

## **Research Article**

### **Laparoscopic Versus Mini-Laparotomy Cholecystectomy – A Comparative Study**

Mukesh Kumar<sup>1\*</sup>, Pukhraj Chaudhary<sup>2</sup>, Ashok Kumar<sup>3</sup>, Mahendra Kumar<sup>4</sup>, Sitaram<sup>5</sup>, Dharamveer<sup>6</sup>

<sup>1,2,6</sup>Post Graduate Resident, <sup>3</sup>Assot. Professor, <sup>4</sup>Assistant professor, <sup>5</sup>Prof. & head of dept., Department of general surgery, SP Medical College, Bikaner, Rajasthan, India

#### **\*Corresponding author**

Dr. Mukesh Sharma

Email: [mukesh.mupriy.sharma9@gmail.com](mailto:mukesh.mupriy.sharma9@gmail.com)

---

**Abstract:** In the recent decade, laparoscopic cholecystectomy has become the gold standard for the treatment of symptomatic cholelithiasis with advantages in regard to postoperative pain, hospital stay, early return to activities of daily living and acceptable cosmetic results. Minilaparotomy cholecystectomy has been suggested as an alternative to conventional as well as to the laparoscopic cholecystectomy as it incorporates the benefits of both these procedures. This study aims to compare laparoscopic and minilaparotomy cholecystectomy in the treatment of cholelithiasis regarding perioperative complications, length of hospital stay, surgical time, incidence of reoperation and conversion to open surgery and time for returning to labor activities. The study subjects were patients, admitted with diagnosis of cholelithiasis, who subsequently underwent cholecystectomy at Department Of General Surgery S.P. Medical College and associated group of Hospital Bikaner (Rajasthan) between jun. 2014 and Jan. 2015. We included patients with symptomatic cholelithiasis divided into two groups: group one—minilaparotomy and group two—laparoscopic cholecystectomy. In results There were 50 patients with cholelithiasis: 11 males (22%) and 39 females (78%). There were 25 patients in each group. Mean operative time was 33 min for minilaparotomy and 42.5 min for laparoscopic cholecystectomy ( $p = <0.001$ ). Average hospital stay was 3 days for minilaparotomy and 2 days for laparoscopy ( $p = 0.129$ ). Complications of minilaparotomy were demonstrated in 8% of patients and for laparoscopic cholecystectomy in 20% of patients ( $p = 0.189$ ). In conclusion Minilaparotomy cholecystectomy has results similar to laparoscopic cholecystectomy.

**Keywords:** cholelithiasis, cholecystectomy, minilaparotomy cholecystectomy, laparoscopic cholecystectomy

---

#### **INTRODUCTION**

The first open cholecystectomy (OC) was performed by Carl Langenbuch on July 15, 1882 according to the theory that the gall bladder needed to be removed not because it had stones, but because it was “sick”. From that time, the technique performed was popularized through large incisions. On September 12, 1985, Erich Muhe, Germany performed the first laparoscopic cholecystectomy (LC). Introduction of LC for the treatment of cholecystitis in the late 1980s quickly became the dominant process. It was a major advance in regard to postoperative pain and hospital stay, as well as for aesthetic results [1].

During 1980s and in the early 1990s, the conventional large sub costal incision in cholecystectomy could be replaced by a much smaller incision, giving a shorter convalescence. This new modification was named as Mini-Laparotomy cholecystectomy. Dubois and Bart helot introduced in 1982, minimal invasive technique for conventional cholecystectomy, the minilaparotomy cholecystectomy

[2], and Tyagi *et al.*; describe a new technique for minimally invasive cholecystectomy, and this has recently challenged the role of laparoscopic cholecystectomy [3, 4]. “To cut is to cure”, “the greater the surgeon, the bigger the incision”, are a few aphorisms, not accepted in today’s era of minimal access surgery.

