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A comparative study for the role of preoperative antibiotic prophylaxis in prevention of surgical site infections

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Abstract

Background: After surgery, an infection that occurs in the part of the body is called surgical site infections.

Aim: The present study aimed to evaluate the role of antibiotic administration prophylactically to achieve clean contaminated surgical cases and to study if antibiotic administration is sufficient to reduce the surgical site infection.

Materials and Methods: This is a prospective study which consisted of 90 cases admitted to SVS Medical College, Mahabubnagar from January 2017 to December 2019 for a period of 2 years. 90 cases were selected in this study and they were divided into two groups which were group I who received 1gm ceftriaxone intravenously half an hour before surgery and Group II who didn't receive any antibiotic before surgery.

Results: Group I had 35 clean surgical cases and 10 clean contaminated cases, and none of them were infected. In group II, 1 case was infected and out of 10 clean contaminated cases, 4 cases were infected. Third generation cephalosporins was administered in group I patients under aseptic conditions half an hour before the surgery, in group I, no patient was infected. In group II, infection rate of 2.86% (1 patient) in clean cases and 40% (4 patients) in clean contaminated cases. No side effects like allergy were reported after administering prolonged prophylactic drug. The P value was 0.3117 and it was significant.

Conclusion: This study concluded that there is no need for prophylactic antibiotics in clean surgeries, as no statistically significance was observed, and statistical significance was observed in clean contaminated cases.

Keywords: Surgical site infections, antibiotics

Introduction

The most frequent cause of postoperative morbidity is surgical site infection (SSI). It accounts for 38% of all infections in surgical patients and it is a nosocomial infection^[1]. Of all SSI's, incisional infections are common among 60% to 80% of the population. The complexity and range of surgical procedures has lead to the emergence of use of prophylactic antibiotics. During post-operative period, the surgical infection treatment was revolutionized by the use of antibiotics from 5 decades ago. Due to this, reduction in SSI which led to lengthening of hospital stay and increasing cost of medical care. This infection problem is multifactorial but the use of antibiotics widely has finally resulted in over dependence of treating the disease effectively which resulted in violating the already established surgical principles and isolation procedures^[2]. Preoperatively, antibiotic therapy is more effective prophylactically and continued through intra operative period and operative period with the goal of achieving therapeutic blood levels^[3, 4]. The present study aimed to evaluate the role of antibiotic administration prophylactically to achieve clean contaminated surgical cases and to study if antibiotic administration is sufficient to reduce the surgical site infection.

Methods and Materials: This is a prospective study which consisted of 90 cases admitted to SVS Medical College, Mahabubnagar from January 2017 to December 2019 for a period of 2 years. All the cases were clean contaminated surgeries under meticulous surgical technique. In this study, only clean contaminated elective surgeries were considered. The study group which consisted of 90 cases were divided into 2 groups of 45 each.

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Group I consisted of patients who received a pre-operative single dose of ceftriaxone and Group II consisted of patients who received no such antibiotic. A comparative study was made based on surgery type, patient age, presence or absence of risk factors for SSI development and associated medical conditions which were equal in both the groups. A detailed proforma was completed on admission into hospital which was preoperative investigations and preoperative patient preparation. Follow up was taken for 10 days post operation. Swabs of wounds were sent for culture and patients who were sensitive were treated accordingly. Based on the patients complaints and diagnosis, they were classified as clean or clean contaminated cases. Patients were taken for surgery after 2 weeks who have shown respiratory tract infections or urinary tract infections on out patient basis. After thoroughly investigating, the patients were admitted into hospital 2 days prior to surgery. To prevent the patients from getting access to hospital infections, preoperative hospital stay was minimized. Patients who had diabetes mellitus were treated with injectable insulin under precaution. Patients were allowed to have a complete scrub bath after which skin preparation and parts were prepared with povidone iodine and the operative site was covered by sterile guage to isolate from surrounding. Half an hour before surgery, patients were given single 1 gm dose of IV ceftriaxone under aseptic condition. All the cases were taken and done in the morning hours, they were anaesthetized, sterile guage was removed, applied povidone

iodine solution and spirit, surface was allowed to dry, it was covered with sterile towels and sheets, surgery was performed and wound was closed by sterile dressings. Post operatively, patients were kept under observation in ward for atleast 3 days. Dressings were removed on 3rd or 4th day post operatively. Any inflammation or infection if observed was noted down and entered into proforma. If infection was observed, the swab of wound was sent to culture and antibiotic was initiated immediately. On 8th post-operative day, the sutures were removed. Follow up was taken upto 14th post-operative day. The results and outcomes were analysed in both the groups and a comparison was made with previous studies and final conclusion was made. A written informed consent was taken from all the patients in study and institutional ethical committee approval was also taken from all patients.

Results

90 cases were selected in this study and they were divided into two groups which were group I who received 1gm ceftriaxone intravenously half an hour before surgery and Group II who didn't receive any antibiotic before surgery. The age ranged from 6 to 68 years and maximum number of patients were between 20 to 31 years age group. Five patients were infected, out of which two were in the age group 40-51 years, two patients were infected in the age group of 50-61 years and one in the age group of 60-71 years were infected in group II.

Table 1: Infection Rates.

