ORIGINAL ARTICLE

Are We Justified in Giving Single-dose Preoperative Antibiotic Prophylaxis for Elective Laparoscopic Cholecystectomy?

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Abstract

Aim: To determine the difference in the rate of surgical site infection (SSI), duration of hospital stay, and cost of treatment in single-dose (SD) (2 gm cefazolin) vs multiple dose (MD) antibiotic prophylaxis in elective laparoscopic cholecystectomy.

Study design: Single-center prospective observational cohort study – 160 patients (80 in each arm).

Place and duration of study: Surgical Department, Kasturba Hospital, Manipal, India, from Jan 2021 to July 2022

Materials and methods: Patients of both genders age >18 years, irrespective of their comorbidity status were selected if they fulfil the eligibility criteria. They were described about the nature of the study and written consent was taken if they were willing to take part in the study and placed in their respective groups based on the antibiotic, they received according to the operating surgeon (SD grouped received SD of Cefazolin 2 g before surgery, MD received MD of antibiotics). All the surgical procedures were carried out as regular standard of care. All patients were followed up for 1 month and data was collected regarding their hospital stay, final bill and SSI.

Results: There is no significant difference in the rate of surgical wound infections between SD (cefazolin 2 g) and MD antibiotic prophylaxis for elective laparoscopic cholecystectomy ($p = 0.216$). The single-dose group had a slightly shorter length of hospital stay (0.48 days) ($p = 0.278$) and a significant difference in the cost of hospitalization (Rs 7,756) ($p = 0.001$).

Conclusion: When it comes to preventing SSIs after laparoscopic cholecystectomy, prophylaxis with an SD of cefazolin 2 g is equally effective as MDs of antibiotic prophylaxis. Moreover, the SD regime has the advantage of a comparatively shorter hospital stay as well as lower treatment costs for the patient.

Keywords: Antibiotic prophylaxis, Cefazolin, Hospital cost, Hospital stay, Laparoscopic cholecystectomy, Prophylaxis, Surgical site infection, Wound infection.

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Introduction

One of the most common surgeries performed globally is laparoscopic cholecystectomy, used for the removal of the gallbladder. It was first performed on September 12, 1985, by Prof. Erich Muehe, MD, in Boeblingen, Germany.[1] This method has mostly replaced open cholecystectomy as the gold standard for treating gallstone disease.[2–8] Annually, for every 100,000 people worldwide, approximately 115 patients undergo cholecystectomy for benign gallbladder disease.[9] Symptomatic gallstone disease, acute cholecystitis, and gallstone pancreatitis are among the most common indications.[10] Laparoscopic cholecystectomy is associated with an extremely low incidence of postoperative infections compared to open cholecystectomy. The average wound infection rate ranged between 0.4 and 1.1%.[11]

Multiple dose (MD) antibiotics are thought to provide better protection for the patient, but they also burden the patient with additional costs and a longer hospital stay. Although single-dose (SD) antibiotic prophylaxis is beneficial to the patient in terms of cost-effectiveness or hospital stay, physicians prefer MDs of antibiotics for fear of potential future complications. Moreover, unnecessary use of antibiotics leads to increase chances of drug resistance.

Most studies in the literature did not differentiate between SD and MD antibiotics for prophylaxis in laparoscopic cholecystectomy based on hospital stay and cost of treatment.

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Conflict of interest: None

Aims and Objectives

Aim

To observe the effects of SD vs MD antibiotics for prophylaxis in laparoscopic cholecystectomy.

Objective

Primary: To determine the difference in rate of length of hospital stay, cost of treatment. Secondary: To determine the difference in rate of surgical site infection (SSI) (superficial, deep and organ/space) in two groups.

Materials and Methods

Type of Study: Single-center prospective observational cohort study 160 patients. In which 80 in SD group and rest 80 in MD group (non-randomized, as per preference of surgeon).

Study Period: Jan 2021 to July 2022

Tools Used: Pro forma

Statistical Method

- For SSI → Chi-Square test
- For Cost of treatment → Mann–Whitney *U*-test
- For Hospital stay → Mann–Whitney *U*-test

Inclusion Criteria

- All adult (>18 years of age) patients undergoing elective laparoscopic cholecystectomies and are willing to participate in study.

Exclusion Criteria

- Patients who are unwilling to participate in study.
- Patients who had their surgeries converted to open procedure.
- Patients operated for acute cholecystitis on emergency basis.
- Patients operated ERCP for CBD stone extraction.

Detailed Description of Procedure

Patients were selected after fulfilling the eligibility criteria.

