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Role of antibiotics in class II (clean–contaminated) surgical cases

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***Abstract**: Anti-microbial are nowadays widely used, and probably overused, for the prevention of surgical site infections. Surgical site infections are the most frequent nosocomial infections with a global cumulative incidence of 7.7% ranging from 3.4% for clean surgery to 23.7% for dirty surgery[2]. The use of antibiotics in clean contaminated cases has been a subject of controversy and that if proper surgical techniques and asepsis is maintained, whether we can avoid giving antibiotics or not is debatable. These days the surgeons have become over dependant on antibiotics to avoid surgical site infections and have forgotten that inadvertent use of antibiotics can lead to harmful effects like drug toxicity, increased cost burden and most importantly emergence of multi drug resistant micro-organisms. Incidence of post operative wound infection was compared in three groups in which first group received no antibiotics, second group received a single shot of antibiotic 2 hours before surgery and third group received antibiotic for 5 days post operatively. Results showed that while the least incidence of infection was found in group C, but when comparing infection rates between Group B (20% infected) and Group C (16.67% infected), p value was found to be 1.0 (<0.05), which is insignificant. Thus, it is being concluded here that statistically there is no significant difference between infection rates in Group B and Group C and thus a single shot of antibiotic 2 hours before surgery is enough to prevent surgical site infection in clean-contaminated surgical cases.*

I. Introduction

Surgical site infections are infections of the tissues, organs, or spaces exposed by surgeons during performance of an invasive procedure. It occurs when micro-organisms get into the part of the body that has been operated on and multiply in the tissues and cause infection[1]. Surgical infections is the most frequent nosocomial infections with a global cumulative incidence of 7.7% ranging from 3.4% for clean surgery to 23.7% for dirty surgery[2]. The antibiotic era which began more than 5 decades ago has revolutionised the treatment of surgical infection particularly during post operative period. It has led to reduction in surgical site infections which complicate the clinical management of surgical patients often lengthening hospital stay and increasing cost of providing medical care. Anti-microbial are nowadays widely used, and probably overused, for the prevention of surgical site infections. The concept of preoperative antibiotic prophylaxis was mooted by Stranchan in 1977, where he compared a single preoperative dose of Cefazoline with regime of Cefazoline given for a period of 5 days post operatively. The infection rate seen in single dose was 3% and in multiple post operative dose was 5%[3]. So Stranchan et al concluded that prophylactic antibiotic therapy is more effective when begun preoperatively with the aim of achieving therapeutic blood levels throughout the operative period[4]. In present scenario, the wide spread use of antibiotics has frequently resulted in an unrealistic over dependence on their effectiveness in treating disease with consequent violation of established surgical principle and the breakdown of isolation procedures, with surgeons giving antibiotics for way too much time than they are required. Even more alarming is the fact that excessive use of antibiotics is leading to development of more resistant strains of infection causing organisms and more and more antibiotics are being rendered ineffective. In the current study we want to emphasize on the timing of antibiotic to be given in clean-contaminated (class II) elective surgical cases and to determine if at all there is a need to administer antibiotics in such cases with the aim to avoid the inadvertent use of antibiotics and minimise its harmful effects.

Aims and objectives-

- To compare the efficacy, need and timing of antibiotic prophylaxis in clean-contaminated general surgery cases.
- To compare the incidence of surgical site infection in class II surgeries when
  - no antibiotic is given (Group A)
  - single prophylactic dose is given (Group B)
  - empirical therapy is given for 5 days post-operatively (Group C)
- To find out the economically best suited surgical prophylaxis regime.

II. Materials and methods

Patients admitted in NIMS Medical College and hospital, Jaipur for Class II (Clean-contaminated) general surgical cases between 2013 and 2015 were taken. 90 patients were taken and were divided into groups of 30 each after randomisation.

1. Group A - no prophylaxis – 30
2. Group B – single prophylactic antibiotic(0-2 hours before surgery) – 30
3. Group C – Empirical therapy for 5 days in addition to single preoperative dose – 30

Details of cases were recorded including history and clinical examination.