The evolution of minimal access procedures represents part of the traditional surgical development. Laparoscopic cholecystectomy and minilaparotomy cholecystectomy are the minimum access procedures which came into existence to reduce the surgical trauma. With the introduction of minimal access procedures, cholecystectomy is evolving into an outpatient procedure. Patients are able to return to preoperative functional status rapidly with minimal postoperative morbidity and pain. Additionally these procedures have gained more acceptances because of cosmetic desirability of the small size of the scar.

Minilaparotomy cholecystectomy has been suggested as an alternative to conventional as well as to the laparoscopic cholecystectomy as it incorporates the benefits of both these procedures. Like conventional cholecystectomy it does not require any special instruments or any specialized training and the procedure is done under direct vision. Like the laparoscopic cholecystectomy it is less traumatizing, as the incision length is limited. Unlike L.C. where image of the operative field is obtained on the screen, and lacks three dimensions, M.C. is done under direct vision. Because of its minimal invasive nature like L.C., there is shorter hospital stay and early return to work.

In the recent decade, laparoscopic cholecystectomy has become the gold standard for the treatment of symptomatic cholelithiasis, despite an increased risk of common bile duct injury [4-8].

Although it is well established that LC is superior to conventional open cholecystectomy, the evidence for its superiority over minilaparotomy cholecystectomy has been poor, and the results of randomized controlled trials are conflicting [9-12].

This study aims to compare laparoscopic and minilaparotomy cholecystectomy in the treatment of cholelithiasis regarding perioperative complications, length of hospital stay, surgical time, incidence of reoperation and conversion to open surgery and time for returning to labor activities.

## MATERIALS AND METHODS

The study subjects were patients, admitted with diagnosis of cholelithiasis, who subsequently underwent cholecystectomy at Department of General Surgery S.P. Medical College and associated group of Hospital Bikaner (Rajasthan) between jun. 2014 and Jan. 2015.

All the patients were interviewed for detailed clinical history and examined. They were then subjected to routine blood, urine and other investigations as per protocol and an abdominal ultrasound were performed in all cases.

### Inclusion criteria:

- Patients presenting with at least one episode of right upper quadrant pain or epigastric pain (typical biliary colic) with ultrasonographically proven cholelithiasis.
- Patients considered otherwise fit for elective cholecystectomy under general anaesthesia.

### Exclusion criteria

1. History or laboratory tests suggesting presence of common bile duct stones,
2. History of prior abdominal surgery,

3. Patients above 70 years of age,
4. Patients having diabetes mellitus or any other co-morbid condition, Patients having acalculus cholecystitis.

A written informed consent was taken from all patients before their inclusion in the study.

Patients were randomly allocated to the two study groups using simple lots (25 in each group). Patients in one group underwent laparoscopic cholecystectomy while those in the other group underwent cholecystectomy through a small sub costal incision varying between 5 - 6 centimeters in length.

All the patients were kept nil by mouth overnight, prior to surgery and were given a dose of prophylactic antibiotic. All the patients were asked to evacuate bladder prior to surgery and a nasogastric tube was passed if thought to be necessary. All the surgeries were performed under general anesthesia, by the same surgical team, Intra operative findings and post operative data were all recorded and analyzed, using simple statistical tests like Chi square test and P-value to compare the results.

### Surgical procedure

Laparoscopic cholecystectomy: L.C. was performed with patient in classical supine position and the surgeon standing on left side of the table. Pneumoperitoneum was created by using Hassan's technique with Two 10 mm and two 5 mm trocars. Peritoneal cavity was examined and dissection carried out using electro cautery. Titanium clips were used to secure the cystic duct and artery.

Mini-laparotomy cholecystectomy: An oblique right sub costal incision was taken varying between 5 - 6 cms. in length, depending on the patient's body stature. The incision was extended if adequate exposure was not achieved through the small incision. If the Calot's triangle was clearly visible, dissection was first started there and then proceeded antegradely towards the fundus. In both the groups, a sub hepatic drain was inserted if thought to be necessary.