They were described about the nature of the study and written consent was taken. All the surgical procedures were carried out as per regular standard of care.

Patients were selected into either group (SD or MD group)

- Single-dose group: Cefazolin 2 gm, 60 min before incision.
- Multiple dose group: As per the discretion of the surgeon performing the procedure.

They were advised for a follow up visit at 1 week to 10 days which coincides with suture removal. Followed by telephonic interview at 30th day.

During all this period they were monitored for →

Surgical site infection (superficial, deep, and organ/space)

- Superficial → Purulent discharge, pain/tenderness, localized swelling, redness
- Deep → Purulent discharge, pus collection, wound gapping
- Organ/space → Intra-abdominal collection

Observations

The study included 160 participants who were divided into two groups based on the antibiotic given to the patient by the operating surgeon: SD and MD.

Demographic Distribution

The study population consisted of 94 females and 66 males, and the ratio of females to males was 1.42:1, showing that females predominate in patients undergoing laparoscopic cholecystectomy (Table 1).

The mean age of male patients was 50.59 years, compared with 42.27 years for females, with males having a longer hospital stay, higher treatment costs, and higher antibiotic costs.

Table 1: Demographic distribution, OT duration, hospital stay

Sex	*Age (years)*	*OT duration (min)*	*Hospital stay (days)*	*Total cost (Rs)*	*Antibiotic cost (Rs)*
Male	50.59	133.48	4.12	52635	1940
Female	42.27	112.37	3.64	48107	1106

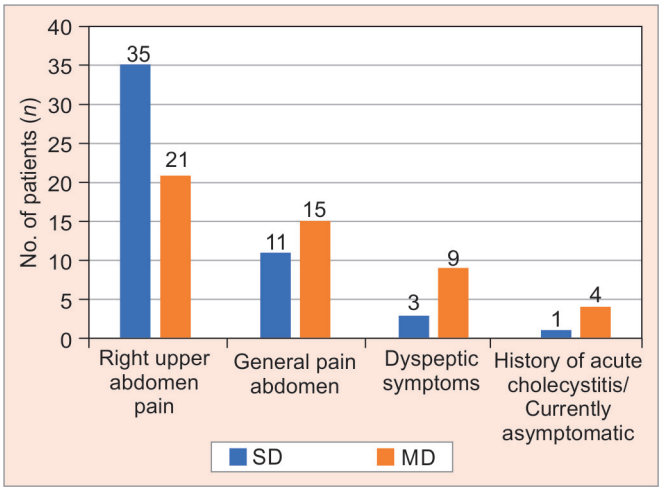

Fig. 1: Presenting symptoms

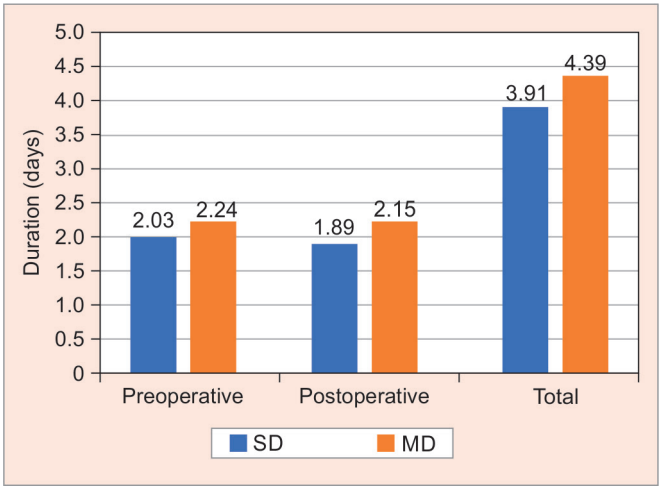

Fig. 2: Length of stay in both the groups

Presenting Symptom

The most common presenting symptom was pain in the right upper abdomen (35%), with an average duration of symptoms of 4.25 months (Fig. 1).

Length of Hospital Stay

The average length of stay in the hospital was 4.15 days as shown in Figure 2 (patients in the SD group had a slightly shorter length of stay than those in the MD group, 3.91 days vs 4.39 days; the *p*-value for this comparison was 0.278, which does not indicate statistical significance).

