J Minim Invasive Surg Sci. 2015 May; 4(2): e25253. DOI: 10.17795/minsurgery-25253

Published online 2015 May 23. **Research Article**

Laparoscopic Cholecystectomy: A Retrospective Four-Year Study

Mohammad Taghi Rajabi Mashhadi [1]; Abbas Abdollahi [2]; Alireza Tavassoli [1]; Mohammad Naser Forghani [3]; Hossein Shabahang [1]; Ehsan Keykhosravi [4]; Azadeh Jabbari Nooghabi [2]; Reza Rezaei [2,*]

[1]Endoscopic and Minimally Invasive Surgery Research Center, Mashhad University of Medical Sciences, Mashhad, IR Iran
[2]Surgical Oncology Research Center, Mashhad University of Medical Sciences, Mashhad, IR Iran
[3]Cancer Research Center, Mashhad University of Medical Sciences, Mashhad, IR Iran
[4]Student Research Committee, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, IR Iran

[*]*Corresponding author*: Reza Rezaei, Surgical Oncology Research Center, Mashhad University of Medical Sciences, Mashhad, IR Iran. Tel: +98-9153067052, Fax: +98-5138525255, E-mail: rezaeir@mums.ac.ir

Received: November 10, 2014**; Revised:** March 21, 2015**; Accepted:** March 25, 2015

Background: Today, laparoscopic cholecystectomy is considered as the gold standard treatment for cholecystectomy, which is mainly due to improved results of laparoscopic surgery compared to the open surgery, and its cosmetic benefits.
Objectives: The purpose of this study was to evaluate the results of laparoscopic cholecystectomy in our institution.
Patients and Methods: This is a retrospective study. Medical records of patients who underwent laparoscopic cholecystectomy from 2004 to 2008 were reviewed. The results and complications of surgery were collected using a checklist.
Results: Participants included 500 patients with mean age of 47 ± 11 years. Three hundred ninety-one (78.2%) were female and 109 (21.8%) were male. Four hundred (80.0%) of patients had symptomatic cholelithiasis. The mean operating time was 70 ± 8 minutes. The most common intra-operative complication was bradycardia during gas insufflation into the abdominal cavity. In 430 (86.0%) of patients length of hospital stay was less than two days. Six patients (1.2%) were complicated by hernia at incision site, 18 (3.6%) by bile leakage, and 15 (3.0%) required laparotomy. Surgical site bleeding and surgical site infection were observed respectively in 11 patients (2.2%) and 17 patients (3.4%). Totally, 52 patients (10.4%) had surgically-induced complications, two (0.4%) of whom died.
Conclusions: Laparoscopic cholecystectomy as the method of choice in treatment of gallbladder stone is associated with high success rate. This approach is increasingly being performed because of the decrease in patients' hospital stay, morbidity, and rapid return to normal life.

Keywords: Cholelithiasis; Cholecystectomy; Complications

1. Background

Open cholecystectomy surgery was considered as the gold standard treatment of gallstone disease for about 90 years. Alternative methods have been introduced like direct injection of cholesterol solvents such as methyl butyl ether (MTBE). However, these methods did not attract much attention due to their high rates of morbidities, stone recurrence, and risk of adenocarcinoma in the residual gallbladder. But compared with open surgery, laparoscopic surgery is associated with less postoperative pain, ileus, improved cosmetics, and higher patients' satisfaction. In comparison to open surgical techniques, the patient can be discharged in laparoscopic cholecystectomy the same day or the day after surgery, and will soon be able to perform the daily physical activities (1-3).

However, laparoscopic surgeons are faced with some limitations and intra-operative difficulties, such as hemorrhage and bile duct injury in case of intra-abdominal adhesions, which require more technical experience and proper patient selection (1, 4, 5).

Recently, with improvements in medical technology, there is a tendency to perform minimally invasive surgeries. For example, Csikesz et al. compared the results of open and laparoscopic cholecystectomy in a retrospective study in approximately one million patients with acute cholecystitis during 2000 - 2005 and concluded that laparoscopic cholecystectomy has lower morbidity and mortality even in circumstances of acute cholecystitis (6). Early laparoscopic cholecystectomy is suggested as a safe procedure during acute phase of cholecystitis (7, 8).

