



ORIGINAL RESEARCH PAPER

General Surgery

SURGICAL SITE INFECTIONS AND ROLE OF PROPHYLACTIC ANTIBIOTICS IN ELECTIVE SURGERIES

KEY WORDS: Surgical Site Infection, Ceftriaxone, antibiotic prophylaxis.

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ABSTRACT

The prevention of surgical site infection (SSIs) remains a focus of attention because wound infections continue to be a major source of expense, prolonged hospitalization, morbidity and even mortality. There is substantial published evidence demonstrating that antimicrobial therapy after wound closure is unnecessary in clean and clean contaminated wound. Prolonged use of antibiotics is associated with emergence of resistant bacterial strains. The objective of the study was to compare the efficacy of single dose of prophylactic intravenous ceftriaxone a third generation cephalosporin pre-operatively one hour before surgical procedure (Protocol-1) v/s ceftriaxone IV for 3-5 days post-operatively (Protocol-2). A prospective study was carried out on 100 patients between the age group of 12-60 years, both sexes, who underwent elective surgeries in the department of surgery during the period of August 2015 to July 2017. In this study, Protocol-1 showed 8% infection rates whereas Protocol-2 showed 12% infection rates. Single dose of inj.ceftriaxone 1gm IV given one hour before incision is sufficient to prevent SSIs.

INTRODUCTION

Surgical site infections (SSIs) are the most common nosocomial infections accounting for 31-38% of all hospital acquired infections (HAIs) among surgical patients.^{1,2} The mortality rate associated with SSI is 3%, with about three quarters of deaths being attributable directly to the infection³. The CDC definition⁴ describes three levels of SSIs:

- *Superficial incisional*, affecting the skin and subcutaneous tissue. These infections may be indicated by localised (Celsian) signs such as redness, pain, heat or swelling at the site of the incision or by the drainage of pus.
- *Deep incisional*, affecting the fascial and muscle layers. These infections may be indicated by the presence of pus or an abscess, fever with tenderness of the wound, or a separation of the edges of the incision exposing the deeper tissues.
- *Organ or space infection*:-which involves any part of the anatomy other than the incision that is opened or manipulated during the surgical procedure, for example joint or peritoneum. These infections may be indicated by the drainage of pus or the formation of an abscess detected by histopathological or radiological examination or during re-operation.

Patients with SSIs have prolonged hospital stay, re-hospitalization, increased morbidity, mortality and high cost of treatment. The emergence of prophylactic antibiotics has made a significant contribution towards extending the range and complexity of surgical procedure. Antibiotics were considered as "magic bullets" and effective tools to prevent infection in various elective procedures. Great skill, time and labour used for a serious surgery get wasted in a minute by a tiny microbe which leaves the patient feeling ill and lethargic even after a meticulous and clean surgery by lowering his/her resistance to microbes, and surrendering them to a weeping pocket of pus caused just because of injudicious prolonged use of antibiotics. Over reliance on antibiotics led to their extensive and often indiscriminate use resulting into development of resistance by various organisms and the problem of hospital infection has boomeranged on us⁵. The cephalosporins are a large group of B-lactam antibiotics that are closely related to the penicillin. Ceftriaxone a 3rd generation cephalosporin have extended spectrum of activities and they have gram +ve and extended gram -ve coverage including Citrobacter, Enterobacter,

Providencia, Pseudomonas aerogenosa and β-lactamase producing meningococci and H. influenzae. In clean contaminated surgery a single dose of prophylactic antibiotics is sufficient to prevent the occurrence of perioperative infection⁶. As per the CDC and prevention guidelines for the prevention of SSIs-2017 1E- in clean and clean-contaminated procedures, do not administer additional prophylactic antimicrobial agent doses after the surgical incision is closed in the operating room, even in the presence of a drain⁷.

Antibiotic resistance has become a global menace, and WHO in 2012 had given a clear call to reduce the antibiotic use and prevent resistance to antibiotics⁸. Antibiotic prophylaxis should begin just before the operation. Incorrect timing of surgical prophylaxis is associated with 2-6 fold increase in rate of SSIs⁹. Beginning earlier than 1-2 hours was found to be unnecessary and potentially dangerous, while beginning later was found to be less effective¹⁰. Antibacterial agents administered as early as three hours after experimental contamination of wound, have no influence on the infection rate of the operative wounds. If the body already has adequate antibiotic concentration at the time of contamination then only infection can be adequately prevented¹¹.

AIMS AND OBJECTIVES :-

Comparing the incidence of SSIs with single dose of 1gm IV ceftriaxone pre-operatively v/s ceftriaxone IV for 5 days post-operatively in 100 patients who underwent clean elective surgeries.

