

Prospective Observational Assessment of Prophylactic Single-Dose Antibiotic to Prevent Surgical Site Infection

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Conflict of interest: Nil

Abstract

Aim: To evaluate the effectiveness of single-dose antibiotic prophylaxis in preventing surgical site infection in elective surgeries.

Material & Methods: This prospective study was conducted in the department of General Surgery Shri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India. 60 patients reporting to the department for elective surgery were selected for this study.

Results: Cholecystectomy was the most common elective procedure conducted in this study. In SSIs was most common in cholecystectomy cases, while *Staphylococcus aureus* was the most common causative organism.

Conclusions: A single preoperative dose of antibiotic cefuroxime effectively prevents surgical site infection in elective cases assuming an uncomplicated procedure.

Keywords: Antibiotic prophylaxis, surgical site infection, surgical wound infection

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Introduction

Preventive antibiotics in surgery are aimed at preventing morbidity and mortality, as well as reducing the duration and cost of hospitalization. [1] Prophylactic antibiotics are useful for preventing postoperative infection. Single prophylaxis can help reduce the development of microbial resistance. [2] Studies have shown the effectiveness of antibiotic prophylaxis for the prevention of surgical infections. Single dose prophylaxis has not been accepted, and many centers still use multiple dose regimens. [3-6] Perioperative management has been recommended in surgical procedures, but recent guidelines and publications have shown that single antibiotic prophylaxis is equally effective in clean and clean

contaminated surgical procedures [7-8] operation improving aseptic and surgical methods and using antibiotics as prevention reduced postoperative wound infections.

The efficacy of single-dose antibiotic prophylaxis in clean surgery has been well established over the past 20 years. Antibiotics augment the natural immune defense mechanisms in the host and kill bacteria that are inoculated into the wound. This is the guiding principle behind antibiotic prophylaxis and it should be ensured that the systemic antibiotic levels are maintained above the minimum inhibitory concentration (MIC) of the pathogen of concern throughout the surgery. [9]

Patients with SSI have prolonged hospital stay, re-hospitalization, increased morbidity and mortality, and high treatment costs. [10] Surgical antibiotic prophylaxis (SAP) is given to reduce surgical SSI based on evidence of effectiveness, minimizing the alteration of the patient's normal bacterial flora, minimizing adverse effects and causing minimal change to the patient's host defenses. [11]

We conducted this study to evaluate the effectiveness of single-dose antibiotic prophylaxis in preventing surgical site infection in elective surgeries.

Material & Methods:

This prospective study was conducted in the department of General Surgery Shri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India. 60 patients reporting to the department for elective surgery were selected for this study. The study duration was of one year.

Ethical clearance was obtained from the institutional ethics committee. Patients were educated and thoroughly explained about procedures. Patient consent was taken both verbally and in writing.

Inclusion criteria:

All patients aged 18 years above, who were admitted for elective surgery with no evidence of infection with normal renal and coagulation profiles, were included.

Exclusion criteria:

Patients under the age of 18 were excluded from the study, as were those who were on antiretroviral drugs, had cancer, were on cortisone or other immunosuppressive drugs, or had comorbidities such as (H.T., D.M., asthma, bleeding disorder, etc.) that were not under control, and were allergic to cephalosporins/-lactam antibiotics.

All patients underwent preoperative testing (Hemoglobin, renal function test, coagulation profile, chest X-ray, electrolytes cardiogram, blood sugar, and

blood pressure). The patients had a bath with non-medicated soap the day before (NICE guideline). It was done the day before with a razor.

There were no clippers used (not a NICE recommendation). The hospital provided specific theatre attire (washed and dried) (NICE recommendation), topical antimicrobials were not used to decontaminate the nose (NICE guideline), 10-16 workers in the operating room (not NICE guideline). Before each operation, the surgical crew cleansed their hands. The operating crew wore sterile gowns in the operating room during the operation. We utilized two pairs of sterile gloves. In all places where procedures are performed, all workers wore non-sterile theatre attire. Surgical and support staff wore sterilized robes (NICE guideline). The skin at the surgical site was prepared with an antiseptic providence-iodine solution right before the incision. No one on the surgical team wore hand jewellery, fake nails, or nail polish (NICE guidelines).

Antibiotic prophylaxis injection cefuroxime 1.5 gm IV (approximately) 30 minutes before the incision was given. Intraoperative homeostasis was maintained (NICE guideline) and wound irrigation and drains were used in the required cases (not NICE guideline).

Surgical incisions were dressed with an appropriate sterile dressing at the end of the procedure.

Surgical wound dressings were removed using an aseptic non-touch approach on post-operative day 2 and then left exposed. Regular monitoring of the surgical site until the sutures removed, followed by follow-up appointments. Aside from the surgical site examination, patient was assessed for fever for deep SSI. A complete blood count was performed, and further investigations were performed as needed if the fever was found. If pus/signs of superficial SSI were discovered, pus was drained, and a sample was sent for

culture sensitivity. The wound was allowed to heal with the secondary goal, and a regular dressing was applied. All patients were followed for at least 30 days after surgery. SSIs were classified as superficial, deep, or organ space infections. The wounds were inspected for any signs or symptoms of infection. Data were presented as frequency and percentages.

Results:

Table 1 shows that among 60 patients, the majority belonged to the 41-50-year age group. This study had 32 male and 28 female participants. Cholecystectomy was the most common elective procedure conducted in this study. According to Table 2, SSIs was most common in cholecystectomy cases, while *Staphylococcus aureus* was the most common causative organism.

Table 1: General characteristics of the patients.

Patient characteristics	Frequency
Age group (years)	
<30	5
31-40	16
41-50	23
51-60	13
>61	3
Gender	
Male	32
Female	28
Surgery	
Appendicectomy	7
Cystolithotomy	4
Lipoma excision	6
Cholecystectomy	11
Hernioplasty lichtenstein	10
TAPP (lap hernia)	1
Ventral hernia mesh repair	3
Umbilical hernia mesh repair	2
Sebaceous cyst excisions	3
Hydrocele	3
Fibroadenoma excision	4

Table 2: Surgical outcomes.

Outcome	Frequency
SSIs	
Cholecystectomy (open)	2
Appendicectomy (open)	2
Hydrocele	1
Hernioplasty	1
Ventral hernia mesh repair	1
Organisms	
<i>Escherichia coli</i>	2
<i>Pseudomonas aeruginosa</i>	2
<i>Staphylococcus aureus</i>	3
<i>Acinetobacter baumannii</i>	1

Discussion:

Post-operative infections, wound drainage, and sepsis were very common until the mid-19th century until the principles of antisepsis were implemented by Joseph Lister in the late 1860s. This fundamental work changed the infections and deaths associated with an operation to reduced suffering and extended life. [12]

Staphylococcus aureus was the most commonly found organism in the infected sites in our study, and a similar pattern of microflora was demonstrated by Anvikar *et al.* and Olson and Lee in his study. [13-14]

In a trial by Hughes *et al.*, where penicillin was given intravenously in a single prophylactic dose, the post-operative infection rates were significantly reduced when compared to the rate when no prophylactic dose was administered. [15]

To effectively reduce SSI rates, a parenteral prophylactic agent spectrum with corresponding possible bacteria on specific surgical sites has recently been advocated. [16] Only when there has been no preoperative contamination or infection is the phrase prophylactic applicable. Many studies have shown that taking prophylactic antibiotics before surgery can help prevent infection. [17-19]

Conclusion:

A single preoperative dose of antibiotic cefuroxime effectively prevents surgical site infection in elective cases assuming an uncomplicated procedure.

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