2. Objectives

To our knowledge there are a few studies evaluating the complications of laparoscopic cholecystectomy in our region, so we performed this study to review and analyze the results of this procedure in our institution.

3. Patients and Methods

This is a retrospective cross-sectional descriptive study.

We reviewed the medical records of 500 patients undergoing laparoscopic cholecystectomies with diagnosis of symptomatic cholelithiasis and acute calculus cholecystitis from 2004 to 2008 in three educational hospitals of Mashhad university of medical sciences.

They ranged in age from 20 to 86 years and had no evidence of biliary obstruction or dilatation of the bile duct. Patients with gallstone complications (cholecystitis associated with jaundice or pancreatitis), history of previous abdominal surgery, and symptoms of bile duct stone in physical examination or paraclinic studies were excluded from the study.

Collected data included age, sex, operative time, hospitalization time, postoperative complications and mortality rate. The interval between insertion of the first trocar and repair of the last trocar was considered as the operative time. All patients underwent four-port laparoscopic cholecystectomy.

For statistical analysis, descriptive statistics was used and data was analyzed using SPSS software version 21.0. To evaluate the association between the variables and sex, the Chi-square and the Fisher's exact test were used. $P \leq 0.05$ was considered statistically significant.

4. Results

Out of 500 patients, 391 patients (78.2%) were women and 109 (21.8%) were men with the mean age of 47 ± 10 (range of 20 - 86) years. Most patients (24.6%) were in the sixth decade of life. All procedures were done by the same surgical team.

The mean operative time was 70 ± 8 minutes. The length of hospital stay was less than two days in 430 patients (86%) and more than two days in 70 (14%) of patients (mean of 1.6 ± 1.8 days).

Eighteen patients (3.6%) had complications related to biliary system including two cases (11.1%) of choledochal injury, which were treated with hepaticojejunostomy and 16 cases (88.9%) of bile leakage from the cystic duct stump, which were improved by endoscopic retrograde cholangiopancreatography and sphincterotomy. Surgical site bleeding occurred in 11 patients (2.2%), which was controlled by laparoscopic procedure in nine (81.8%) and led to conversion to laparotomy in two cases (18.2%). For the management of these complications, 15 patients (3.0%) required laparotomy. Surgical site infection occurred in 17 patients (3.4%), which was treated with percutaneous drainage or antibiotic therapy (Table 1).

In a three-year follow-up period, six patients (1.2%) developed incisional hernia in the trocar site, and two patients (0.4%) died because of sepsis and cholangitis. Fifty-two patients (10.4%) had postoperative complications.

There were no significant relationship between female and male with bile leakage (P = 0.530), incisional hernia (P = 0.640), surgical site bleeding (P = 0.550), and infection (P = 0.308).

In our study, simultaneous splenectomy and cholecystectomy was done in two patients (0.4%) due to idiopathic thrombocytopenic purpura.

Table 1. Frequency and Distribution of Complications [a]

Complications	Percent in Complications	Management
Choledochal Injury	2 (3.85)	Laparotomy
Bile Leakage	16 (30.77)	Laparotomy-ERCP
Bleeding	11 (21.15)	Laparoscopic control-Laparotomy
Surgical Site Infection	17 (32.69)	Percutaneous Drainage
Hernia	6 (11.54)	Hernia Repair
	52	Total percent = 10.40

[a] Data are presented as No. (%).

5. Discussion

Laparoscopic cholecystectomy is the method of choice for treatment of symptomatic gallstone disease. Although there are many documented advantages for laparoscopic surgery in different studies, but there are still concerns about its possible complications. However, in comparison to open surgery, laparoscopic surgery accounts for less morbidity and mortality (4).

In this study, we investigated the results of laparoscopic cholecystectomy in 500 cases of cholelithiasis. Our results showed that most patients were women, with female/male ratio of 3.6, which is consistent with the results of other studies (2.5 to 5.25) (9-12).

In our study, mean age of the patients was 47 years, which is relatively similar to other studies (7, 10, 11, 13). However, some studies reported a range of 35 - 40 years (14).

