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Original Article

Comparative Study on the Incidence of Port-site Infection, With and Without Local Infiltration of Antibiotics to the Port Site after the Removal of Ports in Laparoscopic Surgeries

L Madhu Shankar[1], U Chinmaye Melur[2]

[1]Professor, Department of General Surgery, KIMS, Bengaluru, Karnataka, India, [2]Postgraduate Student, Department of General Surgery, KIMS, Bengaluru, Karnataka, India

Abstract

One of the most popular surgeries performed during laparoscopic surgery is a laparoscopic cholecystectomy (LC). The aim of the study was to examine the prevalence of port-site infections (PSI) in patients having LC, either with or without local antibiotic infiltration at the port site. An 18-month period witnessed the use of systematic random sampling at Bengaluru's Kempe Gowda Institute of Medical Science. LC participants who met the criteria for inclusion were divided into two groups at random (n = 50 in each group). Antibiotics were not locally injected into one group at the port site, while they were locally injected into the other group (amikacin). Patients were observed for symptoms of inflammation, purulent leaking from the port site, and dehiscence of skin sutures after surgery. Follow-up examinations were also performed for patients on the 3rd, 5th, and 7th days, and 4th week of the postop period. Considering a minimum age of 20 and a maximum age of 80, patients' mean ages ranged from 42.66 ± 14.42 years to 20 years. Women dominated (77%), according to the gender distribution. The prevalence of infection at the port site was 5%, and all post-operative problems were observed in the patient group without antibiotic infiltration at the port site. When compared to patients who did not have antibiotic infiltration, the mean LOS was lower in the antibiotic-infiltrated patients. This research demonstrated the difference between patients without antibiotic infiltration to the port site and patients with antibiotic infiltration to the port site in terms of the presence of PSI, postoperative complications, and an increase in the LOS.

Key words: Antibiotics to port site, Cholecystectomy, Laparoscopic surgery, Port-site infection

INTRODUCTION

With the rapid advancement of medical technology, surgeons now have the ability to perform limitedly invasive surgery in addition to surgical disease treatment. The best example is minimal access surgery (MAS), also known as laparoscopic surgery (LS)/keyhole surgery, which has led to a paradigm shift in how modern surgery is approached by reducing access-related morbidities. LS uses trocars, which are microscopic skin incisions or ports made on the skin away from the actual site of surgery. These trocars can be either reusable metallic or disposable plastic, and both types are utilized. With the aid of a telescope and specially designed instruments, the surgical procedure can be carried out through this port. It has grown in popularity as a result of less pain, better anesthesia, early ambulation, early hospital discharge, and an early return to work, which reduces the patient's financial burden. Since Philips Mouret published the first laparoscopic cholecystectomy (LC) in 1987,[1] the technique has been used for a variety of additional surgical operations, such as herniorrhaphy, appendectomy, gastric surgery, colonic surgery, urological as well as gynecological surgery.[2-6] The reason for this is that the horizons of LS have been expanded as a result of a combination of technological advancement and the rising acceptance of MAS by patients. Nevertheless, LS comes with a unique set of complications. Port-site infection (PSI) is one such complication that can be prevented. The benefits of LS are soon eroded by PSI as the patient develops

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Corresponding Author: Dr. L Madhu Shankar, Department of General Surgery, KIMS, Bengaluru, Karnataka, India.

worries about the nagging and indolent infection and loses confidence in the surgeon performing the surgery. Morbidity, hospital stays, and financial losses to the patient all rise significantly. The patients' quality of life is severely affected, destroying the entire goal of MAS—to produce the maximum number of cosmesis and turning it into an unsightly wound. To study the effectiveness of local antibiotic infiltration (Amikacin injection) at the port site following port removal and to ascertain the incidence of PSI in LC, this study was conducted.

