

Original Research Article

Role of antibiotics in elective clean surgeries: limiting its use to single shot preoperative dose

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ABSTRACT

Background: Conventional antibiotic therapy during operation not only increases the financial burden on patient, not only increases chances of adverse reactions among them but also not effective in reducing the infection rate after surgery. Single dose prophylactic antibiotic or maximum 24 hours dosing during or before surgery was found to be equally effective. Objective was the to study utility of single shot antibiotic prophylaxis in patients undergoing surgery

Methods: This prospective study includes 100 clean elective surgical cases randomized to groups of 50 each. Single dose prophylactic antibiotic was given to cases in the study group and conventional antibiotic therapy was given to cases in the control group. Study group cases received Injection Ceftriaxone in the dose of 2 gm intravenously. This was given at induction or half an hour before the incision was given. Second dose was given if there was delay in starting the surgery for more than three hours. Dose of the antibiotic was adjusted for children, underweight and obese persons. For cases in the control group. Injection ceftriaxone 1 gm was given intravenously twice a day for three days. Surgical site infection incidence was recorded.

Results: Both the groups were comparable for age, sex, diagnosis and hence the type of surgery performed. The incidence of fever, redness, swelling and wound discharge which are the signs of surgical site infection after surgery was not found to be statistically significantly different. Management protocol was also not significantly different after the surgery.

Conclusions: Single shot antibiotic before surgery is equally effective in reducing the incidence of surgical site infections (SSIs) compared to conventional antibiotic therapy.

Keywords: Antibiotic, Efficacy, Incidence, Surgery, SSI, Therapy

INTRODUCTION

Giving antibiotics before the surgery is called as preoperative antibiotic prophylaxis. This helps in reducing the risk of infections that are likely to occur after surgery.¹ It is a routine practice to give antibiotics to the patients before surgery in cases where the patient is undergoing the surgeries like grafting, or implantation surgeries etc. in such cases there is requirement to dissect the larger portions compared to routine surgeries.² It is not fixed as to when to give the antibiotic to the patient

undergoing surgery. But the objective is very clear i.e. to increase the concentration of antibiotics in the body tissues as a prophylactic measure so that infection can be taken care of while initiation as well as while the surgery is going on. Decision on which antibiotic should be given depends upon the type of surgery and the region of the surgery involved. General principle is to give such an antibiotic as to cover the major part of the body and at the same time taking care of all possible infections during the operation. At the same time, other factors related to antibiotics like cost, route of administration, adverse

effects to the patient, profile of the antibiotic, activity against the bacteria and the resistance pattern in that particular hospital. Keeping all these things in mind and using all these factors in the selection of the antibiotics, help to prevent the incidence of surgical site infections.³

Surgical site infections discourages patient, is a negative factor. It also increases the money burden on the patient. "Centers for Disease Control and Prevention's (CDC) National Healthcare Safety Network (NHSN) have classified wounds as clean, clean-contaminated, contaminated, or dirty/infected." Patients are asked to take a shower with soap and water before operation. Generally bactericidal antibiotics are preferred over bacteriostatic antibiotics for use in patients undergoing surgery. Thus the main objective is to kill the organism rather than preventing its growth.⁴

Intravenous is the preferred route of administration for antibiotics to be given to the patients before surgery as a prophylactic measure. Prevention success in the patient depends upon the time at which the antibiotic was given, for how long it was given, obesity etc. If the antibiotic is not required, it should not be used at all. This will not only prevent the chances of adverse reaction in the patient but also will reduce the chances of the resistance. If the patient does not have any infection, the antibiotic for prophylactic use should be discouraged within 24 hours. 48 hours of therapy remains debated after the surgery especially in cardiothoracic operations. Two meta-analysis studies have proved that extended duration use of antibiotic brings about the significant reduction in the incidence of the surgical site infections especially if the patient was having infection at the sternum. CDC recommends that antibiotics are not required if the incision during operation is neat and clean. Except in certain procedures, after the surgical site is closed, this recommendation applies.⁵

Present study was carried out to study the efficacy of the single dose antibiotics in clean surgeries.

METHODS

A prospective study was done at tertiary hospital in Maharashtra from April 2017 to January 2019. This study includes 100 clean elective surgical cases randomized to groups of 50 each.

Inclusion criteria

Clean elective surgical cases in department of general surgery were included.

Exclusion criteria

Operative procedure in pregnant women, surgeries in immuno-compromised patients, patients with recurrent lesion, patients with malignancy and patients who do not give consent were excluded.

Process

Single dose prophylactic antibiotic was given to cases in the study group and conventional antibiotic therapy was given to cases in the control group. Study group cases received inj ceftriaxone in the dose of 2 gm intravenously. This was given at induction or half an hour before the incision was given. Second dose was given if there was delay in starting the surgery for more than three hours. Dose of the antibiotic was adjusted for children, underweight and obese persons. For cases in the control group, inj ceftriaxone 1 gm was given intravenously twice a day for three days. Surgical site infection incidence was recorded.

