DOI: https://doi.org/10.53350/pjmhs20221612539

ORIGINAL ARTICLE

Risk of Surgical Site Infection Following Open and Laparoscopic Cholecystectomy

FAZLI SUBHAN[1], MAIRA RIAZ[2], ATIF IQBAL[3], EHSANULLAH MALIK [4], IRFAN ALI[5], ABDUL GHANI SHAIKH [6]
[1]*Consultant General and Laparoscopic surgeon, DHQ Hospital Khar bajaur*
[2]*Training medical officer, Department of Surgery, Khyber Teaching Hospital*
[3]*Assistant Professor, Department of Surgery, Jinnah International Hospital, Abbottabad*
[4]*Associate Professor of Surgery, SMBBMU Larkana, Sindh*
[5]*Trainee Medical Officer, Surgical B ward, MTI-Mardan Medical Complex, Mardan*
[6]*Associate Professor of Surgery, Chandka Medical College SMBBMU Larkana, Sindh*
Corresponding author: Maira Riaz, Email: ghaziyankhan630@gmail.com

ABSTRACT

Objective: The purpose of this research was to assess the risk for infection at the surgical site following open vs. laparoscopic cholecystectomy.

Study Design: Randomized control trial

Place and Duration: Data was collected from different hospitals including Department of Surgery, Khyber Teaching Hospital and Jinnah International Hospital, Abbottabad in the period from March, 2022 to August, 2022.

Methods: Total 94 patients of both genders had age 18-70 years were included. We have taken informed written consent from the included patients for detailed demographics. We equally divided cases in two groups. Group I received open cholecystectomy in 47 patients and 47 patients of group II received laparoscopic cholecystectomy. Post-operative frequency of surgical site infection was compared among both groups. SPSS 23.0 was used to analyze all data.

Results: In 94 included cases, 63 (67.02%) were females and 31 (32.98%) were males. Patients mean age in group I was 32.3±13.44 years while in group II mean age was 35.7±16.37 years. Diabetes, depression, hypertension and liver disease were the comorbidities among both groups. Post-operative duration of hospital stay was lower in group II 1.9±6.32 days as compared to group I 4.5±1.19 days. We found that frequency of surgical site infection in group I was higher in 12 (25.5%) cases as compared to group II in 3 (6.4%) cases.

Conclusion: In this study, we found that laparoscopic cholecystectomy resulted in a lower rate of infection at the surgical site compared to open cholecystectomy.

Keywords: Surgical Site Infection, Open cholecystectomy, Laparoscopic cholecystectomy

INTRODUCTION

Cholecystectomy is among the most common surgical procedures [1]. Symptomatic cholelithiasis has been treated with open cholecystectomy (OC) as the gold standard for over a century [2]. However, laparoscopic cholecystectomy (LC) has been a serious contender in the field for the past two decades. Both are generally safe, but wound infection is still the most common complication after surgery. which can result in septicemia and long-term complications like incisional hernia, among other things, and extend the patient's stay in the hospital and drive up treatment costs. [3] Consequently, research into and development of novel surgical innovations are needed to reduce postoperative morbidity and mortality. In spite of its potential to reduce the frequency of infectious complications [4,5] and modify their characteristics, the impact of laparoscopic surgery on wound infection has not received much attention in the surgical literature. [6] Laparoscopic surgery has the potential to reduce the occurrence of surgical infections due to its minimal impact on the immune system, reduced exposure to the external environment, carbon dioxide penumoperitoneum, and improved tissue visulasation for dissection and hemostasis. However, there is a higher chance of infection when using reusable LC instruments.

The main advantage of laparoscopic cholecystectomy (LC) over open cholecystectomy (OC) is a lower risk of surgical site infection (SSI) (OC). In addition to OC, other factors have been linked to an increased risk of surgical site infection following cholecystectomy, such as the patient's age, the patient's gender, the length of the surgical procedure, the number of procedures performed, the severity of the patient's underlying medical condition, the need for urgent surgery, and so on. Infection rates following cholecystectomy ranged from 1 percent to 14 percent. [8]

There is strong evidence linking open cholecystectomy to an increased incidence of SSI [9], although the links between other risk factors for SSI and cholecystectomy are less solid. Independent risk factors for SSI following cholecystectomy include the patient's older age, the patient's male gender, the length of the procedure, the number of surgeries performed, the patient's sickness severity, and the patient's wound class as contaminated or infected [10,11]. There has not been extensive research on the role of other patient-, operative-, and postoperative-level characteristics in SSI risk following cholecystectomy, although this information might be useful for risk stratification in hospitals with a variety of patient case mixes.

