10 years experience of laparoscopic surgery using 5mm and 10mm umbilical port to avoid bias. Patients were discharged the very next day and follow-up in OPD on 5th, 7th day and 3rd month post-operatively.

Data collection process was done after taking informed consent. The demographic variables were documented. Visual analogue pain scale was used to assess the intensity of pain and the patients were explained about the pain scale. The complications were observed and recorded. Dependent variables indication of surgery, post-

Table-1: - Patient's baseline characteristics at the time of surgery

Variable n=101	Mean ±S.D/ Frequency (%)
Age	38.5±14.27
Gender	Male 27(26.7%)
	Female 74(73.3%)
Co-morbid	Hypertension 11(10.9%)
	Asthma 3(3%)
Port Diameter	Nil 87(86.1%)
	5 mm 53(52.5%)
Pain on Visual Analogue Scale	10 mm 48(47.5%)
	Mild 47(46.5%)
Pain on Visual Analogue Scale	Moderate 32(31.7%)
	Severe 22(21.8%)
Pain on Visual Analogue Scale	4.7 ±2.62

Table-2: - Association Visual Analogue Pain scale with different variables

Variables	Visual analogue pain scale				
	n	Mean Rank	Sum of Squares	P-Value	
Age	37 and below	52	51.97	2702.50	0.726
	38 and above	49	49.97	2448.50	
Gender	Male	27	40.76	1100.50	0.03
	Female	74	54.74	4050.50	
Port Site Diameter	5mm	53	50.07	2653.50	0.731
	10mm	48	52.03	2497.50	
Post Site hernia	Yes	9	52.17	469.50	0.898
	No	92	50.89	4681.50	

Mann Whitney U test was applied to assess the difference

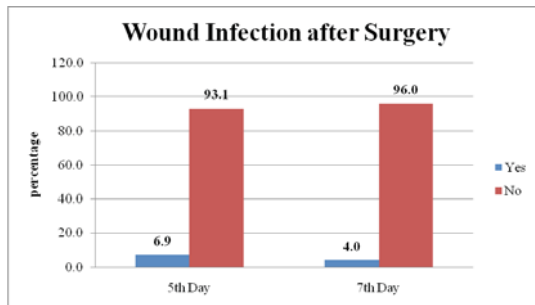


Figure-1: Post-operative wound infection at 5th and 7th post-operative day

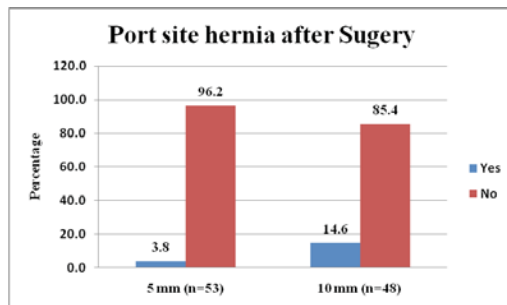


Figure-2: Port site hernia in 5mm and 10mm port diameter (at 3 months)

operative pain, wound infection and port site hernia were assessed.

**Data Analysis:**

Data was analysed using SPSS version 20.0. Data was presented as descriptive analysis statistics. The test for normality was applied and Mann Whitney u-test was used to assess the difference. Bar graphs were used to present the qualitative data. P-value of less than 0.05 was considered as significant.

**Results:**

A total of 101 patients who had undergone modified laparoscopic cholecystectomy were selected for the study. Out of them 27(26.7%) were males and 74(73.3%) were females. The mean age of patients was 38.5±14.27. Patients who had surgical port diameter of 5mm were 53(52.5%) and 10mm were 48(47.5%). 11(10.9%) were known to be hypertensive, only 3(3%) were asthmatic and 87(86.1%) had no co-morbid. No to mild pain was recorded in 47(46.5%) patients, moderate in 32(31.7%) patients and severe in 22(21.8%) patients.(table-1) The complication of wound infection was recorded at 5th and 7th post-operative day and found to be present in 7(6.9%) and 4(4.0%) of patients, respectively. (Figure.1) Port site hernia was observed at 3rd months and seen to be present in 4(3.8%) of patients with 5mm port and 15(14.6%) in patients with 10mm port diameter. (Figure-2). Mean value of pain in all the patients was 4.7±2.62. Mean range of pain in patients below 37 years of age was 51.97. Mean range of pain in patients above 38 years of age was 49.97 with an insignificant p-value of 0.726. Males had a mean range of 40.76 and females 54.74 with a substantial p-value of 0.03. Mean range of pain with 5mm port diameter was 50.07 and with 10mm was 52.03 with a p-value of 0.731. Patients having port site hernia had a mean range of 52.17 and without hernia were 50.89 with insignificant p-value of 0.898.