Patients were asked to follow up in O.P.D., 1 week, 4 weeks, and 12weeks, after surgery, or in between if they had any problem. Data of patients' demographics, history, investigation reports, operative findings, duration of surgery, operation time (from incision to closure), complications (intra operative and post operative), and duration of post operative pain, analgesic requirement and length of hospital stay were all recorded prospectively. The total cost incurred by each patient was also noted. This included costs of investigations, operation (including anesthesia) costs and medication costs.



**Fig-1: Incision mark size 5.5cm.**



**Fig-3: Gall bladder with sponge holding forcecp.**



**Fig-2: Subcutaneous incision.**



**Fig-4: Post-operative incision mark showing sutures.**

#### **RESULTS**

I studied 50 patients with cholelithiasis who met the inclusion criteria. There were 11 males (22%) and 39 females (78%). There were 25 patients in each of the study group based on the operating procedure. In the laparoscopic cholecystectomy group there were 8 males and 17 females with a mean age of 39 years (range 20-65 years). In minilaparotomy cholecystectomy group there were 3 males and 22 females with a mean age of 45 years (range 20-70

years). Comparing the two groups there was no statistical difference regarding gender (p- 0.172) and mean age between groups (p- 0.817).

**Table 1: Case distribution according to duration of operation**

DURATION OF OPERATION ( minutes)	L.C.	M.C.
25-30	0	9
31-35	0	12
36-40	10	3
41-45	10	1
46-50	5	0
Total	25	25

P-value<0.001 (chi square value 37.13)

Patients who underwent LC had a median duration of operation was 42.5 minutes (36-50 minutes) and who underwent minilaparotomy cholecystectomy had a median duration 33 minutes (25-45 minutes). When comparing groups, significant statistical difference was shown (p<0.001). This difference was because of longer duration in LC due to gas leak, difficult adhesions and slippage of clips. (Table 1)

**Table no. 2 Case distribution according to pain score and analgesics**

PAIN AND ANALGESICS	L.C.	M.C.
1. VAS GRADE 0 – 5	2	3
(RANGE)	(2 - 3)	(2 - 4)
2. ANALGESICS USED	2 DAYS	3 DAYS
(RANGE)	(1 - 2)	(1 - 3)

(Chi square value 0 p-value 1)

In assessing postoperative pain using the VAS, in LC group most patients had grade 2-3 pain as comparison to in minilaparotomy cholecystectomy group most patients had grade 2-4 pain. According to a scale of categories, pain levels grouped 1, 2 and 3 were described as mild pain. There is no significant difference (p = 1.0) between two groups.(Table 2)

**Table no. 3 Case distribution according to incidence of complications**

S. No.	COMPLICATIONS	L.C	M.C.
1	BILE LEAK	3	1
2	STONE SPILLAGE	2	0
3	C.B.D. INJURY	0	0
4	ADJ. ORGAN INJURY	0	0
5	WOUND INFECTION	0	1

P-value 0.189 chi-square value 3.32

In this study, surgical morbidity was observed in the 5 (20%) patients who underwent LC (3 were having bile leak and 2 were having stone slippage) and in the 2 (8%) patients who underwent minilaparotomy cholecystectomy (1 was having bile leak and 1 having wound infection). There were no significant differences (p = 0.189). (Table 3)

**Table no. 4 Duration of hospital stay**

S. No.	DAYS OF STAY	L.C	M.C.
1	1-2	18	12
2	3-4	7	11
3	5 or More	0	2
Total		25	25

p value 0.129 (Chi Square value 4.089)

Patients who underwent LC had a mean hospital stay of 2.24 days (minimum 2 day and maximum 3 days) and Patients who underwent minilaparotomy cholecystectomy had a mean hospital stay of 2.76 days (minimum 2 day and maximum 5 days). The comparison group was not significantly different (p = 0.129). (Table 4)

**DISCUSSION**

Mini-LPC is an open surgical approach with a sub costal incision size of <6 cm in size, whereas the conventional OC size is considered to be 10 or more cm. This makes it a viable and safe option for the surgical treatment of cholelithiasis, with the advantages of being economical, with quick recovery and minimal postoperative pain [13].

