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Original Research Article

Study of prophylactic single-dose antibiotic to prevent surgical site infection

R. Saravanan, S. Madhan*

Department of General Surgery, Government Medical College Pudukkottai, Tamil Nadu, India

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***Correspondence:**
Dr. S. Madhan,
E-mail: subashmadhan@gmail.com

ABSTRACT

Background: Surgical site infections (SSIs) have been linked to longer hospital stays and higher costs. Infection occurs when endogenous flora is translocated to a generally sterile site. It's also feasible to seed the surgical site with illness from afar (especially in patients with prostheses or another implant). SSIs are influenced by bacterial inoculums and pathogenicity, host defenses, preoperative care, and intraoperative management. Antibiotic prophylaxis is therefore essential to address this problem. This study to evaluate the effectiveness of single-dose antibiotic prophylaxis in preventing surgical site infection in elective surgeries.
Methods: This prospective study included 50 patients receiving elective surgery at a tertiary hospital's department of general surgery. Relevant information about each patient was obtained using a Performa developed for the project. Cefuroxime was given 30 minutes before the incision, and effect on post-operative wound infection was investigated.
Results: We had 50 cases in our study, predominantly males, with maximum individuals in the 41-50 years age group. Cholecystectomy cases presented with the most SSIs (20%). *S. aureus* was the most common causative organism of SSI in this study.
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

INTRODUCTION

Despite advancements in infection control and modern surgery, infection remains one of the most dreaded surgical procedure outcomes. Perioperative antibiotic prophylaxis has long been recommended to lower the incidence of surgical site infections (SSIs) in several types of clean and clean-contaminated surgical procedures.[1]

SSIs are the most prevalent nosocomial infection in surgical patients, accounting for 38% of all infections.[2]

Antibiotic prophylaxis in clean surgery has been extensively demonstrated during the last 20 years. The guiding principle of systemic antibiotic prophylaxis is that antibiotics in the host tissues can improve natural immune defense systems and help kill germs introduced into the wound. Every effort should be taken throughout the surgical operation to maintain appropriate antibiotic levels above the pathogens of concern's minimum inhibitory concentration (MIC).[2]

From the time of the initial surgical incision until closure, surgical antimicrobial prophylaxis should be used to achieve optimal antimicrobial tissue levels. When care is taken to deliver adequate serum and tissue levels of antibiotics during the surgical operation, the efficacy of prophylactic antibiotics has now been demonstrated for

most major surgical procedures with a wide variety of antimicrobials. Perioperative antibiotics and aseptic measures have become standard practice in most major surgical operations.[2]

Patients with SSI have prolonged hospital stay, re-hospitalization, increased morbidity and mortality, and high treatment costs.[3] 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 defences.[4]

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

METHODS

This prospective study was conducted in the department of general surgery at a tertiary care hospital. 50 patients reporting to the department for elective surgery were selected for this study. The study duration was from June 2021 to June 2022.

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. Consecutive sampling method were followed.

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, 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 povidone-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 50 patients, the majority belonged to the 41-50-year age group. This study had 27 male and 23 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	Percentage (%)
Age group (years)	<30	3	6
	31-40	14	28
	41-50	21	42
	51-60	10	20
	>61	2	4

Continued.

Patient characteristics		Frequency	Percentage (%)
Gender	Male	27	54
	Female	23	46
Surgery	Appendicectomy	6	12
	Cystolithotomy	3	6
	Lipoma excision	5	10
	Cholecystectomy	10	20
	Hernioplasty lichtenstein	9	18
	TAPP (lap hernia)	1	2
	Ventral hernia mesh repair	2	4
	Umbilical hernia mesh repair	1	2
	Sebaceous cyst excisions	4	8
	Hydrocele	4	8
	Fibroadenoma excision	5	10

Table 2: Surgical outcomes.

Outcome		Frequency	Percentage (%)
SSIs	Cholecystectomy (open)	2	33.3
	Appendicectomy (open)	1	16.7
	Hydrocele	1	16.7
	Hernioplasty	1	16.7
	Ventral hernia mesh repair	1	16.7
Organisms	*Escherichia coli*	1	16.7
	Pseudomonas aeruginosa	2	33.3
	Staphylococcus aureus	3	50
	Acinetobacter baumannii	1	16.7

DISCUSSION

SSIs are a common complication in today's healthcare.[5] Since the surgical site is a possible entry point for external organisms, it offers an immediate danger to the body, and infections cause wound healing to take longer.[6] The most important part of a surgical procedure is the preoperative phase, which aims to reduce the bacterial burden around the incision. Antibiotics help prevent SSIs, which are one of the most common preventable post-surgery complications, including healthcare-related disorders (HAIs).[7] To effectively reduce SSI rates, a parenteral prophylactic agent spectrum with corresponding possible bacteria on specific surgical sites has recently been advocated.[5] 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.[8-9]

In the present study, an attempt was made to study the effectiveness of a single prophylactic dose antibiotic in preventing surgical site infection.

We follow a set of protocols for preoperative, intraoperative, and post-operative care. Some of these practices are similar to NICE and CDC recommendations. However, due to various factors, we are unable to pursue certain of them. A single dosage of the antibiotic cefuroxime 1.5 gm was administered to all patients, and an SSI study was conducted.

In our study, the age group presented with the highest number of SSIs was 41-50 years. According to Kaye et al the risk of SSI increased by 1.1% per year between ages 17 and 65 years.[10] Dégbey et al on the contrary, reported that patients who were ≥60 years of age were at greater risk of having a surgical site infection than those aged 30-60 years.[11]

Gender was not statistically associated with surgical site infection, according to the findings of our study. This finding supported Birintanya's findings from 2002 when she discovered this link during her research.[12]

Surgical site infections were seen mainly in cases where cholecystectomy was done twenty percentages (20%). This finding was in agreement with the findings of the Koirala et al.[13]

Cultures from the SSIs in this study revealed that *Staphylococcus aureus* was the most common causative organism. Anvik et al and Olson et al also found *Staphylococcus aureus* as the most common etiological organism in SSI in their respective studies.[14-15]

Limitations

This comparative study is limited by small sample sizes, and antimicrobial selection is based on cost, safety profile, ease of administration, pharmacokinetic profile, and bactericidal activity.

CONCLUSION

Although SSIs cannot be avoided entirely, lowering the infection rate to a low level has the potential to reduce post-operative morbidity and death while also reducing healthcare resource waste. However, SSIs are increased by pre-existing medical problems, extended operating hours, wound class, and wound contamination. Therefore, to prevent SSIs, risk factors must be assessed.

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