Although it is recommended that patients be supervised for at least 24 hours postoperatively to observe early possible complications, some studies showed that laparoscopic surgery can safely be performed as one-day surgery, if there is no evidence of peri-operative compli-

cations (15, 16). In this study the mean length of hospitalization was 1.6 days, which was comparable with the similar studies (1 - 4 days) (6, 7, 11-13, 17-19). Some factors can influence the operative time, such as acute phase of cholecystitis, higher BMI level, previous upper abdominal surgery, male gender, and surgical expertise. In this study, the mean operative time was 70 minutes, which was fair compared with other studies. Similar studies have reported different mean operative time ranging from 61 minutes to 149 minutes (7, 12, 18, 20).

The prevalence of common bile duct injury following laparoscopic surgery is higher than open cholecystectomy and can result to catastrophic postoperative morbidity and mortality.

This complication is related to several factors, such as misidentification of biliary anatomy, complicated cholelithiasis, and lower experience of laparoscopic techniques (21).

In our study, bile duct injury in form of choledochal transection occurred in two patients (0.4%), which was treated with hepaticojejunostomy. These results were similar to results of other studies (0.16 to 1%) (11, 22-29).

Researches have recommended some techniques to reduce the risk of iatrogenic injuries to biliary tracts, including using angled telescope, correct diagnosis of anatomy, meticulous dissection close to the gallbladder cystic duct junction, avoiding electrocautery near common bile duct, using cholangiography in circumstances of complicated cholecystitis, and decreasing the conversions to open (21).

Uncontrolled bleeding, intra-operative bile duct injury, bile leakage, and dense adhesions are the main causes of conversion to open surgery. In our study, most of intraoperative arterial injuries were managed laparoscopically and there was rare need to convert to open surgery because of severe uncontrolled bleeding (2 cases, 0.4%).

In overall, we had to perform laparotomy for management of complications in 15 patients (3%), which seemed to be acceptable compared with other results reported by similar studies (1.95 - 13%) (6, 7, 11, 25, 30).

There is a low risk of surgical site infection in laparoscopic cholecystectomy, because of smaller wound size and less tissue trauma. Similar to other studies, we had a surgical site infection risk of about 3.4% in our patients. Some conditions, such as gallbladder perforation or using suction drain in circumstance of acute cholecystitis or doing endoscopic retrograde cholangiopancreatography can increase the risk of postoperative infection (31, 32).

Totally, complications occurred in 52 (10.4%) of our patients. In different studies, it is reported between 5 to 12% (11, 13, 18, 25).

Regarding mortality, in this series there were two (0.4%) cases of deaths because of cholangitis and sepsis. Similar studies have reported mortality rate of 0 to 1% (7, 11, 24, 27, 33, 34).

Our study showed that laparoscopic cholecystectomy, as a minimally invasive technique, is associated with favorable results for patients, high success rate, less postoperative pain and ileus, shorter hospitalization time, improved cosmetics, and faster return to normal life compared to open surgery. Of course, if this technique is performed by more experienced surgeons and appropriate patient selection, the rate of morbidity and mortality may decrease in patients undergoing this procedure. We recommend performing further studies on methods of controlling complications of laparoscopic cholecystectomy.

Acknowledgements

The results described in this paper were extracted from an MD thesis submitted by the sixth author to the Mashhad university of medical sciences. The study was supported by the vice chancellor for research of Mashhad university of medical sciences. We gratefully acknowledge Ms. M. Hassanpour for editing the manuscript.

Authors' Contributions

Study concept and design: Mohammad Taghi Rajabi Mashhadi, Abbas Abdollahi, and Reza Rezaee. Acquisition of data and Statistical analysis: Mohammad Taghi Rajabi Mashhadi, Abbas Abdollahi, and Alireza Tavassoli. Analysis and interpretation of data: Mohammad Taghi Rajabi Mashhadi, Azadeh Jabbari Nooghabi and Reza Rezaee. Drafting of the manuscript: Mohammad Taghi Rajabi Mashhadi, Abbas Abdollahi, Azadeh Jabbari Nooghabi and Reza Rezaee. Critical revision of the manuscript for important intellectual content: Mohammad Taghi Rajabi Mashhadi, Abbas Abdollahi, Alireza Tavassoli, Azadeh Jabbari Nooghabi and Reza Rezaee. Administrative, technical, and material support: Mohammad Taghi Rajabi Mashhadi Study supervision: Abbas Abdollahi.