**Discussion:**

In today's era of laparoscopic surgery, decreased post-operative pain and early recovery are main goals to achieve better patient care.<sup>18</sup> Some studies have shown that less post-operative complications were linked with reduction in either size or number of ports.<sup>19</sup> A study by Markar SR et

al. demonstrated that single-incision LC is safer procedure for the treatment of un-complicated gallstone disease, with post-operative outcomes similar to that of standard multiport LC.<sup>20</sup>

The findings of the above studies are in accordance with our study in which the complication rate was much reduced and offered better outcome.

In a recent study, in 22 surgeries (3%) of MLC, 16 were reported to be converted to multi-port laparoscopic cholecystectomy and 6 to open cholecystectomy.<sup>21</sup> These findings are consistent with our study in terms of frequency of complications.

There have been numerous comparisons between single port LC and conventional multiport LC.<sup>22-25</sup> These studies concluded that MLC is superior to multi-port LC in terms of post-operative outcome, but not in terms surgical time and post-operative pain. A similar result of MLC was observed in our study in which single post incision of 5mm was more effective in terms of complications as compared to 10 mm incision.

One of the study predicted that the mean pain on VAS pain scale for MLC was  $3.98 \pm 0.84$  where as in our study it was  $4.7 \pm 2.62$ .<sup>26</sup> In another study of MLC it was observed that only 42 (3.6%) out of 1,166 patients had developed wound infection which is slightly higher in our study in which 7 (7%) of patients developed wound infection. In a systematic review by Antoniou et al of 29 studies of MLC including 1,166 patients, the practice to suspend the gallbladder with the use of sutures was correlated with a significant increase of the complication rate from 3.3% to 13.3%.<sup>27</sup> In an analysis of 100 cases by Pietrabissa et al, it was reported that single site robotic cholecystectomy (SSRC) patients had less post-operative pain compared to single incisional laparoscopic cholecystectomy (SILC).<sup>28</sup> Usual pain scores reported in literature range from 2.62 to  $4.3 \pm 1.5$  for MLC.<sup>29,30</sup> while in our study it was observed to be higher with the mean of  $4.7 \pm 2.62$ . Single-incision laparoscopic cholecystectomy has not gained wide spread use general-

ly due to physical limitations of this technology that compromises optimum tri-angulation, the complexity of the procedure, and the quality of vision, leading to difficulties in tissue exposure.<sup>31</sup>

The qualitative approach and large sample size of our study has assured that we have assessed the extensive range of patients undergoing through modified laparoscopic cholecystectomy. However the study might not be immune from observer and practise bias. Considering the finding of our study and to what extent they are consistent with their experience of the surgeons performing the procedure would be illuminating and favourable to regulate the mis-interpretation about the modified laparoscopic cholecystectomy in future

#### **Conclusion:**

The present study concluded that Modified laparoscopic cholecystectomy is harmless and clinically beneficial procedure. The study also recognized numerous benefits of MLC in terms of complications. The difference in the visual pain scale of MLC in 5mm and 10mm port diameter was minor. However substantial variance existed on visual analogue pain scale on gender basis.

**Conflict of interest:** None

**Funding source:** None

#### **Role and contribution of authors:**

Dr Fareya Usmani, collected the data, references and did the initial write-up

Dr Mehmooda Younus, collected the data, references and helped in introduction writing

Dr Amtullah Sheikh, collected the referenes and helped in discussion writing

Dr Syed Muhammad Shafqatullah, helped in colelcting the data and references

Dr Adnan Anwar, critically review the article and made necessary changes in the discussion and conclusion.