Follow-up

Both the group cases were asked to come for follow up visits on third day after surgery, seventh day after surgery and twelfth day after surgery. Those who found to have wound infection were asked to come for follow up regularly till one month after surgery. All data related to surgical site infection was recorded.

Statistical analysis

The data was entered in the Microsoft Excel worksheet and analyzed using proportions. Chi square test was used for proportions. P-value of less than 0.05 was taken as statistically significant.

RESULTS

Table 1 shows age distribution between the Groups. Both the groups were comparable in terms of age. There were thirteen cases in study group and twenty two cases in the control group in less than or equal to thirty years of age. There were seventeen cases in the study group and eighteen cases in the control group in thirty one to sixty years of age group.

There were twenty cases in the study group and ten cases in the control group in above sixty one years of age. All age groups overall were found to have equal representation in the present study.

Table 1: Age distribution between the groups.

Age in years	Study	Control	Total	Chi-square	P value
≤30	13	22	35	4.94	0.084
31-60	17	18	35		
≥61	20	10	30		
Total	50	50	100		

Table 2 shows sex distribution between the groups. Males were more i.e. seventy two compared to only twenty eight females in the present study. This difference

was found to be statistically significant. There were forty males in the study group and thirty two males in the control group which is not statistically significant different. There were eight females in the study group and twenty females in the control group which is not statistically significant different.

Table 2: Sex distribution between the groups.

Gender	Study	Control	Total	Chi-Square	P value
Male	40	32	72	5.824	0.016*
Female	8	20	28		
Total	48	52	100		

Table 3: Distribution of study subjects as per diagnosis.

Diagnosis	Control group	Study group
Inguinal hernia	20	20
Thyroid swelling	2	2
fibro adenoma	6	6
Lipoma And benign superficial lumps	10	10
Congenital fluid hernia	4	4
Ventral hernias	3	3

Table 3 shows distribution of study subjects as per diagnosis. Most common diagnosis in the present study was inguinal hernia in both the groups. This was followed by the lipoma and benign superficial lumps where it can be seen from this table that there were ten cases each in both the groups. This was followed by fibro adenoma where it can be seen from this table that there were six cases each in both the groups. This was followed by congenital fluid hernia where it can be seen from this table that there were four cases each in both the groups. This was followed by Ventral hernias where it can be seen from this table that there were three cases each in both the groups.

Table 4: Comparison of fever in two groups.

Fever	Study group	Control group	Total	Chi square	P value
Yes	6	5	11	0.125	0.78
No	44	45	90		
Total	50	50	100		

Table 4 shows comparison of fever in two groups. Six patients in the study group and five patients in the control group developed fever after surgery which is a sign of wound infection. But the difference in the study group and the control group regarding fever after surgery was not found to be statistically significant. 44 cases in the study group and 45 cases in the control group did not

develop fever after surgery as was recorded from the follow up visits.

Table 5: Comparison of swelling in two groups.

Swelling	Control group	Study group	Total	Chi square	P value
Yes	2	3	5	0.196	1
No	47	48	96		
Total	50	51	101		

Table 5 shows comparison of swelling in two groups. 2 patients in the study group and 3 patients in the control group developed swelling after surgery which is a sign of wound infection. But the difference in the study group and the control group regarding swelling after surgery was not found to be statistically significant. 47 cases in the study group and 48 cases in the control group did not develop swelling after surgery as was recorded from the follow up visits.

Table 6: Comparison of redness in two groups.

Redness	Control group	Study group	Total	Chi square	P value
Yes	2	3	5	0.196	1
No	48	47	95		
Total	50	50	100		

Table 6 shows comparison of redness in two groups. 2 patients in the study group and 3 patients in the control group developed redness after surgery which is a sign of wound infection. But the difference in the study group and the control group regarding redness after surgery was not found to be statistically significant. 48 cases in the study group and 47 cases in the control group did not develop redness after surgery as was recorded from the follow up visits.

Table 7: Comparison of wound discharge in two groups.

Wound discharge	Control group	Study group	Total	Chi square	P value
Yes	3	2	5	0.210	0.64
No	47	48	95		
Total	50	50	100		

Table 7 shows comparison of wound discharge in two groups. 3 patients in the study group and 2 patients in the control group developed wound discharge after surgery which is a sign of wound infection. But the difference in the study group and the control group regarding Wound discharge after surgery was not found to be statistically significant. 47 cases in the study group and 48 cases in the control group did not develop wound discharge after surgery as was recorded from the follow up visits.

Table 8: Comparison of management between the groups.

