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Study on Single Dose Preoperative Antibiotic Prophylaxis versus Routine Long Term Postoperative Prophylaxis in Elective General Surgical Cases

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Abstract

Background: The preventive effect of the routine use of preoperative surgical antibiotic prophylaxis (SAP) on the occurrence of surgical site infections (SSI) prior to non-clean and implant surgery has long been recognized. **Subjects and Methods:** A total of 100 patients were included in the study and divided in to Group A and Group B. Group A contains patients with 1 g of cefotaxime sodium intravenously, that is, single dose was given 1 h before induction of anesthesia and Group B contains patients who were given first dose at 1 h before induction of anesthesia, and subsequent doses were given at an interval of 12 h after surgery for 5 days, that is, multiple dose. **Results:** This case comparative study were conducted in 100 cases, out of which 50 was included in Group A & 50 was included in Group B. In group A & B different surgical procedure have been done during the study period which is shown in table 1. In group A & B hernioplasty was done in 28% of total cases followed by other procedure. **Conclusion:** In can be concluded that single preoperative dose of cefotaxime sodium is cost-effective and is as effective as multiple-dose prophylaxis. In elective general surgical cases, it is a reliable method of prophylaxis.

Keywords: Cefotaxime, prophylaxis, preoperative, postoperative, antimicrobial agent.

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Introduction

Prophylaxis consists of the use of an antimicrobial agent or agents. It is used to reduce the number of microbes that enter the tissue or body cavity before initiation of certain specific types of surgical procedures. It has been also administered in many randomized clinical trials to reduce the incidence of postoperative wound infections(WIs).[1–3] Presently, such prophylaxis is recommended at the time of many "clean-contaminated" and some clean operations.[4] However, it was found that the prophy¬lactic antimicrobial agents were not given at the required time leading to ineffective levels of these agents throughout the operative period.[5]

Although the benefits of prophylactic antibiotics is well established but choice of drug and scheduled for different surgical procedures is still a matter of debate.[6,7] Ehrenkraz observed that for patients undergoing caesarean section, antibiotic prophylaxis could result in national annual saving for this category alone. Though the cost may increase by the inappropriate and indiscriminate use of prophylactic antibiotics.[8,9] The appropriate use of prophylactic antibiotics can reduce the incidence of postoperative wound infection. Prophylactic antibiotic should be directed against the bacteria. It is likely to infect the wound. Bacterial contamination is likely in traumatic wounds as in high risk biliary tract operations and gynaecologic operations.[10,11]

For the effective use of antibiotic against the pathogens, it should be selected with least toxicity. A single dose of antibiotic should be given intravenously 30–60 minutes preoperatively.[12] If operation lasts longer than 4 hours or more, a second dose should be administered. When consequences of infection would be unusually severe, use of antibiotic is appropriate.[13]

The preventive effect of the routine use of preoperative surgical antibiotic prophylaxis (SAP) on the occurrence of surgical site infections (SSI) prior to non-clean and implant surgery has long been recognized. However, the benefit of continued SAP after completion of the procedure is unclear. Increasing evidence shows that a single preoperative dose of SAP (and possible additional intraoperative doses according to the duration of the operation) may be non-inferior to additional postoperative multiple doses for the prevention of SSI. Despite this, surgeons still have a tendency to routinely continue SAP up to several days after surgery.[14,15]

Subjects and Methods

Study Population

A total of 100 patients were included in the study and divided in to Group A and Group B. Group A contains patients with 1 g of cefotaxime sodium intravenously, that is, single dose was given 1 h before induction of anesthesia

and Group B contains patients who were given first dose at 1 h before induction of anesthesia, and subsequent doses were given at an interval of 12 h after surgery for 5 days, that is, multiple dose.

Study duration

The duration of study was from August 2017 to February 2018.

Study Area

This case comparative study was conducted in the department of surgery in a tertiary care centre.

