ADHERENCE TO PERI-OPERATIVE PROPHYLACTIC ANTIBIOTIC TIMINGS IN CLEAN ORTHOPEDIC SURGERIES INVOLVING METALLIC IMPLANTS: A RETROSPECTIVE OBSERVATIONAL STUDY

1Dr. Kamalasundar T, 2Dr. Udaykumar P, 3Dr. Manjuprasad MS
1PG Resident, Department of Pharmacology, Father Muller Medical College, Mangalore.
2Professor, Department of Pharmacology, Father Muller Medical College, Mangalore.
3PG Resident, Department of Pharmacology, Father Muller Medical College, Mangalore.

ABSTRACT
Surgical site infection (SSI) after a surgery can lead to prolonged misery to the patient, prolonged hospital stay, increased re-hospitalization with greater use of health & economic resources. Prevention of SSI requires bundle of care approach. One element of care practiced in hospitals is administration of intravenous antibiotic prophylaxis within 60 minutes before incision in any clean orthopedic surgery involving metallic implants. This observational study was conducted in order to observe the current pattern of surgical antibiotic prophylaxis practiced in a tertiary care hospital in Mangalore and find ways to improvise the quality of care. Drugs used for prophylaxis were intravenous b.d doses of cefaperazone sulbactam, ceftriaxone sulbactam, cefuroxime, amoxycillin clavulnic acid. Among 100 patients only 56% were found to have received prophylaxis within 60 minutes before incision. Fortunately nil case of SSI was detected, though edema and serous discharge were observed in 4 patients. Prolonged duration of antibiotic continuation was found in the all the patients but the recommended duration for continuation is only 24 hr. Quality of care can be improvised by conducting CME for surgeons and hospital staff on antibiotic prophylaxis. Regular audits are needed to check adherence to antibiotic policy.

KEYWORDS: clean orthopedic surgery, metallic implant, prophylaxis, surgical site infection.
INTRODUCTION
An infection that occurs within 30 days of a surgical procedure or an infection that occurs within one year of placing a metallic implant is referred as Surgical Site Infection (SSI). It is a common Health Care Associated Infection (HCAI). This iatrogenic complication after an orthopedic surgery can lead to prolonged misery to the patient, prolonged hospital stay, increased re-hospitalization with greater use of health and economic resources.

Though strategically significant achievements have been made in hospital infection control sector by improving the standard of operation theatres and incorporating established measures to minimize the possibility of contamination during surgery, intravenous antibiotic prophylaxis always plays a pivotal role in surgical practice.

High Impact Intervention (HII) is a bundle of strategies that prevent SSI. The risk of SSI increases when ≥1 action of a care bundle is not implemented. Quality of care can be ensured by regular audit and review of HII care bundle. One element of HII care bundle is administration of intravenous antibiotic prophylaxis within 60 minutes prior to incision in any clean orthopedic surgery involving metallic implants.

This observational study strives to look into the current pattern of surgical antibiotic prophylaxis (associated with clean orthopedic surgeries requiring metallic implant) practiced in a tertiary care hospital in Mangalore and find ways to improvise the quality of care if required.

METHOD OF STUDY
This observational study was done using a retrospective design with data from the medical records department of a teaching hospital in Mangalore. Inpatient record of patients admitted for elective surgery for clean orthopedic procedures requiring metallic implants who met a set of inclusion and exclusion criteria were analyzed.

Inclusion criteria were male & female patients, aged 18 to 75 years, undergoing closed fracture open reduction requiring metallic implants, receiving single prophylactic antibiotic prior to surgery. Exclusion criteria were: patient on immunosuppressive treatment, immune-compromised patient, patient suffering from open wound elsewhere, skin & soft tissue infection, patient receiving antibiotics other than prophylaxis, pregnant or lactating woman.
Each record was analyzed for the practicing trend associated with prophylactic antibiotics used in the surgery. Demographic data, co-morbidities, type of metallic implant used, duration of surgery were noted. The time of 1st full dose of prophylactic antibiotic from the nurse’s record and the time of incision from the anesthetist’s record was used to calculate the prophylaxis interval. Duty doctor’s records were noted to observe the pattern of duration of i.v. antibiotic continuation, change to oral antibiotic, duration of stay as inpatient and the occurrence of complications due to surgery. Microbiologist’s report of bacterial culture from samples obtained from surgical site was also noted.

RESULTS AND DISCUSSION

Demographic data: Among 100 patients, 72 were males and 28 were females. Patients were divided into 3 age groups: 18 to 30 yr, 31 to 50 yr and >50 yr (Fig 1 & 2).