MATERIALS AND METHODS

With the General Surgery Department at the Kempegowda Institute of Medical Science in Bangalore, this prospective comparative study was conducted from March 2021 to November 2022. One hundred (100) patients over the age of 18 who underwent LC and had symptomatic gallstone disease were examined. A study group as well as a control group of fifty patients each were randomly divided into two groups. Patients under the age of 18, those who had laparoscopic surgeries other than an LC, those who were immunocompromised, and those who had acute cholecystitis, cholangitis, obstructive jaundice, or gall bladder ruptures during surgery were excluded. A 4-port approach was used to perform LC on each patient. Both groups underwent the same preoperative preparation of the wound region. Following the removal of the ports, the study group was given a local injection of the antibiotic amikacin, while the control group did not receive any antibiotic infiltration on the port site. Postoperatively, patients in both groups were evaluated for symptoms of inflammation, purulent leaking from the port site, and dehiscence of skin sutures. Follow-up was also completed on the 3rd, 5th, 7th days, and 4th week postoperatively. Post op follow up was done on 3rd, 5th, 7th and 30th day. The mean, standard deviation, and frequency for quantitative variables, as well as the proportions and frequencies for qualitative variables, were used to produce descriptive statistics for the explanatory and outcome variables. Regarding qualitative variables, a chi-square test was used to determine the association. In order to evaluate the duration of hospital stays between the groups, an independent sample t-test was used (based on antibiotic to port site). The level of significance is 5%.

RESULTS

With a minimum age of 20 and a maximum age of 80, the patients in the current study had a mean age of 42.66 ± 14.42 years. Ages 36–50 made up the majority of the patients (36/36%) in this group. 77 (77%) of the 100 (100%) patients were female, compared to 23 (23%) male patients, demonstrating the majority of female patients. About 93 (93%) had cholelithiasis and 7 (7%) had chronic cholecystitis [Table 1].

According to the antibiotic-to-port site, an equal number of patients were divided. The mean (LOS) length of hospital stay was 7.29 ± 3.71 days, with a minimum of 3 days and a maximum of 24 days. Among 100 (100%) patients, histopathology showed that 79 (79%) had chronic cholecystitis, 15 (15%) had acute chronic calculous cholecystitis, and 6 (6%) had chronic calculous cholecystitis with cholesterosis [Table 2].

Among 100 (100%) patients, about 93 (93%) patients had cholelithiasis, 48 (48%) patients had to no antibiotic at the port site, and out of 7 (7%) patients with chronic cholecystitis, and 5 (5%) patients were given antibiotics at the port site. A chi-square test was applied to associate the antibiotic at the port site with the diagnosis and showed no statistically significant association between the antibiotic at the port site and the diagnosis (χ^2 = 1.38, P = 0.24) [Table 3].

According to histopathology, cholecystitis was observed in 79 (79%) patients with chronic cholecystitis; acute and chronic calculous cholecystitis was observed in 15 (15%) patients; chronic calculous cholecystitis with cholesterosis was observed in 6 (6%) patients. The Chi-square test showed no statistically significant association between antibiotics at the port site and histopathology (χ^2 = 0.74, P = 0.68) [Table 4].

Table 1: Distribution of the patients based on age, age groups, gender, and diagnosis

Distribution of the patients based on age				
Variables	*n*	Minimum	Maximum	Mean±SD
Age	100	20.0	80.0	42.66±14.42

Distribution of the patients based on age groups	
Age groups (years)	Frequency (%)
20–35	33 (33.0)
36–50	36 (36.0)
51–65	25 (25.0)
66–80	6 (6.0)
Total	100 (100.0)
Distribution of the patients based on gender	
Gender	
Females	77 (77.0)
Males	23 (23.0)
Total	100 (100.0)
Distribution of the patients based on diagnosis	
Diagnosis	
Cholelithiasis	93 (93.0)
Chronic cholecystitis	7 (7.0)
Total	100 (100.0)

SD: Standard deviation

During the postoperative day (POD) 5, erythema was observed in 4 (4%) patients, purulent discharge was observed in 4 (4%) patients at POD 7, and edema, as well as purulent discharge, were observed in 1 (1%) patient at the POD 4th week. Those without exposure to an antibiotic at the port site had all the complications. A connection between complications at PODs 5 and 7 and antibiotic application to the port site was statistically significant, according to the Chi-square test (χ^2 = 4.16, P = 0.041) [Table 5].