Meanwhile, LC today is considered the preferred technique for gallbladder removal in most of the world with the benefits of being aesthetically well-accepted, with rapid recovery and minimal pain. In this study, with respect to demographic variables, there was a predominance of female patients. Comparing age and gender in the two groups operated by mini-LPC and LC, we found no statistically significant differences.

This study showed a shorter period of hospital stay for patients undergoing L.C. as compared to those undergoing M.C. (median 2 versus 3 days). The difference was however statistically insignificant. Mc Mohan[14] reported that median post operative hospital stay was two days shorter for L.C. as compared to M.C. Several other authors [15-17] have reported shorter hospital stay, after L.C. but some others [18, 19] have reported no difference between the two groups.

Postoperative pain was evaluated according to a visual analog scale (VAS), When comparing groups of mini-LPC and LC, postoperative pain did not show any statistically significant differences. The results are comparable to those reported by several authors such as

Zacks *et al.*; [20]. who reported mild to moderate pain according to the VAS without respiratory restriction, being in favor of access by mini-LPC. On the other hand, Squirrell *et al.*; [21] reported that scores for postoperative pain in both groups were low, and LC was associated with less pain and less analgesic consumption compared with the mini-LPC. Mc Mohan [14] and Mc Ginn [10] also reported less pain and less analgesic requirement in the L.C. group.

Complications in the mini-LPC were observed in 8.9% of cases and for the LC group it was 18.6%. The results are consistent with those reported by Ros *et al.*[22] and Leo *et al.*[23] Mc Mohan[14] Our results differ from those reported by Lujan *et al.*[24] upon comparing LC vs. mini-LPC, reporting complication rates of 14% in LC and 23% in the mini-LPC, In this study, the laparoscopic procedure was found to be associated with a longer operating time than M.C. (Median of 42.5 minutes against 33 minutes for M.C.). This finding is comparable with that of Ros *et al.*; [25], who reported 100 & 85 minutes for L.C. And M.C. Respectively. Mc Mohan [14] also reported that mean operating time was 14 minutes longer for L.C. in their study. Likewise Majeed [15] reported that L.C. took longer to perform than M.C. (median 65 versus 40 minutes). Similarly others [10, 18, 19] too found L.C. to take longer to perform. As experience is gained, the operating time is decreased. The surgeon gets trained in dealing with challenging cases in the course of his / her learning curve.

In this study mini-lap cholecystectomy more cost effective as compare to laparoscopic cholecystectomy find significant difference in the costs, incurred by the patients in the two groups. L.C. was however found to be a higher costlier than M.C. (Rs. 1500 versus 0). Majeed [15] has also reported L.C. to be costlier in comparison to M.C. Mohan [14] has reported significant difference between the costs of the two procedures, claiming laparoscopic technique to be costlier. Mc Mohan [14] found L.C. to be costlier by about 400 pounds.

Lucena *et al.*; [26] report being in favor of LC, arguing less postoperative pain, less use of analgesics and antiemetics, and shorter periods of hospitalization and disability, with excellent results in quality of life compared with mini-LPC.

However, Gómez *et al.*; [27] mention that the mini-LPC has a place as a viable and secure option rather than the LC in difficult cases or when resources are insufficient for carrying it out. Mini-LPC has a low cost and is an option especially in countries where the majority of the population has no health insurance coverage or where institutions lack the infrastructure necessary to perform laparoscopic procedures. Current

evidence justifies the technique as part of the repertoire of surgeons and the decision of which technique to carry out depends on the availability of resources and surgeon's discretion.