**References:**

1. Su WL, Huang JW, Wang SN, Lee KT. Comparison study of clinical outcomes between single-site robotic cholecystectomy and single incision laparoscopic cholecystectomy. *Asian journal of surgery*. 2016 May 14;(40):424-428
2. Segal DM. Case Report: Modified Laparoscopic Subtotal Cholecystectomy: An Alternative Approach to the "Difficult Gallbladder". *Am J Case Rep*. 2017;18:186-9.
3. Kwon YJ, Ahn BK, Park HK, Lee KS, Lee KG. What is the optimal time for laparoscopic cholecystectomy in gallbladder empyema?. *Surgical endoscopy*. 2013 Oct 1;27(10):3776-80.
4. McGillicuddy JW, Villar JJ, Rohan VS, Bazaz S, Taber DJ, Pilch NA, et al. Is cirrhosis a contraindication to laparoscopic cholecystectomy?. *The American Surgeon*. 2015 Jan 1;81(1):52-5.
5. Arya SV, Das A, Singh S, Kalwaniya DS, Sharma A, Thukral BB. Technical difficulties and its remedies in laparoscopic cholecystectomy in situs inversustotalis: A rare case report. *International journal of surgery case reports*. 2013 Dec 31;4(8):727-30.
6. Phothong N, Akaraviputh T, Chinswangwatanakul V, Trakarnsanga A. Simplified technique of laparoscopic cholecystectomy in a patient with situs inversus: a case report and review of techniques. *BMC Surgery*. 2015;1(15):1-4.
7. Halbert C, Pagkratis S, Yang J, Meng Z, Altieri MS, Parikh P, et al. Beyond the learning curve: incidence of bile duct injuries following laparoscopic cholecystectomy normalize to open in the modern era. *Surgical endoscopy*. 2016 Jun 1;30(6):2239-43.
8. Strasberg SM, Brunt LM. Rationale and use of the critical view of safety in laparoscopic cholecystectomy. *Journal of the American College of Surgeons*. 2010 Jul 1;211(1):132-8
9. Akhtar NN, Fawad A, Allam KM. Early Versus Delayed Laparoscopic Cholecystectomy in Acute Cholecystitis. *PAKISTAN JOURNAL OF MEDICAL & HEALTH SCIENCES*. 2016 Jul 1;10(3):1039-43.
10. Kim KH, Kim TN: Endoscopic management of bile leakage after cholecystectomy: a single-center experience for 12 years. *ClinEndosc*, 2014; 47(3): 248–53
11. Tamura A, Ishii J, Katagiri T et al: Effectiveness of laparoscopic subtotal cholecystectomy: Preoperative and long-term postoperative results. *Hepatogastroenterology*, 2013; 60(126): 1280–83
12. Reddy SR, Balamaddaiah G. Predictive factors for conversion of laparoscopic cholecystectomy to open cholecystectomy: a retrospective study. *International Surgery Journal*. 2016 Dec 8;3(2):817-20.
13. Yoon PD, Pang T, Siriwardhane M, Richardson A, Hollands M, Pleass H, Johnston E, Yuen L, Lam V. Laparoscopic partial cholecystectomy: A way of getting out of trouble. *International Journal of Hepatobiliary and Pancreatic Diseases (IJHPD)*. 2016 Dec 1;6(2):68-75.
14. Ferzli G, Timoney M, Nazir S, Swedler D, Fingerhut A. Importance of the node of Calot in gallbladder neck dissection: an important landmark in the standardized approach to the laparoscopic cholecystectomy. *Journal of Laparoendoscopic & Advanced Surgical Techniques*. 2015 Jan 1;25(1):28-32.
15. Coccolini F, Catena F, Pisano M, Gheza F, Fagiuoli S, Di Saverio S, et al. Open versus laparoscopic cholecystectomy in acute cholecystitis. Systematic review and meta-analysis. *International journal of surgery*. 2015 Jun 30;18:196-204.
16. Abdelrahim WE, Elsiddig KE, Wahab AA, Saad M, Saeed H, Khalil EA. Subtotal laparoscopic cholecystectomy influences the rate of conversion in patients with difficult laparoscopic cholecystectomy: Case series. *Annals of medicine and surgery* (2012). 2017 Jul;19:19-22.