Among patients who had not received an antibiotic at the port site, the mean length of hospital stays increased by 7.46 ± 4.127 as compared to patients with an antibiotic at the port site by 7.12 ± 3.287. To compare the average duration of hospital stays between the groups, an independent sample t-test was used. A random sample t-test conducted independently revealed no statistically significant variation between the groups (P = 0.65) [Table 6].

Postop complications were present in 5 (5%) patients, and all the patients belonged to the group with no antibiotic at the port site. The Chi-square test showed a statistically significant association between antibiotic at the port site and post-operative complications (χ^2 = 5.26, P = 0.022) [Table 7].

Table 2: Distribution of the patients based on the antibiotic to the port site, mean duration of hospital stay (days), and histopathology

Distribution of the patients based on the antibiotic to the port site				
Antibiotic to port site				**Frequency (%)**
No				50 (50.0)
Yes				50 (50.0)
Total				100 (100.0)
Distribution of the patients based on the mean duration of hospital stay (days)				
Days of hospital stay	***n***	**Minimum**	**Maximum**	**Mean±SD**
	100	3	24	7.29±3.71
Distribution of the patients based on histopathology				
Histopathology				**Frequency (%)**
Acute on chronic calculous cholecystitis				15 (15.0)
Chronic calculous cholecystitis with cholesterosis				6 (6.0)
Chronic cholecystitis				79 (79.0)
Total				100 (100.0)

SD: Standard deviation

Table 3: Cross-tabulation of antibiotic to port site with the diagnosis

Diagnosis	Count (%)		
	Antibiotic to port site		Total
	No	Yes	
Cholelithiasis	48 (48.0)	45 (45.0)	93 (93.0)
Chronic cholecystitis	2 (2.0)	5 (5.0)	7 (7.0)
Total	50 (50.0)	50 (50.0)	100 (100.0)
χ^2, P	1.38, 0.24		

Table 4: Cross-tabulation of antibiotic to port site with histopathology

Histopathology	Count (%)		
	Antibiotic to port site		Total
	No	Yes	
Acute on chronic calculous cholecystitis	8 (8.0)	7 (7.0)	15 (15.0)
Chronic calculous cholecystitis with cholesterosis	2 (2.0)	4 (4.0)	6 (6.0)
Chronic cholecystitis	40 (40.0)	39 (39.0)	79 (79.0)
Total	50 (50.0)	50 (50.0)	100 (100.0)
χ^2, P	0.74, 0.68		

DISCUSSION

With the advantages of decreased postoperative pain, a quicker recovery to normal activities, a reduction in wound size, and other advantages, laparoscopic procedures have transformed surgery in recent years. However, a number of LS complications have recently been identified. According to statistics from all across the world, Karthik *et al.* found that the frequency of port-site complications ranged from

Table 5: Cross-tabulation of antibiotic to port site with complications at postoperative day 5, day 7, and 4th week

Complications	Count (%)			χ^2	*P*
	Antibiotic to port site		Total		
	No	Yes			
POD 5					
Absent	46 (46.0)	50 (50.0)	96 (96.0)	4.16	0.041*
Erythema present	4 (4.0)	0	4 (4.0)		
POD 7					
Absent	46 (46.0)	50 (50.0)	96 (96.0)	4.16	0.041*
Purulent discharge	4 (4.0)	0	4 (4.0)		
POD 4th week					
Absent	49 (49.0)	50 (50.0)	99 (99.0)	1.01	0.315
Swelling and purulent discharge	1 (1.0)	0	1 (1.0)		