Data collection

This study is a randomized prospective and comparative study of single-dose cefotaxime sodium I.V. 1 g (40 mg/kg B.W.) versus long-term (5 days) postoperative in elective general surgical cases. All the patients were thor¬oughly examined and formal consent for inclusion in the study was taken. Inclusion and exclusion criteria were defined. A study includes all the patients who were electively operated for upper gastrointestinal, biliary tract, appendicitis, breast, thyroid, hydrocele, and hernia surgery between 18 to 70 years of age without any regard to sex. All wounds were inspected before discharge, and all inci¬sions were carefully examined during suture removal at 7 to 9 days (first follow-up visit) and during the second follow-up visit 4 to 6 weeks after discharge. Thereafter, all patients were followed up at 6-month intervals (third follow-up visit) until 1 year (fourth follow-up visit) after surgery.

Data analysis

Data were analyzed by using Microsoft excel & chi-square test.

Results

Table 1: Different surgical procedure in Group A & B

Operative Procedure	Group A		Group B	
	Cases	%	Cases	%
Cholecystectomy	11	22%	12	24%
Hernioplasty	14	28%	14	28%
Herniorrhaphy	4	8%	4	2%
Thyroidectomy	3	6%	3	6%
Paraumbilical hernia repair	2	4%	1	2%
Epigastric Hernia Repair	2	4%	2	4%
Incisional hernia repair	1	2%	3	6%
Varicose vein surgery	2	4%	2	4%
Fibroadenoma excision	3	6%	2	4%
Circumcision	3	6%	1	2%
Varicocelectomy	2	4%	2	4%
Hydrocelectomy	3	6%	4	8%
Total	50	100%	50	100%

This case comparative study were conducted in 100 cases, out of which 50 was included in Group A & 50 was included in Group B. In group A & B different surgical procedure have been done during the study period which is shown in table 1. In group A & B hernioplasty was done in 28% of total cases followed by other procedure. In this study found that incidence of wound infection in relation of age group, gender, hemoglobin, plasma protein, duration of surgery. It is found that incidence of wound infection were 12%,10%,12%,10%,10% in relation to age, gender, Hb, plasma protein and duration of surgery respectively. Whereas, in group B incidence of wound infection were 10%,10%,10%,10%,10% in relation to age, gender, Hb, plasma protein and duration of surgery respectively.

Table 2: Incidence of wound infection in relation of age

Age	Group A			Group B		
	No	Wound infection	%	No	Wound infection	%
11-20	7	1	14.2%	4	1	25%
21-30	11	1	9.1%	14	1	7.1%
31-40	12	1	8.3%	20	1	5%
>40	20	3	15%	12	2	16.7%
Total	50	6	12%	50	5	10%
P value=0.809 (Not significant)						

Table 3: Incidence of wound infection in relation of gender

Gender	Group A			Group B		
	No.	Wound infection	%	No.	Wound infection	%
Male	42	3	7.1%	40	2	5%
Female	8	2	25%	10	3	30%
Total	50	5	10%	50	5	10%
P value=0.809 (Not significant)						

Table 4: Incidence of wound infection in relation of Hb

Hb level (gm/dl)	Group A			Group B		
	No.	Wound infection	%	No.	Wound infection	%
0-8	2	1	50%	4	1	25%
8-10	9	1	11.2%	8	1	12.5%
10-12	26	3	11.5%	26	2	7.6%
12-14	13	1	7.6%	12	1	8.4%
Total	50	6	12%	50	5	10%
P value=1.000 (significant)						

Table 5: Incidence of wound infection in relation of plasma protein

Plasma Protein	Group A			Group B		
	No.	Wound infection	%	No.	Wound infection	%
5.5-64	28	3	10.7%	20	3	15%
6.5-8.1	22	2	9.1%	30	2	6.7%
Total	50	5	10%	50	5	10%
P value=1.000 (significant)						

Table 6: Incidence of wound infection in relation of duration of surgery

Duration of surgery	Group A			Group B		
	No.	Wound infection	%	No	Wound infection	%
0-1	10	1	10%	11	1	9.1 %
1-2	32	2	6.25 %	29	2	6.8 %
>2	8	2	25%	10	2	20%
Total	50	5	10%	50	5	10%
P value=1.000 (significant)						