17. Cao AM, Eslick GD, Cox MR. Early laparoscopic cholecystectomy is superior to delayed acute cholecystitis: a meta-analysis of case-control studies. *Surgical endoscopy*. 2016 Mar 1;30(3):1172-82.
18. Kumar TRJS. Modifications of Laparoscopic Cholecystectomy. *World J Lap Surg* 2016;9(2):71-74
19. Pan MX, Jiang ZS, Cheng Y, Xu XP, Zhang Z, Qin JS, He GL. Single-incision vs three-port laparoscopic cholecystectomy: prospective randomized study. *World Journal of Gastroenterology: WJG*. 2013 Jan 21;19(3):394-98
20. Markar SR, Karthikesalingam A, Thrumurthy S, Muirhead L, Kinross J, Paraskeva P. Single-incision laparoscopic surgery (SILS) vs. conventional multiport cholecystectomy: systematic review and meta-analysis. *Surgical endoscopy*. 2012 May 1;26(5):1205-13.
21. Wakasugi M, Tanemura M, Furukawa K, Tei M, Suzuki Y, Masuzawa T, Kishi K. Feasibility and safety of single-incision laparoscopic cholecystectomy in elderly patients: A single institution, retrospective case series. *Annals of Medicine and Surgery*. 2017 Oct 1;22:30-3.
22. Leung D, Yetasook AK, Carbray J, Butt Z, Hoeger Y, Denham W, Barrera E, Ujiki MB. Single-incision surgery has higher cost with equivalent pain and quality-of-life scores compared with multiple-incision laparoscopic cholecystectomy: a prospective randomized blinded comparison. *Journal of the American College of Surgeons*. 2012 Nov 30;215(S):702-8.
23. Lee PC, Lo CH, Lai PS, Chang JJ, Huang SJ, Lin MT, Lee PH. Randomized clinical trial of single-incision laparoscopic cholecystectomy versus minilaparoscopic cholecystectomy. *British Journal of Surgery*. 2010 Jul 1;97(7):1007-12.
24. Lai EC, Yang GP, Tang CN, Yih PC, Chan OC, Li MK. Prospective randomized comparative study of single incision laparoscopic cholecystectomy versus conventional four-port laparoscopic cholecystectomy. *The American Journal of Surgery*. 2011 Sep 30;202(3):254-8.
25. Gangl O, Hofer W, Tomaselli F, Sautner T, Függer R. Single incision laparoscopic cholecystectomy (SILC) versus laparoscopic cholecystectomy (LC)-a matched pair analysis. *Langenbeck's archives of surgery*. 2011;396(6):819-24
26. Su WL, Huang JW, Wang SN, Lee KT. Comparison study of clinical outcomes between single-site robotic cholecystectomy and single incision laparoscopic cholecystectomy. *Asian journal of surgery*. 2017 Nov 1;40(6):424-8.
27. Antoniou SA, Pointner R, Granderath FA. Single-incision laparoscopic cholecystectomy: a systematic review. *Surgical endoscopy*. 2011 Feb 1;25(2):367-77.
28. Pietrabissa A, Sbrana F, Morelli L, Badessi F, Pugliese L, Vinci A, Klersy C, Spinoglio G. Overcoming the challenges of single-incision cholecystectomy with robotic single-site technology. *Archives of surgery*. 2012 Aug 1;147(8):709-14.
29. Lee SH, Jung MJ, Hwang HK, Kang CM, Lee WJ. The first experiences of robotic single-site cholecystectomy in Asia: a potential way to expand minimally-invasive single-site surgery?. *Yonsei medical journal*. 2015 Jan 1;56(1):189-95.
30. Prasad A, Mukherjee KA, Kaul S, Kaur M. Postoperative pain after cholecystectomy: conventional laparoscopy versus single-incision laparoscopic surgery. *Journal of minimal access surgery*. 2011 Jan;7(1):24-7
31. Allemann P, Schafer M, Demartines N. Critical appraisal of single port access cholecystectomy. *Br J Surg*. 2010;97(10):1476-1480.