References

1. Oddsdottir M, Hunter JG. Gallbladder and Extrahepatic Billiary System. In: Brunicardi FC, Anderson DK, Billiar TR, Dunn DL, Hunter JG, Polloc RE editors. *Schwartz's principles of surgery.*. New York: McGraw Hill; 2010. pp. 1187–219.
2. Keus F, Gooszen HG, Van Laarhoven CJ. Systematic review: open, small-incision or laparoscopic cholecystectomy for symptomatic cholecystolithiasis. *Aliment Pharmacol Ther.* 2009; **29**(4):359–78.
3. Keus F, de Jong JA, Gooszen HG, van Laarhoven CJ. Laparoscopic versus open cholecystectomy for patients with symptomatic cholecystolithiasis. *Cochrane Database Syst Rev.* 2006(4):CD006231.
4. Amir D, Amin N. Frequency of complications due to laparoscopic cholecystectomy in Hamedan Hospitals. *J Pak Med Assoc.* 2012;**62**(1):13–5.
5. Soltes M, Radonak J. A risk score to predict the difficulty of elective laparoscopic cholecystectomy. *Wideochir Inne Tech Maloinwazyjne.* 2014;**9**(4):608–12.
6. Csikesz N, Ricciardi R, Tseng JF, Shah SA. Current status of surgical management of acute cholecystitis in the United States. *World J Surg.* 2008;**32**(10):2230–6.
7. el Madani A, Badawy A, Henry C, Nicolet J, Vons C, Smadja C, et al. [Laparoscopic cholecystectomy in acute cholecystitis]. *Chirurgie.* 1999;**124**(2):171–5.
8. Zhou MW, Gu XD, Xiang JB, Chen ZY. Comparison of clinical safety and outcomes of early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a meta-analysis. *ScientificWorldJournal.* 2014;**2014**:274516.