LC presents a rapid postoperative recovery; however, there may be institutional overprotection by overextending the period of disability, ending expectations of an early return to activities. On the other hand, a high percentage of LCs is performed in elderly patients who are no longer in the workplace. Therefore, based on the comparison of results of both techniques, mini-LPC may be an option in patients who do not need to be incorporated immediately into the workplace. Mini-LPC is a valid and safe option without requiring sophisticated and expensive equipment or lengthy training.

## CONCLUSION

Laparoscopic Cholecystectomy has emerged as the gold standard in the treatment of gall stones. Though it is easier to teach and learn the laparoscopic procedure with the help of magnified visual display, specialized training is a must in case of the laparoscopic technique. On the other hand, mini-laparotomy cholecystectomy does not require any special training (nor any additional / special instruments) Mini-LPC is an alternative to laparoscopic cholecystectomy in the treatment of symptomatic cholelithiasis. Both techniques produce similar results in terms of postoperative complications, hospital stay and postoperative pain except surgical time, which show longer duration of operation in LC. Mini-LPC is seen as acceptable resource in centers where laparoscopic equipment is not available. The approach by mini-LPC is an option for surgeons experienced in open surgery and for residents in training in developing country settings with limited resources.

## REFERENCES:

1. Novitsky YW, Kercher KW, Czemiach DR, Kaban GK, Khera S, Gallagher-Dorval KA *et al.*; Advantages of mini-laparoscopic vs conventional laparoscopic cholecystectomy: results of a prospective randomized trial. Arch Surg 2005; 140:1178-1183.
2. Dubois F, Barthelot G; cholecystectomy par minilaparotomie. Nov. presse Med. 1982; 1:1139.
3. Tyagi NS, Meredith MC, Lumb JC, Cacdac RG, Vanterpool CC, Rayls KR, *et al.*; A new minimal invasive technique for cholecystectomy: Subxiphoid "minimal stress triangle" microceliotomy. Ann Surg. 1994; 220:617-625.
4. Begos DG, Modlin IM; LC: from gimmick to gold standard. J Clin Gast. 1994; 19:325-30.
5. Adamsen S, Hansen OH, Funch-Jensen P, Schulze S, Stage JG, Wara P; Bile duct injury during laparoscopic cholecystectomy; a prospective