The efficacy of prophylactic antibiotic relies on bactericidal concentration in serum and tissues at the time of incision, maintenance throughout the surgery and preferably a few hours even after wound closure. This depends on the time of administration of the first dose.[9] As per the Dutch Working Party on Antibiotic Policy (Dutch acronym SWAB), single dose of antibiotic with a limited spectrum which is reserved for this indication, should be given as
intravenous dose within 30 min before the first incision.\textsuperscript{[10]} However, generally accepted recommendation is that the prophylaxis should be given within 60 minutes before the skin incision.\textsuperscript{[11]}

**Prophylaxis interval:** Based on interval between prophylaxis & surgery, cases were divided as: within 30 min, more than 30 min to one hr, more than one hr to 3 hr and more than 3 hr to 5 hr. Hence only in 56% cases appropriate interval between prophylaxis and surgery was followed (Fig 3).

According to Classen et al, > 2 hr before incision administration of prophylaxis were associated with a higher incidence of SSI compared to delivery of drug within 2 hr before incision.\textsuperscript{[12]} Fortunately nil case of SSI was observed in the present study. On the day of surgery, all patients were given prophylaxis early morning in the ward by the ward staff, while surgeries started late by afternoon since there were many cases posted on the same day. This situation could have been avoided if prophylaxis was given in the operation theatre by OT staff.

**Duration of surgery:** 92 surgeries were conducted in less than 3 hour while 8 surgeries required ≥3 hours. Among the cases which required ≥3 hrs, 5 patients had received prophylaxis more than 2 hours prior to incision and they did not receive re-dose during surgery. Re-dosing is required in case of prolonged surgeries with duration longer than the half-life of the prophylactic antibiotic. For SSI prevention, short duration prophylaxis is as equally effective as a long duration prophylaxis.\textsuperscript{[1,13,14]} But long duration prophylaxis can lead to mutations in bacteria resulting in production of resistant strains.\textsuperscript{[15,16]}
Drugs used: Methicillin resistant staphylococcus aureus (MRSA) outbreak in wards can be attributed to irrational use of 3rd generation cephalosporins. Hence antibiotic audits gain crucial importance as these drugs are currently the mainstay of prophylaxis.[17]

Prophylactic antibiotics used were: intravenous b.d doses of Cefaperazone sulbactam 1.5 g, Ceftriaxone sulbactam 1.5 g, Cefuroxime 1.5 g and Amoxicillin clavulanic acid 1.2 g. Hence in 76% third generation cephalosporins were used in combination with a beta-lactamase inhibitor sulbactam (Fig 4).

Continuation of antibiotic prophylaxis: Patients continued receiving intravenous antibiotic prophylaxis for 2 to 11 days. So the cases were divided as those who received prophylaxis for ≤ 3 days, 4 to 6 days and > 6 days (Fig 5).

Oral antibiotic prophylaxis: Change in route of prophylaxis is a common practice in post-operative care. Among 100 patients, 42 were shifted to oral antibiotics for 2 to 7 days while
they continued as inpatients; hence those 42 cases were divided as those who received oral antibiotic cefixime for 2 to 3 days, 4 to 5 days and 6 to 7 days (Fig 6).

16 patients who received oral antibiotics for ≤ 3 days as inpatients were advised to continue oral antibiotics for another 3 days at the time of discharge. The data regarding compliance with the prescription given could not be recorded.

Prolonged prophylaxis was followed in the present study. This results in raise of healthcare cost. This cost can be turned to saving if prophylaxis were given according to evidence based approach. \cite{18}

Complications: On the third post-operative day, edema & serous discharge were observed at the surgical site in 4 patients. Swab samples obtained from the wound of patients revealed no bacterial growth as per the microbiologist’s report but only pus cells. These patients recovered eventually.

Duration of stay: According to duration of stay in hospital, inpatients were divided into those who stayed for ≤ 7 days, 8 to 10 days and >10 days (Fig 7).
Interventions needed: Improvements in the quality of antibiotic prophylaxis and reduction in irrational use of antibiotics can be brought about by interventions like review of clinical practice patterns as a tool for change.[19]

Adherence to evidence based recommendations is hindered by lack of awareness, personal choice of surgeons, and lack of surgical antibiotic prophylaxis policy in the hospital. Awareness can be done by created by Continuous Medical Education (CME) on antibiotic prophylaxis. Hospital infection control team can conduct regular audits before & after the implementation of the surgical antibiotic prophylaxis policy to ensure adherence by the hospital staff.[20]

The limitation of the study were less patient numbers, lack of comparator and intervention after observation.

CONCLUSION: The present study highlights the improper time interval practiced between antibiotic prophylaxis & surgery in a tertiary care hospital. It emphasizes the need for antibiotic prophylaxis policy for clean surgeries involving metallic implants and control on use of third generation cephalosporins for long duration in this subspeciality.

ACKNOWLEDGEMENT
This study was conducted in Medical Records Department of Father Muller Medical College Hospital without any external funding. Authors declare no conflict of interest.

REFERENCES


17. Fukatsu K, Saito H, Matsuda T, Ikeda S, Furukawa S, Muto T: Influences of type and duration of antimicrobial prophylaxis on an outbreak of methicillin-resistant