9. Greenberger NJ, Paumgartner G. Diseases of the gallbladder and bile ducts. In: Fauci AS editor. *Harrison's principles of internal medicine*. 18th ed. New York: McGraw-Hill; 2005. pp. 1880–95.
10. Kama NA, Doganay M, Dolapci M, Reis E, Atli M, Kologlu M. Risk factors resulting in conversion of laparoscopic cholecystectomy to open surgery. *Surg Endosc*. 2001;**15**(9):965–8.
11. Herve J, Simoens C, Smets D, Ngongang C, Mendes da Costa P. Laparoscopic cholecystectomy; a retrospective 10-year study. *Hepatogastroenterology*. 2007;**54**(77):1326–30.
12. Bhasin SK, Langer JG. Laparoscopic Cholecystectomy: An experience of 200 cases. *JK Sci*. 2004;**6**(2).
13. Peters JH, Ellison EC, Innes JT, Liss JL, Nichols KE, Lomano JM, et al. Safety and efficacy of laparoscopic cholecystectomy. A prospective analysis of 100 initial patients. *Ann Surg*. 1991;**213**(1):3–12.
14. Koc E, Suher M, Oztugut SU, Ensari C, Karakurt M, Ozlem N. Retroperitoneal abscess as a late complication following laparoscopic cholecystectomy. *Med Sci Monit*. 2004;**10**(6):CS27–9.
15. Leeder PC, Matthews T, Krzeminska K, Dehn TC. Routine day-case laparoscopic cholecystectomy. *Br J Surg*. 2004;**91**(3):312–6.
16. Sato A, Terashita Y, Mori Y, Okubo T. Ambulatory laparoscopic cholecystectomy: An audit of day case vs overnight surgery at a community hospital in Japan. *World J Gastrointest Surg*. 2012;**4**(12):296–300.
17. Martinez Vieira A, Docobo Durantez F, Mena Robles J, Duran Ferreras I, Vazquez Monchul J, Lopez Bernal F, et al. Laparoscopic cholecystectomy in the treatment of biliary lithiasis: outpatient surgery or short stay unit? *Rev Esp Enferm Dig*. 2004;**96**(7):452–5.
18. Schirmer BD, Edge SB, Dix J, Hyser MJ, Hanks JB, Jones RS. Laparoscopic cholecystectomy. Treatment of choice for symptomatic cholelithiasis. *Ann Surg*. 1991;**213**(6):665–76.
19. Soper NJ, Stockmann PT, Dunnegan DL, Ashley SW. Laparoscopic cholecystectomy. The new 'gold standard'? *Arch Surg*. 1992;**127**(8):917–21.
20. Zdichavsky M, Bashin YA, Blumenstock G, Zieker D, Meile T, Konigsrainer A. Impact of risk factors for prolonged operative time in laparoscopic cholecystectomy. *Eur J Gastroenterol Hepatol*. 2012;**24**(9):1033–8.
21. Connor S, Garden OJ. Bile duct injury in the era of laparoscopic cholecystectomy. *Br J Surg*. 2006;**93**(2):158–68.
22. Flum DR. Common Bile Duct Injury During Laparoscopic Cholecystectomy and the Use of Intraoperative Cholangiography. *Arch Surg*. 2001;**136**(11):1287.
23. Orlando R3, Russell JC, Lynch J, Mattie A. Laparoscopic cholecystectomy. A statewide experience. The Connecticut Laparoscopic Cholecystectomy Registry. *Arch Surg*. 1993;**128**(5):494–8.
24. Z'Graggen K, Wehrli H, Metzger A, Buehler M, Frei E, Klaiber C. Complications of laparoscopic cholecystectomy in Switzerland. A prospective 3-year study of 10,174 patients. Swiss Association of Laparoscopic and Thoracoscopic Surgery. *Surg Endosc*. 1998;**12**(11):1303–10.
25. Nuzzo G, Giuliante F, Giovannini I, Ardito F, D'Acapito F, Vellone M, et al. Bile duct injury during laparoscopic cholecystectomy: results of an Italian national survey on 56 591 cholecystectomies. *Arch Surg*. 2005;**140**(10):986–92.
26. MacFadyen BJ, Vecchio R, Ricardo AE, Mathis CR. Bile duct injury after laparoscopic cholecystectomy. The United States experience. *Surg Endosc*. 1998;**12**(4):315–21.
27. 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**(6):571–8.
28. Yaghoubian A, Saltmarsh G, Rosing DK, Lewis RJ, Stabile BE, de Virgilio C. Decreased bile duct injury rate during laparoscopic cholecystectomy in the era of the 80-hour resident workweek. *Arch Surg*. 2008;**143**(9):847–51.
29. Di Vita G, Frazzetta M, Cortese E, Damiano A. [Complications of the laparoscopic access]. *G Chir*. 1996;**17**(1-2):31–6.
30. Ancona E, Zaninotto G, Rossi M, Costantini M, Finco C, Bovolato M. The safety and feasibility of laparoscopic cholecystectomy. *Ital J Gastroenterol*. 1992;**24**(6):320–3.
31. Turk E, Karagulle E, Serefhanoglu K, Turan H, Moray G. Effect of Cefazolin Prophylaxis on Postoperative Infectious Complications in Elective Laparoscopic Cholecystectomy: A Prospective Randomized Study. *Iran Red Crescent Med J*. 2013;**15**(7):581–6.
32. Dugg P, Shivhare P, Singh H, Mittal S, Kumar A, Munghate A. A Prospective Analysis of Port Site Complications in Laparoscopic Cholecystectomy. *J Minim Invasive Surg Sci*. 2014;**3**(2):e17634.
33. Chen YJ, Peng BG, Liang LJ, Wang J, Ou JR, Jian ZX, et al. [A survey of bile duct injuries sustained during laparoscopic cholecystectomy]. *Zhonghua Wai Ke Za Zhi*. 2008;**46**(24):1892–4.
34. Bingener-Casey J, Richards ML, Strodel WE, Schwesinger WH, Sirinek KR. Reasons for conversion from laparoscopic to open cholecystectomy: a 10-year review. *J Gastrointest Surg*. 2002;**6**(6):800–5.