Among 100 patients having cholecystectomy, 50 were assigned to have laparoscopic surgery, while the other 50 underwent open surgery in a randomised clinical study. Based on their findings, wound infections are significantly less common in the laparoscopic cholecystectomy group (6%) compared to the open cholecystectomy group (22%). [12] The postoperative morbidity and length of hospital stay following open and laparoscopic cholecystectomy were also compared in a separate research. In patients undergoing laparoscopic cholecystectomy, researchers found no evidence of infection at the surgical site. However, 11 patients who had open cholecystectomy (57.8%) developed wound infections. [10]

MATERIAL AND METHODS

We conducted this research study at multi hospitals including Department of Surgery, Khyber Teaching Hospital and Jinnah International Hospital, Abbottabad in the period from March, 2022 to August, 2022 and comprised of 94 patients. Included patients were aged between 18-70 years. An ultrasonographic finding of gall stones in a patient who presented with right hypochondrium discomfort led to the diagnosis of systemic gallstone disease. Ultrasonography revealed echoing gallstones. Patients with a history of surgery, particularly in the upper abdomen, diabetes mellitus or any other comorbidities, e.g. hypertension, and patients using oral contraceptives and steroids were excluded from the study since these medications enhance the risk of infection.

All patients were given a thorough explanation of the study's aims and anticipated benefits before providing written informed permission, which was approved by the institutional review board. Detailed medical histories, in-depth physical examinations, and diagnostic tests such ultrasounds, serum alkaline phosphatase, and complete blood counts were performed on all patients before they were admitted to the unit via the outpatient department (OPD)

to confirm the presence of gallstones. The research included all individuals with gallstones who sought treatment at a surgical outpatient clinic or emergency department. The study included all patients who met the inclusion and exclusion criteria, and they were all examined using a single-blind method. Patients were first assigned into groups using a lottery system (Concealed Allocation), with subsequent patients divided using simple random sampling. We equally divided cases in two groups. Group I received open cholecystectomy in 47 patients and 47 patients of group II received laparoscopic cholecystectomy. General anesthesia was used for both procedures.

The frequencies and percentages of categorical variables like gender and Surgical site infection were determined (SSI). Chi-square analysis was used to compare SSI between the two groups, and results were considered significant when the P-value was less than 0.05. SSI was divided up according to patient's age, gender, and length of hospital stay. The chi-square test was used once the groups were divided up. Results with a P-value less than 0.05 were considered significant. The findings were displayed graphically and tabulated.

RESULTS

In 94 included cases, 63 (67.02%) were females and 31 (32.98%) were males.(figure 1)

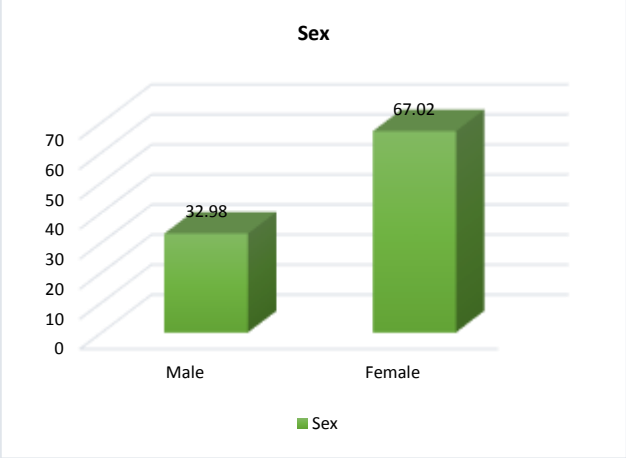

Figure-1: Included cases with sex presentation

Patients mean age in group I was 32.3±13.44 years while in group II mean age was 35.7±16.37 years. Diabetes, depression, hypertension and liver disease were the comorbidities among both groups.(table 1)

Table-1: Presentation of the demographics

Variables	Group I (47)	Group II (47)
Mean age (years)	32.3±13.44	35.7±16.37
Comorbidities		
diabetes	17 (36.2%)	16 (34.04%)
depression	15 (31.9%)	12 (25.5%)
hypertension	10 (21.3%)	16 (34.04%)
liver disease	5 (10.6%)	3 (3.4%)

Post-operative duration of hospital stay was lower in group II 1.9±6.32 days as compared to group I 4.5±1.19 days. We found that frequency of surgical site infection in group I was higher in 12 (25.5%) cases as compared to group II in 3 (6.4%) cases. (table 2)

Table-2: Comparison of SSI and hospitalization among both groups

Variables	Group I (47)	Group II (47)
Mean hospital stay (days)	4.5±1.19	1.9±6.32
Surgical Site Infection		
Yes	12 (25.5%)	3 (6.4%)
No	35 (74.5%)	44 (96.6%)

