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EVALUATION OF SINGLE DOSE VERSUS TRIPLE DOSE ANTIBIOTIC THERAPY IN PERIOPERATIVE PERIOD OF CLEAN VASCULAR SURGERY

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ABSTRACT

Infection is defined as invasion of the tissue by a pathogenic mirobes which establishes itself in host tissue, multiplies and results in tissue damage due to release of toxic substances. Among surgical patients, surgical site infections (SSI) are the most common cause of nosocomial infection accounting for up to 38% of all such infections. The commonest and most dangerous complication in vascular surgery is prosthetic graft infection. Up to 2-5% of patients undergoing clean vascular surgery develop SSI. While handling infections, surgeons need to have knowledge of appropriate use of prophylactic and therapeutic antibiotics to mitigate high risk of morbidity and mortality. In this study, we have compared doses of antibiotics in perioperative period in clean vascular surgery, such as single versus triple dose.

KEYWORDS

AIM : To evaluate single dose versus triple dose antibiotic therapy in perioperative period of clean vascular surgery

INTRODUCTION :

Throughout the history, hospitals have coexisted with nosocomial infections (NI) which has been defined as an infection that was neither present nor was incubating at the moment of patient's admission to hospital[1]. In surgery, incision causes exposure of sterile area to non sterile environment. Bacteria contaminate the wound and host defences also act upon dead and devitalised tissue. Local factors such as haematomas, seroma, suture material, prosthetic graft, poor surgical technique, immune status, co morbid states also play important role in development of surgical site infection (SSI)[2]. The rate of infection varies as per the class of the wound, but for clean vascular surgeries it is 3 to 5% infections per 100 procedures. SSI is 3rd most frequently reported infection of all NI accounting for 14 to 16%[3,4].

Advances in infection control have been spectacular leading to major use of prophylactic and therapeutic antibiotics in surgical patients. Vascular surgery patients also have problems of ischemia and associated trauma causing muscle, nerve or bone injury[5]. Risk factors are also related to patient and operations. Modern surgeon cannot escape the responsibility of dealing with infections. Surgeon needs to have knowledge of aseptic technique and proper use of antibiotics[6].

Surgical wound infections can be responsible for additional week of hospitalisation and approximate increase of 20% in overall cost. It increases post operative morbidity of which prosthetic graft infection is deadly complication which can lead to limb loss or life loss as well. It is important to achieve effective antibiotic levels in the blood and tissues just prior to and during the procedure itself[7]. Antibiotics that are present in blood at the time of surgery get trapped in fibrin clot and produce desire effects. When given later, do not enter clotted fibrin. Oxygen enters fibrin clot along with antibiotic and prolongs its duration of action. In actual practice, however antibiotics are often not administered at the optimal time to ensure their presence in effective concentration throughout the operative period[8].

Inappropriate use and choice of antibiotics have led to antibiotic resistance. Despite the existence of general recommendations for antibiotic prophylaxis many deviations from these recommendations are still reported notably. The present study aims to focus some light on perioperative use of single dose versus triple dose antibiotic therapy in clean vascular surgery.

MATERIALS AND METHODS :

A randomized prospective study was conducted at Department of Cardiovascular and Thoracic Surgery, G. S. Medical College and KEM Hospital. During the period from August 2015 to July 2019. We have included a total of 180 patients who underwent clean vascular surgery during the above mentioned period.

The study has been devised to evaluate efficacy of single dose versus triple dose antibiotic therapy in clean vascular surgery. All patients were evaluated for presence of SSI by clinical and laboratory criteria.

Inclusion criteria : All patients of clean vascular surgery (non traumatic/non inflammatory/not involving respiratory, gastrointestinal or genitourinary system, no breach in technique).

Exclusion criteria : High risk of contamination or contaminated cases, immuno compromised status of patient due to HIV, Cancer, Diabetes and Steroid Therapy.

Sample size : patients operated during study period including use of prosthetic vascular grafts.

On admission each patient underwent clinical assessment, laboratory investigations, radiological evaluation, pre anaesthetic check up, valid consent, antibiotic administered 1 hour before induction, aseptic precautions, incision was closed primarily, sterile dressing in operation theatre which was changed after 48 hours, sutures removed on 7th day. SSI diagnosed by criteria laid down by CDC guidelines. When discharge present, wound swab was taken and sent for gram stain, culture and sensitivity. Antibiotics were changed or continued accordingly. Patient followed up on outpatient basis on 14th and 30th post operative day. Different categories were made in each variable and observations made accordingly : Age, Sex, Haemoglobin, Dose of antibiotic, post operative stay, duration of surgery, use of prosthetic graft, closed suction drain, presence of SSI.

We have used p value and chi-square test wherever applicable. SSI can occur anytime from 0 to 30 days post operative or upto 1 year after use of prosthetic material.

Choice of antibiotic was amoxicillin + clavulanic acid 1.2gm. Dose was given, single dose 60 mins before skin incision and as triple dose 1dose preoperative plus 2 doses post operatively at 12 hours interval. All analysis was carried out at 5% significance level ($p<0.05$).

OBSERVATION AND RESULTS :

This study includes a total of 180 patients. Comparison was done between two groups, 1 group of 90 patients who received single dose and other of 90 patients who received triple dose. Patients were evaluated for presence of SSI.

Out of 180 patients, 16 patients developed SSI (8.88%). Amongst single dose 9 patients developed SSI (10%) and in triple dose 7 developed SSI (7.77%).

