

Single Dose versus Multiple Doses Antibiotics Prophylaxis in Patients Undergoing Elective Laparoscopic Cholecystectomy

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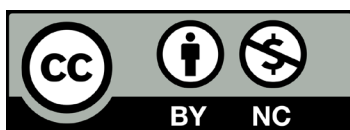
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ABSTRACT

Introduction: Laparoscopic cholecystectomy, a minimally invasive procedure for gallbladder removal, is favored for its reduced postoperative pain and faster recovery. However, the risk of surgical site infections (SSIs) can lead to increased morbidity and healthcare costs, necessitating effective antibiotic strategies.

Methods: We conducted a prospective comparative study at Birat Medical College Teaching Hospital from 11 June 2023 to 11 September 2023. A total of 238 patients undergoing elective laparoscopic cholecystectomy were enrolled consecutively and assigned to the single dose (SD) or multiple dose (MD) group on a roll basis. The SD group received a preoperative injection of ceftriaxone (1gm) before anesthesia induction, while the MD group received plus three additional doses postoperatively, spaced 12 hours apart. Data were collected and analyzed using SPSS version 23.

Results: The mean hospital stay duration was mean±SD=3.06±0.72 and 2.60±0.81 in the MD group. While patients receiving single preoperative antibiotics experienced fewer SSIs than those in the multiple dose group, there was no statistically significant association (p-value 0.775).

Conclusion: This study found no significant difference in terms of surgical site infection rates between patients receiving single or multiple doses of antibiotics during laparoscopic cholecystectomy.

Keywords : Antibiotics; Laparoscopic cholecystectomy; Surgical site infection.

INTRODUCTION

Laparoscopic cholecystectomy, a minimally invasive surgery for gallbladder removal, has gained popularity due to its benefits like reduced postoperative pain and faster recovery. However, the risk of surgical site infections (SSIs) remains a concern, prompting the need for effective antibiotic strategies.^{1,2,3} Among these, the timing and duration of antibiotic administration have raised questions about their impact on infection rates and patient outcomes. SSIs post laparoscopic cholecystectomy can lead to increased morbidity, prolonged recovery, and healthcare costs. Current guidelines recommend antibiotic prophylaxis, but the optimal regimen is debated.⁴

The question hinges on whether extending antibiotic coverage beyond the preoperative phase could offer better protection against infections that might arise during and after the surgery. This study aims to thoroughly compare the efficacy of two antibiotic prophylaxis approaches: a single preoperative dose and a combined pre and postoperative dose regimen within the context of laparoscopic cholecystectomy to address the existing gap in knowledge regarding use of single dose preoperative antibiotic prophylaxis and multiple dose in laparoscopic cholecystectomy.

METHODS

A hospital based comparative observational study was conducted from 11 June 2023 to 11 September 2023 in the department of surgery of Birat medical College Teaching Hospital. We enrolled 238 patients consecutively by total enumeration sampling.

Patients were divided in two groups namely those receiving single dose(SD) preoperative antibiotics as the group one and both preoperative and postoperative antibiotics, multiple doses(MD) as group two. The sample divided were 119 in each group. The patient who comes first in contact with the researcher was grouped in group one and subsequently coming thereafter was scheduled in group two. Thus the samples were enrolled on a roll basis in each group during the study period. Ethical approval was obtained from the Institutional Review Committee of the college (IRC-PA-313/2023).

Patients aged above 18 years, presented with the symptomatic cholelithiasis, confirmed with ultrasonography, according to the American society of anaesthesiology(ASA) scoring <3 and those undergoing elective cholecystectomy were included for the study. Patients were scheduled for elective laparoscopic cholecystectomy after written informed consent was obtained from each patient. The patients in group one received single dose third generation cephalosporin 1 gram intravenously(I/V) at the time of induction of anesthesia. The patients in group two received injection ceftriaxone 1 gm intravenously at the time of induction of anesthesia and followed by continuation of the same dose 12 hours apart (twice a day) for next 48 hours(3 doses postoperatively). After cleaning and draping, elective laparoscopic cholecystectomy was performed via routine 4-ports under aseptic condition. Gallbladder was removed from gallbladder fossa and sent for histopathological examination. Aseptic dressing was applied. Patients in both groups were observed on the second postoperative day and their findings were recorded on a proforma. Port site redness and tenderness, wound discharge, wound gap and wound abscess were considered as signs of surgical site infection(SSI)and temperature greater than 99 degree fahrenheit was considered as fever. Patients were discharged on the second postoperative day and followed up till 4 weeks for presence of any sign of SSI and other complications like abdominal distension, nausea, vomiting, altered bowel habit and postoperative intestinal obstruction requiring further investigations and intervention. On discharge patients were advised for a follow up visit after a week for suture removal, observed for any sign of SSI, fever and other complications and were

recorded. Subsequently all patients on group 1 and group 2 were followed up every week for next 3 weeks via phone call and findings were recorded.

Collected data was entered in Microsoft excel sheet and transferred to SPSS version 23. Frequency percentage, mean and standard deviation(sd) were calculated. Chi square test was used to find the statistical significant association among patients receiving single dose antibiotic versus multi dose antibiotic. P value <0.05 was considered statistically significant.