Among 94 cases, overall SSI after cholecystectomy was 15 (15.95%).(figure 2)

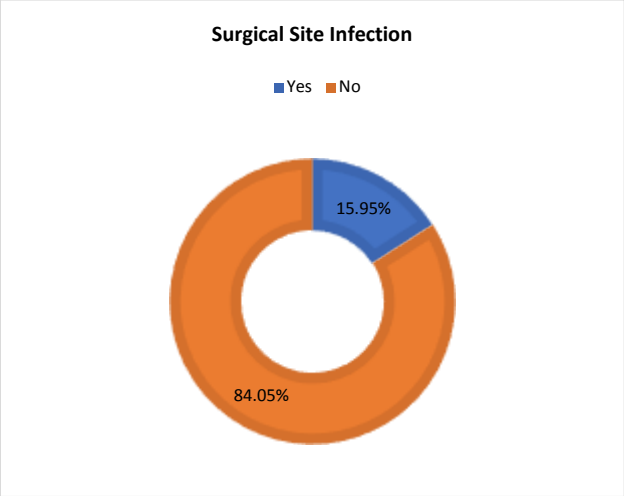

Figure-2: Frequency of SSI among all cases

DISCUSSION

One of the most frequent reasons for surgery is treatment for gallstones. From 3-20% of the global population suffers from it, according to published studies.[13] Laparoscopic cholecystectomy has surpassed open surgery in frequency of use at most institutions in recent years, becoming a standard surgical procedure.[14]

In 94 cases included cases of current study, 47 received open cholecystectomy in group I and 47 cases of group II received open cholecystectomy. Patients mean age in group I was 32.3±13.44 years while in group II mean age was 35.7±16.37 years. Diabetes, depression, hypertension and liver disease were the comorbidities among both groups. These findings were comparable to the studies conducted in past.[15,16] In 94 included cases, 63 (67.02%) were females and 31 (32.98%) were males.[13] Inflammation is caused by changes in the immune system that are triggered by surgical intervention. [17] Post-traumatic immune suppression, in any form, is linked to an increased risk of septic complications. It's generally agreed upon now that laparoscopic surgery is preferable to open surgery when it comes to preserving the immune system, and several markers, including Interleukin (IL) 6 and C-reactive protein, attest to this (CRP). The greatly reduced tissue injury that causes this diminished immune response. [18] Studies conducted in the last few years have examined this question in depth, [19] detailing the impact of laparoscopic surgery on various immune system components like T-cell lymphocytes and delayed hypersensitivity, mononuclear phagocytic neutrophils, polymorphonuclear elastase, and anion superoxide. After having open surgery, everyone changes more than they did before. The peritoneal cavity is the site of early infection after surgery, hence studying this area's reaction to infection is crucial. [20,21]

Among 94 cases, overall SSI after cholecystectomy was 15 (15.95%). We found that frequency of surgical site infection in group I was higher in 12 (25.5%) cases as compared to group II in 3 (6.4%) cases. Similar results were seen in the research where the rate of SSI (wound infection) was 4.93 times greater following open cholecystectomy than laparoscopic surgery (0.64). [22] Another research compared the effectiveness of open cholecystectomy with laparoscopic cholecystectomy in treating gallstones. When comparing laparoscopic and open cholecystectomies, they found that the latter had a substantially higher rate of wound infection (22%) than the former (6%). [23] The routine use of antibiotics for preventative purposes has been

widely accepted in clinical settings. [24] The low rate of abdominal wall infection following laparoscopic surgery, however, implies that it should be rethought in this context. Infection rates did not differ significantly between the 164 patients treated laparoscopically who were given preoperative antibiotic prophylaxis and the 78 patients who were not given antibiotics (Frantzides and Sykes [25]). (nine of 164 versus none of 78 respectively). Chronic cholecystitis patients, therefore, should not take antibiotics for prevention purposes.

Hussain and Khan [26] found no difference in SSI incidence between patients in Saudi Arabia undergoing laparoscopic cholecystectomy for acute versus chronic cholecystitis (1.7% vs. 1.3%, respectively), which contradicts the results of the current study.

CONCLUSION

In this study, we found that laparoscopic cholecystectomy resulted in a lower rate of infection at the surgical site compared to open cholecystectomy.

REFERENCES

1 Abbasi SA, Haleem A, Tariq GR, Iqbal A, Almas D, et al. An audit of laparoscopic cholecystectomies performed at PNS Shifa. Pak Armed Forces Med 2003;53: 51-8.

2 Cheema AM, Akif M, Mohammad Z. An experience of laparoscopic cholecystemies at Lahore General Hospital. Biomedica 2001; 17: 32-6.