Approval of the Institutional Ethical Committee was obtained for the study. A written informed consent was also undertaken from all the patients and after duly explaining the study protocol before enrolling them for the study.

Third generation cephalosporins were taken as the choice of antibiotic to be given.

Routine pre-operative investigations performed in all the groups.

Operative wound was examined on the second, fifth and eighth post-operative day for signs of surgical site infection.

The data so obtained was tabulated and assessed for statistical significance using Anova test, X^2 test and Fisher Exact test, as and when applicable. P-value less than 0.05 was considered significant.

Patients with tuberculosis, uncontrolled diabetes mellitus, on steroids or chemotherapy nad surgeries lasting more than 2 hours were excluded from the study.

III. Observations

Overall infection rate was found to be 28.9%, with least in group C (16.67%) and maximum in group A (50%).

	Total patients	Infected		Non infected	
		No.	**%**	**No.**	**%**
Group A	**30**	15	50.00	15	50.00
Group B	**30**	6	20.00	24	80.00
Group C	**30**	5	16.67	25	83.33

p value was found to be 0.007 (<0.05), which is significant for the infection rates in different study groups. So, comparison between each group separately had to be carried out to identify the significant change.

Infection	Group A		Group B	
	No.	**%**	**No.**	**%**
Present	15	50.00	6	20.00
Absent	15	50.00	24	80.00

While comparing infection rates between Group A (50% infected) and Group B (20% infected), p value was found to be 0.014 (<0.05), which is significant. Thus, it was being concluded here that statistically there is significant difference between infection rates in Group A and Group B.

Infection	Group B		Group C	
	No.	**%**	**No.**	**%**
Present	6	20.00	5	16.67
Absent	24	80.00	25	83.33

While comparing infection rates between Group B (20% infected) and Group C (16.67% infected), p value was found to be 1.0 (<0.05), which is insignificant. Thus, it is being concluded here that statistically there is no significant difference between infection rates in Group B and Group C

Infection	Group A		Group C	
	No.	**%**	**No.**	**%**
Present	15	50.00	5	16.67
Absent	15	50.00	25	83.33

Study group	Infection rate			P value
	Antibiotic not given	Single dose prophylactic given	Empirical therapy	
Carlsson et al[5]	24.1%	3.3%	-	>0.05 (NS)
Rao et al[6]	2.3%	1%	-	>0.05 (NS)
Yadav et al	33.33%	0		>0.05 (NS)
David classen et al[7]	-	0.6%	3.3%	>0.05 (NS)
Purushotham et al[8]	-	7.6%	3.8%	>0.05 (NS)
Mohri et al[9]	-	9.5%	8.6%	>0.05 (NS)
Osstovogel et al[10]	-	3.1%	1.8%	>0.05 (NS)
Present study	50%	20%	-	0.014 (<0.05) (S)
Present study	-	20%	16.67%	1.000(>0.05) (NS)
Present study	50%	-	16.67%	0.03(<0.05) (S)

While comparing infection rates between Group A (50% infected) and Group C (16.67% infected), p value was found to be 0.03 (<0.05), which is significant. Thus, it is being concluded here that statistically, there is significant difference between infection rates in Group A and Group C.

The present study was also compared to studies done in the past for clean-contaminated cases

IV. Discussion

Our study shows that a single dose of antibiotic given prior to surgery in clean-contaminated surgical cases is more effective in preventing post-operative surgical site infection than not giving antibiotic at all.
The rate of surgical site infections was similar in patients who received a single pre-operative dose of antibiotic in comparison to those who received multiple doses of antibiotics post-operatively. The p value was found to be 0.1 (>0.05), which was not significant. So, it can be concluded that timing of administering antibiotic is of utmost important and that single dose prophylactic antibiotic within 2 hours of incision for surgery is sufficient to prevent post-operative surgical site infections in clean-contaminated surgeries and that multiple doses of antibiotics post-operatively is unnecessary. Misuse of antibiotics should be avoided by giving the most appropriate antibiotic regimen thus preventing adverse outcomes of inadvertent antibiotic usage, such as increased cost burden on patients, multi-drug resistance and drug toxicity.

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