Table 1 SSI wise distribution of cases in study groups

SSI	Single dose	Triple dose	Total
Yes	9	7	16
No	81	83	164
Total	90	90	180

On applying Chi square test, p value was>0.05, thus no statistical significance.

Table 2 symptoms wise distribution of cases on 2nd day of surgery in study groups

Symptoms present	Single dose (n=90)	Triple dose (n=90)
Pain	6	7
Fever	2	1
Temperature	3	2
Induration	4	5
Erythema	4	3
Discharge	3	1
Haemorrhage	0	0

On applying chi square test, p value was >0.05 for all symptoms on 2nd day. No statistical significance.

Table 3 Comparison of follow up on day 7 in study group

Follow up on day 7	Single dose	Triple dose	Total
Healed without SSI	81	83	164
Healed with SSI	7	6	13
Persistent SSI	2	1	3
Total	90	90	180

On applying chi square test, p value was >0.05 for follow up on 7th day. No statistical significance.

Table 4 age wise distribution of SSI

Age (years)	SSI	Single dose	Triple dose	Total
31-45	Yes	2	1	3
	No	21	24	45
46-60	Yes	5	4	9
	No	34	26	60
>61	Yes	2	2	4
	No	26	33	59
Total		90	90	180

On applying chi square test, p value was >0.05 for age wise distribution. No statistical significance.

Table 5 Sex wise distribution of SSI cases in study group

Sex	SSI	Single dose	Triple dose	Total
Male	Yes	5	4	9
	No	45	41	86
Female	Yes	4	3	7
	No	36	42	78
Total		90	90	180

On applying chi square test, p value was >0.05 for association of sex. No statistical significance.

Table 6 Postoperative stay wise distribution of SSI

POS	SSI	Single dose	Triple dose	Total
<5 days	Yes	2	1	3
	No	35	40	75
>5 days	Yes	7	6	13
	No	46	43	89
Total		90	90	180

On applying chi square test, p value was >0.05 for postoperative stay. No statistical significance.

Table 7 Duration of surgery wise distribution of SSI

Duration	SSI	Single dose	Triple dose	Total
<60 mins	Yes	3	1	4
	No	36	40	76
>60 mins	Yes	6	6	12
	No	45	43	88
Total		90	90	180

On applying chi square test, p value was >0.05 for duration of surgery. No statistical significance.

Table 8 Prosthetic graft wise distribution of SSI

Prosthetic graft	SSI	Single dose	Triple dose	Total
Yes	Yes	5	5	10
	No	38	37	75
No	Yes	4	2	6
	No	43	46	89
Total		90	90	180

On applying chi square test, p value was >0.05 for use of prosthetic vascular graft. No statistical significance.

Table 9 Drain wise distribution of SSI

Drain	SSI	Single dose	Triple dose	Total
Yes	Yes	6	5	11
	No	36	35	71
No	Yes	3	2	5
	No	45	48	93
Total		90	90	180

On applying chi square test, p value was >0.05 for drain wise distribution of SSI. No statistical significance.

Table 10 Haemoglobin wise distribution of SSI

Haemoglobin	SSI	Single dose	Triple dose	Total
<9	Yes	1	1	2
	No	21	20	41
9-11	Yes	3	2	5
	No	27	31	58
>11	Yes	5	4	9
	No	33	32	65
Total		90	90	180

On applying chi square test, p value was >0.05 for haemoglobin wise distribution of SSI. No statistical significance.

DISCUSSION :

Many researchers have studied antimicrobial prophylaxis in surgery and the occurrence of SSI in detail. The CDC have laid guidelines for the diagnosis and prevention of SSI. Although advances have been made in the field of infection control, SSI remains to be the commonest nosocomial infection challenging surgeons worldwide[1,2,3]. It causes significant post operative morbidity and mortality, increased hospital stay, financial burden and risk of limb/life loss in vascular cases. Also, inappropriate and injudicious use of antibiotic have led to problems of antibiotic resistance, increased toxicity, costs, super infections and altered microflora of institution[3,4]. The incidence of SSI in present study is 8.88% for overall cases, single dose group is 10% and triple dose is 7.77%. The difference in both groups is statistically not significant although there is slightly high infection in single dose group. Higher incidence of infection was noted in 46-60 years patient group as compared to remaining patients. However there was not statistical significance. Sex wise, males had slightly higher percentage of infection rates as compared to females but the difference was not statistically significant. In patients with post operative stay > 5 days, duration of surgery > 60 minutes and in patients with prosthetic vascular grafts higher percentage of infection was noted[5]. Howsoever no statistical significance was noted when compared to patients with postoperative stay < 5 days, duration < 60 minutes and without prosthetic vascular grafts. Similarly higher infections were noted in cases of drain in situ and haemoglobin >11 g/dl. These observations were not statistically significant. Pain was most common symptom on postoperative day 2. There were 3 cases of persistent SSI on postoperative day 7, but on day 14 all wounds had healed well[6,7,8].

CONCLUSION :

Out of the 180 clean vascular surgery patients evaluated for single dose versus triple dose antibiotic therapy in postoperative period, slight higher preponderance was seen for SSI in single dose group. However there was no statistical significance. Cases in which prosthetic vascular grafts were used, showed higher infection in single dose group. But this difference was not significant statistically. Pain was most common postoperative symptom but haemorrhage was least seen. All wounds healed by day 14. The difference in SSI between single and triple dose was not statistically significant.

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