- nationwide series. *J Am Coll Surg.* 1997; 184:571–8.
6. Flum DR, Cheadle A, Prella C, Dellinger EP, Chan L; Bile duct injury during cholecystectomy and survival in Medicare beneficiaries. *JAMA.* 2003; 290:2168–73.
  7. Ooi LL, Goh YC, Chew SP, Tay KH, Foo E, Low CH, *et al.*; Bile duct injuries during laparoscopic cholecystectomy: a collective experience of four teaching hospitals and results of repair. *AustNZ J Surg.* 1999; 69:844–6.
  8. Waage A, Nilsson M; Iatrogenic bile duct injury: a population based study of 152 776 cholecystectomies in Swedish Inpatient Registry. *Arch Surg.* 2006; 141:1207–13.
  9. Keus F, Gooszen HG, Laarhoven CJHM; Systematic review: open, small-incision or laparoscopic cholecystectomy for symptomatic cholecystolithiasis. *Aliment Pharmacol Ther.* 2009; 29:359–78.
  10. McGinn FP, Miles AJG, Uglow M, Ozmen M, Terzi C, Humby M; Randomized trial of laparoscopic cholecystectomy and mini cholecystectomy. *Br J Surg.* 1995; 82:1374–7.
  11. Ros A, Gustafsson L, Drook H, Nordgren CE, Thorell A, Wallin G, *et al.*; Laparoscopic cholecystectomy versus mini-laparotomy cholecystectomy. A prospective randomized single-blind study. *Ann Surg.* 2001; 234:741–9.
  12. Keus F, Werner JEM, Gooszen HG, Oostvogel HJM, van Laarhoven CJ; Randomized clinical trial of small-incision and laparoscopic cholecystectomy in patients with symptomatic cholecystolithiasis. *Arch Surg.* 2008; 143:371–7.
  13. Duque González B, Moll de la Fuente T, Ramírez Montero F, Pérez García G, Huertas Vega B, Corral Rosado M, *et al.*; Colecistectomía laparoscópica frente a colecistectomía transciliíndrica. Una vision desde el bloque quirúrgico. *Cir Esp* 2002; 72:318-322.
  14. Mc Mahon AJ, Russell IT, Baxter JN, Ross S, Anderson JR, Morran CG *et al.*; Laparoscopic versus minilaparotomy cholecystectomy: a randomized trial. *Lancet* 1994; 343: 135 – 138
  15. Majeed AW, Troy G, Nicholi JP, Smythe A, Reed MWR, Stoddard CJ *et al.*; Randomized, prospective, single-blind comparison of laparoscopic versus small incision cholecystectomy. *Lancet* 1996; 347: 989 - 994.
  16. Nilsson E, Ros A, Rahmqvist M, Backman K, Carlsson P; Cholecystectomy: costs and health related quality of life: a comparison of two techniques. *International Journal for Quality in Health care* 2004; 16: 473 – 482
  17. Lucena JR; Laparoscopic versus mini-laparotomy cholecystectomy, *Cir Esp.* 2005; 77(6):332-6.
  18. Assalia A, Kopelman D, Hashmonai M; Emergency Minilaparotomy Cholecystectomy for Acute Cholecystitis: Prospective randomized trial implications for the laparoscopic era. *World J Surg* 1997; 21: 534 – 39
  19. Ros A, Gustafsson L, Krook H, Nordgren CE, Thorell A, Wallin G *et al.*; Laparoscopic Cholecystectomy versus Minilaparotomy Cholecystectomy – A prospective, randomized, single-blind study. *Ann Surg* 2001; 234 (6): 741 – 749
  20. Zacks SL, Sandler RS, Rutledge R, Brown RS Jr; A population-based cohort study comparing laparoscopic cholecystectomy and open cholecystectomy. *Am J Gastroenterol* 2002; 97:334-340.
  21. Squirrel DM, Majeed AW, Troy G, Peacock JE, Nicholl JP, Johnson AG; A randomized, prospective, blinded comparison of postoperative pain, metabolic response, and perceived health after laparoscopic and small incision cholecystectomy. *Surgery* 1998; 123:485-495.
  22. Ros A, Carlsson P, Rahmqvist M, Bäckman K, Nilsson E; Non-randomised patients in a cholecystectomy trial: characteristics, procedures, and outcomes. *BMC Surg* 2006; 6:17.
  23. Leo J, Filipovic G, Kremmentsov J, Norblad R, Söderholm R, Nilsson E; Open cholecystectomy for all patients in the era of laparoscopic surgery: a prospective cohort study. *BMC Surg* 2006;6:5
  24. Lujan LA, Parrilla P, Robles R, Marin P, Torralba JA, Garcia-Ayllon J; Laparoscopic cholecystectomy vs open cholecystectomy in the treatment of acute cholecystitis. A prospective study. *Arch Surg* 1998; 133:173-175.
  25. Nilsson E, Ros A, Rahmqvist M, Backman K, Carlsson P; Cholecystectomy: costs and health related quality of life: a comparison of two techniques. *International Journal for Quality in Health care* 2004; 16: 473 – 482
  26. Lucena JR; Laparoscopic versus mini-laparotomy cholecystectomy. *Cir Esp* 2005; 77:332-336.
  27. Gómez Néstor A, Zapatier Jorge, Vargas Paola E; Ventajas reconocidas de la colecistectomía por minilaparotomía frente a la colecistectomía laparoscópica. *Cir Esp* 2006; 79:130-131.