Discussion

The highest incidence of infection was found at the age of 40 years whereas the lowest infection rate was observed in the first decade. According to Shooter et al. (1960) observed that the newborn as well as the older patients are extremely susceptible to staphylococcal infection. Clark et al. (1974) also revealed that the average age for higher infection rate was 42 years. Postoperative wound infection showed a rising tendency with the advancement in age under identical situations. The reason could be that body defense mechanism diminishes with the advancing age. Therefore, wound infection rate is directly related to the age of the patients. In the present study, it is seen that the incidence of wound infection is higher in the female population in comparison to the male population. Clark et al. (1974) also reported the similar results. The major factors that may be responsible for the high incidence of WI in females are subcutaneous fat, anemia, and poor nutritional factors. These factors are often seen in female population of developing countries. It has been found in this study that the incidence of WI is more prevalent in anemic patients as well as in patients having plasma protein below the standard level. This is due to the suppression of host defense mechanism providing an upper hand to the pathogenic bacteria to multiply and invade. In another study Wolf (1950) and Udupa (1969) observed higher incidence of WI in patients with anemia and hypoproteinemia. The higher inci-dence of WI in low socioeconomic status is maybe because of their poor nutritional status. It has been observed that the incidence of WI is higher when the duration of operation is lengthy. This study showed that when the operation was finished within 1 h, the WI rate was 10% and when the operation was pro¬longed for more than 1 h, it was 25%. Wasek et al. (1965) and Subreme-nium (1973) also found the similar results. The reason could be due to the greater exposure of the tissues to exogenous factors. The success of the antibiotic prophylaxis is assured only when the selected drug is available at the critical moment, at the correct site, and in sufficiently high concentration, to prevent the bacterial contamination of surgical field. When bacterial contamination at the operation site may occur during surgery, one cannot predict with certainty. Thus, the chosen agent should cover the entire perioperative period of risk for postoperative infection, which may extend longer than the actual surgical procedure. Scottish Intercollegiate Guidelines Network (SIGN) reported that the antibiotics chosen for prophylaxis must cover the expected pathogens for that operative site,[16] the choice of antibiotic should be based on its local resistance patterns, during surgery, narrow spectrum and less expensive antibiotics should be the first choice for prophylaxis, it should be administered intravenously, and should be given within 60 min before the skin is incised and as close to time of incision as practically possible, a single dose of antibiotics with a long half-life to achieve activity throughout the operation is recommended, or surgery longer than 4 h, an additional intraoperative dosage of antibiotic is also recommended, and if there is major intraoperative blood loss in an adult patient (>1,500 mL) then additional dosage of prophylactic antibiotic should be considered after fluid replacement. Apart from antibiotic prophylaxis, there are many other risk factors which should be taken in to consideration by every surgeon seriously. It has been seen that patient-related factors such as antiseptic baths or preoperative bath can reduce the microbial load of the skin, and clipping hair immediately before an operation has been related with decreased rates of SSIs. These are the rec-ommended practice. There are some factors which are directly related with surgical team such as team members coming directly in contact with the sterile-operating field, sterile instruments, or supplies used must perform a surgical scrub for at least 2 to 5 min with broad-spectrum antiseptic agent that is fast acting and having a persistent effect. This may be 4% chlorhexidine gluconate or 7.5% chlorhexidine gluconate having greater residual antimicrobial activity. Burke found that in reducing infection, postoperative antibiotics were much less useful than those given before surgery.[17,18] According to The American Society of Health System Pharmacist for elective surgical cases, prophylaxis should be used with cephalosporin.[19]

It is well known that surgical WIs are very much common and consume a considerable amount of health-care finances. Though surgical WIs cannot be completely eliminated yet a reduction in the infection rate to a minimal level could reduce morbidity and mortality, and wastage of health-care resources. For the reduction of WI rate, it is essential to use antibiotic prophylaxis sensibly. There should be an organized system of wound surveillance and reporting at the surgical site.

Conclusion

In can be concluded that single preop¬erative dose of cefotaxime sodium is cost-effective and is as effective as multiple-dose prophylaxis. In elective general surgical cases, it is a reliable method of prophylaxis.

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