3 Arian GM, Randhawa H, Malik SA. Laparoscopic cholecystectomy and its complications: A study of 1100 cases. Pak J Gasteroenterol 1998; 12 : 29-35

4 Targarona EM, Balague C, Knook M. M. Laparoscopic surgery and surgical infection. Br J Surg 2000; 87: 536-44.

5 Vittimberga FJ, Foley DP, Meyers WC. Laparoscopic surgery and the systemic immune response. Ann Surg 1998; 227: 326-34.

6 Hackan DJ, Rostein OD. Host response to laparoscopic surgery: mechanisms and clinical correlates. Can J Surg 1998; 41: 103-11.

7 Duman K, Sezer KH, Yilmaz F, Akin ML. The clinical outcome of traditional laparoscopic Cholecystectomy Gaziantep Med J. 2013;19:35–9

8 den Hoed PT, Boelhouwer RU, Veen HF, Hop WC, Bruining HA. Infections and bacteriological data after laparoscopic and open gallbladder surgery J Hosp Infect. 1998;39:27–37

9 Romy S, Eisenring MC, Bettschart V, et al. Laparoscope use and surgical site infections in digestive surgery. Ann Surg 2008; 247:627–32.

10 Bogdanic B, Bosnjak Z, Budimir A, et al. Surveillance of surgical site infection after cholecystectomy using the hospital in Europe link for infection control through surveillance protocol. Surg Infect (Larchmt) 2013; 14:283–7.

11 Mu Y, Edwards JR, Horan TC, et al. Improving risk-adjusted measures of surgical site infection for the national healthcare safety network. Infect Control Hosp Epidemiol 2011; 32:970–86.

12 SinghP, Gupta SK, Kumar M.Acomparative studyofopen cholecystectomyandlaparoscopiccholecystectomy in patients withcholelithiasis. InternationalSurgeryJournal. 2017 Dec 26;5(1):253-6

13 Aslam R, Siddique AB, Kalim M, Faridoon S, Shah RU, Khan SA. Comparitive Risk of Surgical Site Infection with Open CholecystectomyVS Laparoscopic Cholecystectomy. J Gandhara Med Dent Sci. 2022;9(3): 25-29

14 Owings MF, Kozak LJ. Ambulatory and inpatient procedures in the United States, 1996.National Center for Health Statistics. Vital Health Stat 13 1998; 139: 1-119.

15 Warren DK, Nickel KB, Wallace AE, Mines D, Tian F, Symons WJ, Fraser VJ, Olsen MA. Risk Factors for Surgical Site Infection After Cholecystectomy. Open Forum Infect Dis. 2017 Feb 22;4(2):ofx036.

16 Biscione FM, Couto RC, Pedrosa TM, Neto MC. Comparison of the risk of surgical site infection after laparoscopic cholecystectomy and open cholecystectomy. Infect Control Hosp Epidemiol. 2007 Sep;28(9):1103-6.

17 Lennard TWJ, Shenton BK, Borzotta A. The influence of surgical operations on components of the human immune system. Br J Surg 1985; 72: 771-6.

18 Targarona EM, Balague C, Knook M. M. Laparoscopic surgery and surgical infection. Br J Surg 2000; 87: 536-44.

19 Hackan DJ, Rostein OD. Host response to laparoscopic surgery: mechanisms and clinical correlates. Can J Surg 1998; 41: 103-11.

20 Redmond HP, Waston RWG, Houghton T. Immune function in patients undergoing open vs laparoscopic cholecystectomy. Arch Surg 1994; 129:1240-6.

21 Sietses C, Beelen RH, Meijer S, Cuesta MA. Immunological consequences of laparoscopic surgery, speculations on the cause and clinical implications. Langenbeckes Arch Surg 1999; 384:250-8.

22 Lirici MM, Tierno SM,Ponzano C.Single-incisionlaparoscopiccholecystectomy: does itwork?Asystematic review. Surgical endoscopy.2016 Oct;30(10):4389-99

23 Ekici U, Yılmaz S, Tatlı F. Comparativeanalysis oflaparoscopic cholecystectomyperformedinthe elderlyandyoungerpatients: should we abstain fromlaparoscopic cholecystectomy intheelderly?. Cureus. 2018 Jun 27;10(6)

24 Song F, Glenny AM. Antimicrobial prophylaxis in colorectal surgery; a systematic review of randomized controlled trials. Br J Surg 1998; 85: 1232-41.

25 Frantzides CT, Sykes A. A revaluation of antibiotic prophylaxis in laparoscopic cholecystectomy. J Laparoendosc Surg 1994; 4: 375-8.

26 Hussain MI, Khan AF. Outcome of laparoscopic cholecystectomy in acute and chronic cholecystitis. Saudi Med J 2006; 27:657–60.