Management	Study group	Control group	Total	Chi square	P value
Number	43	40	83	0.63	0.42
Observation	0	1	1		
Antibiotics	6	9	15		
Drainage	1	0	1		

Table 8 shows comparison of management between the groups. Out of 10 patients who developed SSI in control group no patients were managed by drainage of infection, 9 patients infection resolved with antibiotics alone and 1 patient had minor infection that resolved spontaneously. In the study group of the 7 patients with SSI, 1 required drainage of collection while 6 patients infection resolved with antibiotics alone. There was no significant difference between the groups as shown by the p value of 0.79 which is not significant.

DISCUSSION

The most common age group was 30-60 years. Most of the patients were male. In this study there was an even distribution of cases based on the diagnosis. There was a slight preponderance of elective hernia overall. In the study it is found that 6 patients of study population and 5 of control population developed fever due to wound infection. It is found that in the control group 2 patients developed swelling that of study group developed comparable changes. It is found that in the control group 2 patients developed redness that of study group developed comparable changes. In this study patients in the control group and patients in the study group developed wound discharge. Out of 10 patients who developed SSI in control group no patients were managed by drainage of infection, 9 patients infection resolved with antibiotics alone and 1 patient had minor infection that resolved spontaneously.

Agrawal et al carried out a prospective study among patients undergoing elective orthopedic surgery.⁶ They divided the patients into two groups. First group was given ceftriaxone along with amikacin in the doses of 1 gm and 15 mg/kg body weight respectively. Two doses were given 12 hours apart. Second group received regular antibiotics in regular prescribing doses. They observed that the infection rate of the superficial was 3.27% compared to 1.41% in second group which was found to be statistically significant. But the deep infection rate was less in first group i.e. 1.31% compared to 2.82% in the second group and this difference was also found to be statistically significant. Thus they concluded that antibiotics given prophylactically should not be continued beyond twenty four hours in patients undergoing elective orthopedic surgery. This finding is in accordance with the finding of the present study.⁶

Mundhada et al noted that the infection rate was 32% after the surgery. The most common organism found was *Staphylococcus aureus*. But no strain of the *Staphylococcus aureus* was found to be resistant to Methicillin. Enterobacteriaceae was found to be more resistant. They recommended that the antibiotics should be used judiciously based on the evidence.⁷

Mathur et al carried out a randomized prospective study and divided the patients into two groups. Group 1 patients were given three doses of cefuroxime in the dose of 1 gm which was administered intravenously and an interval of 12 hours was maintained. Group 2 patients were given regular regimen for five days. They observed that finally only two patients from group 2 and two patient from group 1 were found to develop the infection. The strain isolated was methicillin resistant *Staphylococcus aureus* in three cases and *Acinetobacter baumannii* in one case. Thus the authors concluded that short course antibiotics before surgery is as good as conventional therapy with the antibiotics. Hence to reduce the burden of the patient in terms of cost, adverse events etc, single shot antibiotic prophylaxis before surgery should be done. This finding is in accordance with the finding of the present study.⁸

Lovato et al carried out a retrospective study. They reviewed 150 cases. These cases were the cases of operation for fracture of the mandible and among them some were complicated cases and some were non-complicated cases. In group 1 the cases were given antibiotics only during 24 hours after the surgery. Group 2 cases were given antibiotics up to 10 days after surgery depending upon conditions. The results showed that the infection rate in group 1 was 13.33% compared to 10.67% in group 2 cases. This difference was not found to be statistically significant. Thus the authors concluded that extended use of antibiotics after surgery has no role in preventing infection rate after surgery and hence patients should be given short course antibiotics. This finding is in accordance with the finding of the present study.⁹

Xu et al used SSI risk scorecard in their study. They included patients with low score of SSI risk i.e. score less than or equal to eight and divided them into two groups. One group received conventional antibiotic therapy and second group were not given any antibiotics. All these cases i.e. both the groups were followed after 13-17 months after the operation. The results showed that the infection rate in group 1 was 2.2% compared to 2.4% in group 2 cases. This difference was not found to be statistically significant. Thus the authors concluded that extended use of antibiotics after surgery has no role in preventing infection rate after surgery and hence patients should be given short course antibiotics. This finding is in accordance with the finding of the present study.¹⁰

Marimuthu et al included cases undergoing spinal surgeries. They divided the patients into 72 hour antibiotics prophylaxis and 24 hours antibiotics

prophylaxis. They found that the rate of infection did not differ significantly in two groups. Thus the authors concluded that extended use of antibiotics after surgery has no role in preventing infection rate after surgery and hence patients should be given short course antibiotics. This finding is in accordance with the finding of the present study.¹¹

CONCLUSION

Incidence of fever, redness, swelling, wound discharge, and management protocol did not differ significantly in two groups. Hence single shot antibiotic prophylaxis in clean surgeries has been found to be as good as conventional three day antibiotic therapy. Hence we recommend performing clean surgeries and giving single prophylactic dose of the antibiotic to all cases undergoing surgeries to prevent the burden on the patients and reduce the chances of adverse reactions.

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