RESULTS

A total of 238 patients, with 119 in each group were included in this study. Patients in the single-dose preoperative antibiotic group had a mean age of 45.94±13.682 years, while those in the multiple-dose group had a mean age of 49.55±14.335 years. The majority of patients in the single-dose group were in the 31-40 age group which is 30 (25.21) , whereas the majority in the multiple-dose group were in the 51-60 age group which is 30(25.21). Most patients in both groups were female, with 86(72.23) in the single-dose group and 85(71.43%) in the multiple-dose group. The mean duration of hospital stay was slightly higher in multiple dose groups (mean±SD= 3.06±0.72) compared to single dose groups(mean±SD=2.60±0.81) . (Table 1) Patients receiving single dose antibiotics had fewer SSI compared to those in multiple dose antibiotics receiving groups but there was no statistically significant association (p value=0.775). Females had relatively less SSI compared to males but no statistical significant association was found. (Table 2)

Table 1: Demographic profile of patient

Category	Single dose (Group 1) (n=199)	Multiple dose (Group 2) (n=199)
Age in years	Mean ±SD	Mean ±SD
	45.94±13.682	49.55±14.335
20-30	18(15.13)	15(12.61)
31-40	30 (25.21)	20(16.81)
41-50	29(24.37)	25(21.01)
51-60	19(15.97)	30(25.21)
61-70	18(15.13)	22(18.49)
71-80	5(4.21)	7(5.89)
Sex		
Females	86(72.23)	85(71.43)
Males	33(27.73)	34(28.57)
Mean duration of stay	2.60±0.806	3.06±0.717

Table 2: Association of SSI with single dose vs multiple dose antibiotics & sex

Antibiotic category	Surgical Site Infection		Total	P value
	Yes	No		
Single dose	6(5.0)	113(95)	119(100)	0.775
Multiple dose	7(5.9%)	112(94.1)	119(100)	
Sex				
Female	9(5.3%)	162(94.7)	171(100)	0.761*
Male	4(6)	63(94)	67(100)	

* fisher's exact test was applied.

DISCUSSION

The primary focus of this study was the incidence of SSI, and it was observed that patients receiving single-dose antibiotics had fewer SSIs compared to those in the multiple-dose antibiotic group. Despite this trend, the study did not find a statistically significant association between the dosing regimen and the incidence of SSI (p value = 0.775). The female patients had relatively less SSI compared to males but no statistical significant association was found. The findings of this study contribute to the ongoing discussion surrounding the optimal use of preoperative antibiotics in laparoscopic cholecystectomy. It is essential to consider these results in the context of existing literature to draw meaningful conclusions.

Previous studies have explored various dosing regimens for antibiotic prophylaxis in surgical procedures. While some studies have favored single-dose regimens, others have advocated for multiple doses. Consistent with our study findings, a study from National Medical College Birgunj reported that 4(3.1%) patients receiving SD and 3(2.5%) receiving MD had SSI and there was no statistically significant association (p value=0.437)⁵. Similar findings were found from another study conducted in Nobel Medical College, Biratnagar, Nepal, which reported that there was no difference in between SD and MD in presence of SSI⁶. Studies done in India and Pakistan also favored the outcome of our study which stated that single dose preoperative antibiotics are equally effective as compared to multiple dose antibiotics^{4,7,8}.

A meta-analysis report also suggests that routine preoperative as well as postoperative antibiotics prophylaxis had no role in reducing the incidences of postoperative infectious complications in elective laparoscopic cholecystectomy.

The study also stated that infection rate in elective laparoscopic cholecystectomy was extremely low (wound infection: 1.62%; major infection: 0.14%; distant infection: 0.51%; overall infection: 2.26%)¹ A systematic review however reported that the current evidence was not sufficient to support or refute the use of antibiotic prophylaxis to reduce surgical site infection. The results obtained were that they found no statistically significant differences between antibiotic prophylaxis and no prophylaxis in the proportion of surgical site infections (odds ratio (OR) 0.87, 95% CI 0.49 to 1.54) or extra-abdominal infections (OR 0.77, 95% CI 0.41 to 1.46)³.

Laparoscopic cholecystectomy has been considered the "gold standard" for the surgical treatment of gallstone disease since 1990.^{9,10} This procedure is proven to be associated with lower postoperative infections, better cosmesis, shorter duration of hospital stays and disability from work.¹¹ Given its extremely low risk of postoperative infections, the routine use of antibiotic prophylaxis both during preoperative and postoperative period is not supported in low- risk elective laparoscopic cholecystectomy patients^{1,12}. Patients excluding all the possible risk factors were included and also the study didn't find any statistical significant differences in single dose versus multiple dose of antibiotics hence the study can recommend avoiding routine use antibiotics postoperatively in elective laparoscopic patients. Besides the routine use of antibiotics causes unnecessary exposure to the patients hence consideration should be given to its use.

Interestingly, the mean hospital stay was slightly longer in the multiple-dose group (3.06 days) compared to the single-dose group (2.60 days) in this study. This might be due to the reason that patients have to stay longer for the completion of prescribed antibiotic dosage. Consistent with this, a study from Nepal reported that the postoperative infection rate had no statistically significant differences (p=0.75) and hospital stay was prolonged and cost was higher significantly in Group MD.¹³ It's essential to consider the potential adverse effects of antibiotics when making these choices. Based on our research, we conclude that a single dose of preoperative antibiotic is equally effective as multiple doses of antibiotic.

CONCLUSION

In conclusion, our study suggests that for elective laparoscopic cholecystectomy, both single-dose and multiple-dose preoperative antibiotic regimens yield similar outcomes in terms of surgical site infections and hospital stay duration. Single-dose antibiotics may offer

advantages such as cost-effectiveness and reduced adverse effects, making them a feasible option in clinical practice.

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