	Number of cases		Who got Infected		Infection Rate	
	Clean	Clean Contaminated	Clean	Clean Contaminated	Clean	Clean Contaminated
Group I	35	10	-	-	-	-
Group II	35	10	1	4	2.86%	40%
Total	70	20	1	4	1.43%	20%

Table I shows that group I had 35 clean surgical cases and 10 clean contaminated cases, and none of them were infected. In

group II, 1 case was infected and out of 10 clean contaminated cases, 4 cases were infected.

Table 2: Risk factors.

Risk Factors	Group I	Group II	Total	Percentage (%)
Anaemia	3	3	6	20%
Diabetes Mellitus	2	2	4	13.3%
Obesity	3	5	8	26.7%
Prolonged duration of surgery	0	6	6	20%
Old age	3	3	6	20%
Total	11	19	30	100%

Table II shows that 30 patients out of 90 cases were having risk factors for surgical infections development.

Table 3: Duration of surgery affecting infection rate.

Duration in hours	Group I	Group II	No. of cases infected	Infection rate (%)
<1 hour	30	28	-	-
1-2 hours	15	14	1	7.14%
>2 hours	0	3	2	66.7%

Table III shows that to complete the surgery, care was taken as early as possible and efficiently. The average surgery duration from skin incision time to closure time was 1 hour 25 minutes. The minimum time was 30 minutes and maximum time was 1 hour 50 mins. 1 patient in our study who got infected had a

duration of 1 hour 45 minutes and 2 patients who got infected had duration of more than 2 hours. No cases were reported which were infected who had surgery duration of less than 1 hour.

Table 4: Antibiotics and timing of antibiotic prophylaxis.

		No. of cases	No. of cases infected	Infection rate (%)
Clean	Group I	35	-	-
	Group II	35	1	2.86%
Clean Contaminated	Group I	10	-	-
	Group II	10	4	40%

Table IV shows that third generation cephalosporins was administered in group I patients under aseptic conditions half an hour before the surgery, in group I, no patient was infected. In group II, infection rate of 2.86% (1 patient) in clean cases and 40% (4 patients) in clean contaminated cases. No side effects like allergy were reported after administering prolonged prophylactic drug. The P value was 0.3117 and it was significant.

Discussion

Ever since surgery origin, surgical site infection has been documented and it has not been able to be mastered. The SSI incidence was reduced by asepsis strictly, surgical techniques, prophylactic antibiotic. All age groups are affected by surgical site infection and its incidence is increased with age and is mostly observed in old age group. In present study, maximum number of cases were observed in age group 20-31 years. For SSI development, older age group is a risk factor. In present study, two were in the age group 40-51 years, two patients were infected in the age group of 50-61 years and one in the age group of 60-71 years were infected in group II. In older age group of 50-70 years, SSI was increased as shown in Rao *et al.* [4] study. In the present study, 30 patients out of 90 cases were having risk factors for surgical infections development. In both groups, 3 patients each had anaemia, 2 patients each had diabetes mellitus, 3 patients in group I had obesity and 5 patients had obesity in group II, 6 patients in group II had prolonged duration of surgery. In Cruise and Ford *et al.* [6], it was demonstrated that obesity presence is an independent risk factor for the SSI development. Surgical Site infection incidence was increased by prolonged surgery time. In Funary AP *et al.* [7] study, it was demonstrated that during perioperative period by continuous intravenous insulin infusion, blood glucose level were below 200 mg/dl and reduced SSI incidence from 24% to 6.06% which was statistically significant. Infection rate can be decreased as none of the patients got infected and the control of diabetes mellitus can be controlled. SSI development depends significantly on surgery type. Out of 90 cases, 70 cases were clean (1.43%), 20 cases were clean contaminated (20%). In Lilani *et al.* [8] study, 3.68% were clean, 22.4% were clean contaminated and 32.45% were contaminated. In Cruise *et al.* [6] study, 7% were clean, 18% were clean contaminated and more than 35% were contaminated. A direct relationship between operating time length and infection rate of clean wounds will double with every hour of operating time. In present study, the infection rate was 7.14% in surgery duration of 1-2 hours and infection rate was 66.7% in surgery duration of more than 2 hours. Cruise and Ford *et al.* [6], the infection rate was 1.4% in 0-1 hours of surgery duration, 1.8% in 1-2 hours, 4.4% in more than 2 hours, Lilani *et al.* [8] demonstrated that 1.47% infection rate in 1-2 hours of surgery duration and 38.46% infection rate in more than 2 hours. Third generation cephalosporins was administered in group I patients under aseptic conditions half an hour before the surgery, in group I, no patient was infected. In group II, infection rate of 2.86% (1 patient) in clean cases and 40% (4 patients) in clean contaminated cases. The number of patients who were administered with antibiotics were 58

(24.1%), prophylactic antibiotics were administered in 60 patients (3.3%) in Carlson *et al.* [9] study, Rao *et al.* [4] demonstrated that 100 patients were administered with antibiotics (2.3%), 100 patients were administered with prophylactic antibiotics (1%). The P value was not significant in both the studies. Prakash Dattatray Gurav *et al.* [10]; have shown similar results to the present study.

Conclusion

This study concluded that there is no need for prophylactic antibiotics in clean surgeries, as no statistically significance was observed, and statistical significance was observed in clean contaminated cases.

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