Hospital Expenses

The cost of hospitalization was 50,555.25 rupees on average (Fig. 3), with the SD group having an average cost of 46,677.08 rupees

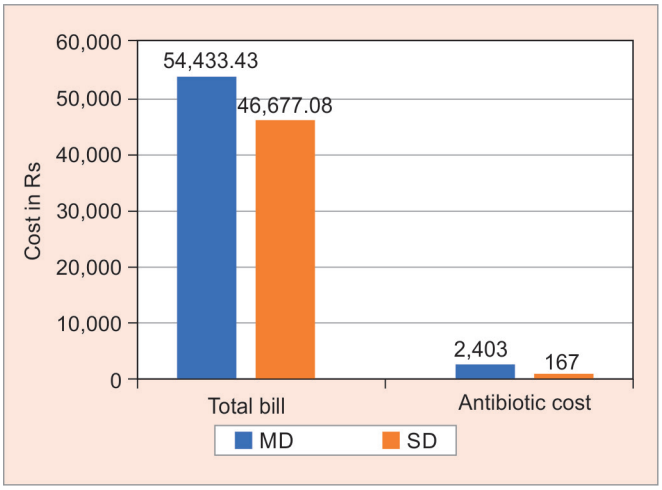

Fig. 3: The cost of antibiotics and total cost between the groups

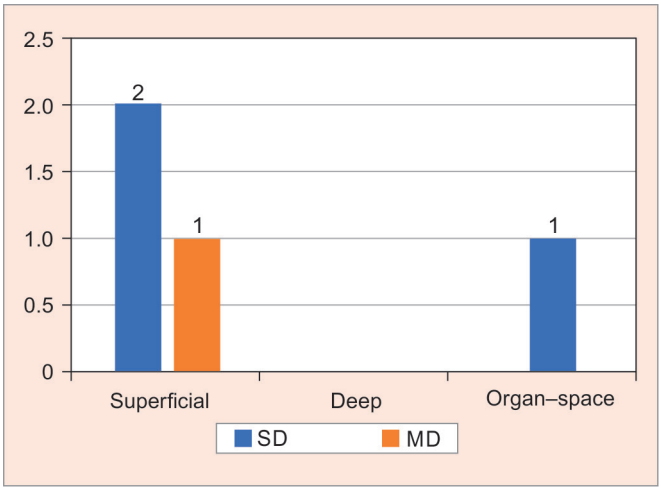

Fig. 4: Distribution of surgical site infection between the groups

and the MD group having an average cost of 54,433.43 rupees, which is a difference of 7,756.35 rupees ($p = 0.001$, which is highly significant). Taking into account that the average price difference between the SD group and the MD group for an antibiotic is Rs 167 in the SD group and Rs 2403 in the MD group, this results in a total of Rs 2,236. The additional cost apart from antibiotic cost, i.e., 5,520.35 rupees (7756.35–2236) could be due to the increased cost of the instruments that are used to administer the antibiotic, in addition to the lengthened length of stay in the hospital required for patients who require MDs of antibiotic prophylaxis following surgical procedures.

Surgical Site Infection

There were a total of 160 patients who underwent laparoscopic cholecystectomy, and 4 of them developed SSI. This results in a rate of SSI of 2.5% overall (Fig. 4). Because three of the participants who developed SSI belonged to the SD group and one of the participants who developed SSI belonged to the MD group, the SSI rate in the SD group was 3.75% and the SSI rate in the MD group was 1.8%. Two of the participants in the SD group who experienced SSI had superficial SSI, while the other participant experienced SSI in the organ space. Only one of the participants in the MD group ended up developing SSI (superficial). The difference in SSI between the two groups did not reach the level of statistical significance required to be considered significant ($p = 0.216$).

Table 2: Length of hospital stay and cost comparison

Study group	*Total cost (Rs) ($p = 0.001$) (HS)*	*Length of hospital stay (days) ($p = 0.278$)*	*SSI N (%) ($p = 0.216$)*
SD	46,677.08	3.91	3 (3.75%)
MD	54,433.43	4.39	1 (1.25%)

Results

- The length of hospital stay in SD was 3.91 days as compared to 4.39 days in MD group which was not statistically significant ($p = 0.278$).
- The total cost of treatment in SD was 46677.08 Rs as compared to 54433.43 Rs in MD group and the cost difference was statistically significant ($p = 0.001$) (Table 2).
- The SSI rate in SD was 3.75% and in MD was 1.25% (average SSI rate 2.5%), the difference was not statistically significant ($p = 0.216$).

Conclusion

When it comes to preventing SSIs after laparoscopic cholecystectomy, prophylaxis with an SD of cefazolin 2 g is equally effective as MDs of antibiotic prophylaxis. Moreover, the SD regime has the advantage of a comparatively shorter hospital stay as well as lower treatment costs for the patient.

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