POD: Postoperative day, * P value – 0.05

Table 6: Mean comparison of the duration of the hospital days based on the antibiotic to port site

Antibiotic to port site	*n*	Minimum	Maximum	Mean±SD	Mean different	*P*
No	50	4	24	7.46±4.127	0.34	0.65
Yes	50	3	21	7.12±3.287		

SD: Standard deviation

Table 7: Cross-tabulation of antibiotic to port site with postoperative complications

Postoperative complications	Count (%)		
	Antibiotic to port site		Total
	No	Yes	
Absent	45 (45.0)	50 (50.0)	95 (95.0)
Present	5 (5.0)	0	5 (5.0)
Total	50 (50.0)	50 (50.0)	100 (100.0)
χ^2, *P*	5.26, 0.022*		

*Significant

0.2% to 6%. A port-site infection was the most frequent portsite complication, and it was more prevalent in secondary ports.[7] To prevent wound infection that could result in unacceptable cosmetic outcomes, an incisional hernia, and a longer hospital stay, it is crucial to identify the risk factors. One of them, an unnoticed tear in the endobag while retrieving the specimen, might be the cause. Wound infection is one of the most common reasons for morbidity after LS, despite the fact that it is much less prevalent than in open surgery. A lower risk of wound infection is likely connected with LS's smaller wounds and very little tissue damage.

In the current study, the average age of the patients was 42.66 ± 14.42 years, with a minimum age of 20 years and a maximum age of 80 years. Out of 100 (100%) patients, more than 3/4th of the patients were females: 77 (77%) and 23 (23%) were males, showing female predominance. Amonkar *et al*.'s study included 112 patients and showed male predominance, i.e., 61 (54.4%) were males and 51 (45.6%) were females, which is in contrast with the current study.[8] In general, men are more likely than women to get appendicitis. The Kotwal and Jadav study, which shows that 73.66% of the patients are male, reflects this.[9] Nevertheless, the role of laparoscopy is more significant in females because it assists in visualizing and treating any disorders of the female pelvic organs in the same environment, as in many such circumstances, a precise preoperative evaluation may be impossible or exceedingly difficult.

According to the clinical diagnosis distribution in our study, symptomatic cholelithiasis (93/93%) was the most common diagnosis among the 100 patients (100%), followed by chronic cholecystitis in 7 (7%) individuals. The mean LOS in the group that got antibiotics was 7.29 3.71 days, with a minimum of 3 days and a maximum of 10 days. The preoperative stay should be kept to a minimum, only long enough for the patient to become somewhat familiar with the location as well as the staff. During the postoperative period, this is quite helpful. The risk of postoperative wound infection is definitely decreased by shortening the hospital stay before surgery. Histopathology assessment showed that 79 (79%) had chronic cholecystitis, 15 (15%) had acute chronic calculous cholecystitis, and 6 (6%) had chronic calculous cholecystitis with cholesterosis. In the study of Jha *et al*., a total of 921 patients were examined during the study period. Histopathological lesions seen in gall bladder specimens were categorized as benign, premalignant, and malignant. Most of them were benign lesions (97.6%), followed by incidental carcinoma, the burden of which was 1.8%. The most common pathology (95.01%) overall and among benign lesions was discovered to be chronic calculus cholecystitis. Cholesterosis was reported in one out of ten cholecystectomy specimens (9.9%). Out of 93 (93%) patients who had cholelithiasis, 48 (48%) patients belonged to the no antibiotic port site, and out of 7 (7%) patients with chronic cholecystitis, 5 (5%) patients were in the antibiotic port site.[10] We observed a statistically insignificant association between antibiotic use at the port site and histopathology.