MATERIALS AND METHODS:-

The study was conducted in NRI Medical College & General Hospital, Chinakakani during the period from August 2015 to July 2017. All the patients in our study were treated in general surgical wards of our Hospital. The study involved 100 patients who underwent various elective surgical procedures with normal general surgical workup. All the patients were followed up to 4 weeks postoperatively.

Protocol 1 -- Group of patients received a single dose of 1gm ceftriaxone IV one hour before or at the time of induction of anesthesia and no IV antibiotics was given after surgery.

Protocol 2 -- Group of patients received no antibiotics preoperatively but received 1gm ceftriaxone IV at 12th hourly intervals after surgery for a minimum of 5 days.

Inclusion Criteria:

- Elective surgical procedures in clean and clean-contaminated cases between 12 years and 60 years.

Exclusion Criteria:

- Age less than 12 years and more than 60years.
- Immunocompromised patients, history of DM, HTN, TB or other chronic illness.
- Surgeries exceeding 3hrs of duration. Contaminated and dirty wound
- Use of prosthetic materials.

Results:-

Table-I Age incidence

Age group (years)	Total Number of Cases	Infected Cases
12 – 20	23	01
21 – 30	41	04
31 – 40	24	05
41 – 50	09	00
51 – 60	03	00
Total	100	10

In this study, majority of the cases fall into age group of 31-40 years.. The youngest patient was of 12 years of age and the oldest patient was of 58 years of age.(Table-I)

Table-II Infection Rates

	Total No. of Patients	No. of Infected Wounds	Percentage (%)
Protocol 1	50	4	8
Protocol 2	50	6	12
Total	100	10	10

Out of 100 cases studied, only 10 cases showed SSIs accounting for 10% SSIs rate. Protocol 1 group showed 4 SSI cases (8%) and Protocol 2 group showed 6 SSI cases (12%). (Table-II)

TABLE –III Incidence of infection in clean and clean contaminated wounds

Type of wound	Protocol-1	No of infective cases	Protocol -2	No of infective cases
Clean	40	1	38	2
Clean contaminated	10	3	12	4
Total	50	4	50	6

In this study 78 cases were clean wounds out of which 40 cases were in Protocol-1 and 38 cases were in Protocol-2.patients in clean contaminated group were 22 out of which 10 were protocol-1 and 12 were in protocol-2.(Table-III)

Table –IV Administration Of Antibiotics

Types of surgery	Timing of Antibiotic Administration	
	Protocol-1	Protocol-
Inguinal herniorrhaphy	11	10
Excisions of benign neoplasm	7	7
Surgery for varicose veins	3	2
Surgery for benign breast disease	3	2
Thyroidectomy	7	8
Varicocelectomy	1	1
Ventral Hernia's	3	4
Hydrocoele	4	5
Appendectomy	6	7
Cholecystectomy	4	5
Total	50	50

There was increase in duration of stay with SSIs cases. The maximum stay of 14 days was noted and a minimum stay of 6 days was noted in this study. The average number of days was 8.8 days for SSI cases, were as it was 3.35 days for non-infected cases.

Discussion:-

SSIs are the leading cause of hospital acquired infections¹² and are associated with excess cost for treatment and increased hospital stay. Preoperative preparation, excellent surgical technique, skilled postoperative care and management are cornerstone of infection prophylaxis. Injudicious use of antibiotics leads to development of drug resistance. The concept of use of antibiotics preoperatively to curtain and prevent wound infection was postulated by Bernard and Cole in 1964¹³. Globally, surgical site infection rates have been reported to range from 2.5% to 41.9%^{14, 15, 16}. In the present study, out of the 100 cases studied, 10 cases had surgical site infections (SSI) with an overall incidence of 10% which was similar to Watanabe A et al (15.5%)¹⁷. Infection rate in protocol -1 group was 8% which was less as compared to protocol -2 which was 12% suggesting that even though there is not much difference in the incidence of SSIs in both groups still SSIs were less common in Protocol -1. Even though the incidence of SSIs in both groups were equivocal omitting the administration of antibiotics in protocol-1 did not increase the incidence suggesting that a single dose of preoperative antibiotic gives an enough coverage against infection. This reduces the risk for emergence of resistant strains and even decreases the cost of treatment decreasing the number of doses administered and the total duration of hospital stay.

Conclusion:-

Clean surgeries constitute more than three fourth of all surgical procedures, irrespective of the surgical discipline. An infection rate in this group of surgeries is a valid pointer to adoption of aseptic principles, meticulousness of surgery and efficient care (both preoperative and postoperative) offered to patients in the institution. Administration of single dose antibiotic is effective and sufficient in clean and clean contaminated wounds.

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