On days 3, 5, 7, and 4 weeks following surgeries, all postoperative complications were observed in patients who had not received any antibiotics at the port site. This resulted in a statistically significant association between the presence or absence of antibiotic infiltration at the port site in the current study. 17 of the 112 participants studied by Amonkar *et al*. experienced complications at the port site (17/15.1%).[8] According to data from throughout the world, Karthik *et al*. found that the incidence of complications at the port site ranged from 0.2% to 6%; the most prevalent of these complications was an infection at the port site, which was more prevalent in secondary ports.[7] According to a review of the literature, there are different levels of PSI frequency. It has been recorded as low as 2.3% in Israel[11] and as high as 9.2% in Cairo, Egypt.[12] It was reported as 5.3% by Raina *et al*.,[13] which is comparable to the 5.7% reported by Waqar and Sabir[11] and the 5.3% reported by Den Hoed PT.[14] Shindholimath *et al*.[15] reported a relatively higher percentage of 6.3%.

According to Darzi *et al*., surgical site infections (SSI) occurred at different rates in patients who had LC and were given prophylactic antibiotics or not, i.e., 1.7% and 2.1%, respectively. However, the variance was not statistically significant.[16] Cefazolin is an efficient antibiotic used in open cholecystectomy as well as other biliary operations.[17,18] Moreover, investigations have shown that cephalosporin should be given intravenously in a single dosage for the induction of anesthesia or right before cutting in clean as well as clean-contaminated surgeries.[19] Therefore, the goal of antimicrobial prophylaxis is not to totally eradicate microorganisms from the tissue but rather to lower the number of microorganisms to the point where the host's defense mechanisms can effectively avoid infection by the contaminated microorganisms.[20] Controversy remains over the impact of antibiotic prophylaxis on developing postoperative infections in LC.[21-23] Prophylactic antibiotics are the primary method of preventing infectious side effects during LC.[24,25] However, their results were in conflict with those of other prospective surveys, indicating that their use is not necessary given the low risks of infection during LC.[22,23] Less postoperative pain, a shorter hospital stay, a faster resumption to work and food intake, and a considerable decline in perioperative infection problems are just a few of the advantages of laparoscopy, which is considered as an elective procedure.[26,27] Foster *et al*. conducted a study to determine the function of a single shot of ampicillin plus sulbactam during laparoscopic appendicectomy in a city hospital in Nottingham, England, where 8% of patients had infections.[28] The risk of wound infection in a study at Agakhan Hospital was 8.5%. After administering prophylactic antibiotics throughout the recovery period following LS, Chang *et al*. reported an 8.9% wound infection rate.[22] This is about equivalent to our infection rate (2–6%).

In our research, patients without infiltration antibiotics at the port site had a greater mean LOS than those with antibiotics at the port site. The most frequent procedure was a LC, and the rate of port-site complications in our sample was 5%, which is comparable to global figures (0.2–6%). Regarding SSI, the bacteria responsible for the infection may differ in different patients, whether prophylactic antibiotics are given or not.[29] Antibiotic prophylaxis plays no part, particularly in cholecystectomy instances, but there is a definite risk of SSIs compared to other surgeries.[30] A different antibiotic regime also produces the same number of infections in patients, so we cannot say which one prevents the infection. The organisms cultured may be different, with the same antibiotic prophylaxis or other.[31] Although laboratory costs may be substantial and unusual findings are rarely seen. However, performing a routine histopathological examination of all appendectomy specimens is still recommended to rule out unusual pathologies.

Infection at the port site has been recorded following laparoscopic procedures in Egypt,[12] Pakistan,[32] China,[33] Turkey,[34] and Georgia,[35] according to a study of the literature that is currently available. As far as we are aware, no similar studies have been carried out in the state of Karnataka, and the current study is the first to investigate operational issues at the port site with or without the infiltration of antibiotics into the port site. In this context, it is important to note that developing nations have reported higher PSIs than developed countries in laparoscopic procedures.[33]

CONCLUSION

In our investigation, we observed that the incidence of PSI was 5%. Only the patients who did not get antibiotic infiltration experienced any post-operative problems. Compared to patients without antibiotic infiltration, the mean LOS was lower in patients with antibiotic infiltration.

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