

Antibiotic Prophylaxis in Surgery is Adherence to Standard Guidelines Feasible in a Tertiary Centre of Developing Country

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Abstract

Introduction: Antibiotic use in various surgical procedures should be decided by the surgeon based on the type of case, the duration of surgery, and various patient and environmental related factors. However there has been non judicious usage of antibiotics which has inturn propelled the emergence of antibiotic resistance and spiralled the treatment cost in hospitals. Hence this study aims to compare the efficacy of single dose antibiotic usage in our hospital in comparison with conventional antibiotic usage. **Materials and Methods:** A randomized control trial was done in fr mullers medical college in the surgical unit. All patients in the study group received single dose antibiotic at the time of induction of anaesthesia. The antibiotic was repeated only if the duration exceeded the half life of the antibiotic. Drains were removed in 24 hrs if found less than 70 ml. The control group patients received one dose of antibiotic at induction of anaesthesia and two doses post operatively. The outcome was assessed in terms of surgical site infection and cost of antibiotics. **Results:** In the single dose regimen, 60 cases were clean and infection found in 6.6 % of the patients. 15 patients in group A underwent clean contaminated surgery and were not associated with any infection. The group B patients included 62 patients in the clean surgery category with a infection found in 8.06% of the patients. 18 patients were in the clean contaminated category of group B with no infection reported in this category. The mean duration of surgical time was seen to be higher with 3 dose regimen (67.37 min) as

compared to single dose (62.8 min) though the difference was not statistically significant. The overall proportion of infection in our study was higher with group B (6.25%) as compared to single dose (5.33%). The cost of antibiotic in the group A patients was lesser than group b patients. **Conclusion:** we found no statistically significant difference in the surgical site infection rate between the single or the three dose group of patients.

Keywords: Antibiotic; Surgical Site Infection; Surgical Prophylaxis.

Introduction

The antibiotic era which began in the middle of 20th century fostered hope that surgical infection would be eliminated [1]. In this generation the surgeons are facing a number of serious infections due to combination of factors like complicated surgeries, prolonged operations and geriatric patients [1]. The concept of preoperative antibiotic prophylaxis was given by Strachan in 1977, wherein he compared single preoperative dose of Cefazolin with 5 days found that infection rate in single dose was 3% and multiple dose was 5% [2].

Surgical site infections (SSI) were and will continue to be one of the most feared postoperative complications for the increase in morbidity, mortality and cost in a form of hospital stay and absence from work. Also SSI have increasingly been used a measure of quality of care in hospitals [3].

The use of antibiotic has revolutionised the treatment of surgical infection in the postoperative period resulting in reduction in occurrence of surgical site infection thereby reducing the length of hospital stay and overall treatment cost.

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Prophylactic antibiotic therapy should be directed against the bacteria likely to contaminate the wound. The most preferred regimen is a single dose antibiotic dose given intravenously 30-60 min preoperatively and a second dose administered if the surgical time exceeds 4 hrs or twice the half life of the antibiotic used. However the non judicious usage of these antibiotics has propelled the emergence of antibiotic resistance and spiralled the treatment cost in hospitals. It can also alter the colonic flora, with the proliferation of *Clostridium difficile* and resultant pseudomembrane formation and diarrhea [3]. Most of the hospitals in our setting where there is overload of surgical patients and the environmental sanitation cannot be monitored antibiotics are given for 7-10 days for fear of surgical site infection even in clean and clean contaminated cases. The cornerstone of infection control like meticulous surgery, respectful tissue handling, OT sanitation, adequate preoperative preparation and wound care are given less importance.

In view of all this, WHO 2012 had given a clear call to reduce the injudicious antibiotic use and prevent antibiotic resistance. Various campaigns by the health insurance and regional health authorities have tried to change this concept without success.

In this study we intend to study the efficacy of single dose antibiotic prophylaxis given at time of induction of anaesthesia versus one dose at induction and two doses postoperatively in clean and clean contaminated surgeries.

Objective

To assess the incidence and grade the surgical site infection in patients receiving single pre-operative antibiotic dose in clean and clean contaminated surgeries Compare SSI 's in single dose antibiotic prophylaxis group with conventional 3-dose antibiotic patients To compare the cost effectiveness of single dose antibiotic compared to three dose group.

Aim

To study the efficacy of single dose antibiotic prophylaxis in clean and clean contaminated surgeries compared to three dose antibiotic prophylaxis.

Materials and Methods

Study Design

Interventional study.

This study is being done in the department of General Surgery in Father Muller Medical College. A total of 150 patients posted for clean and clean contaminated surgery will be included in the study. On admission a detailed proforma will be completed which includes the diagnosis and pre op investigations, patients will then be categorised as clean and clean contaminated cases and randomly grouped into 2 groups, Group A and B consisting of 75 patients each with both clean and clean contaminated cases.

1. Clean cases are those where there is no inflammation.
2. Clean contaminated are surgeries through the respiratory tract or GIT or genitourinary tract is entered under controlled conditions with no contamination.

All surgeries will be carried out as per same preoperative safety protocol. theater asepsis is maintained. Standard scrub of 3-5 min was followed by the surgical team.

Group A will receive single dose antibiotic at the time of induction of surgery, Group B will receive 3 doses of antibiotic (one at the time of induction and two postoperatively). In Group A if surgical time exceeds 4 hrs a second dose of antibiotic will be administered. Any drain placed will be removed by 1st postoperative day if less than 70 ml. Keeping the drain further and administering a second dose of antibiotic will be decided by the surgeon depending on the conditions related to the case. The wound will be inspected on postop day 1 and 7 for any signs of infection using the southhamptons grading system (Table 1). Post-operative recovery will not be assessed in our study

Inclusion Criteria

Clean Cases

1. Total thyroidectomy
2. Hemithyroidectomy
3. Breast lump excision
4. Inguinal hernioplasty (open and lap)
5. Umbilical hernioplasty
6. Lipoma excision
7. Dermoid cyst excision
8. Sural nerve biopsy
9. Temporal artery biopsy
10. Trendelenberg surgery
11. Orchidopexy

12. Sebaceous cyst excision

13. Lap cholecystectomy

14. hydrocelectomy

15. open cholecystectomy

Clean contaminated

1. Appendicectomy (open and lap)

2. Haemorrhoidectomy

3. Fistulectomy

4. Lateral sphincterotomy

5. pyocele

Exclusion Criteria

Patients with any pre existing foci of infection like TB, bronchitis, LRTI

Statistical Analysis

Categorical data will be analysed by chi square test and z test for proportions, continuous data using student t test. Data will be summarized as odds ratio and 95%ci. $p < 0.05$ will be considered statistically significant.

Observation and Results

A total of 150 patients were taken for this study and randomly grouped into 2 groups, Group A and B consisting of 75 patients each with both clean and clean contaminated cases (Chart 1) Group A patients received single dose antibiotic at the time of induction of surgery, Group B received 3 doses of antibiotic (one at the time of induction and two postoperatively).

The average stay of patients in both groups was 1-2 days post operatively. In case of any evidence of infection the patient remained admitted for 7 days.

In the single dose regimen, 60 cases were clean and infection found in 6.6% of the patients. This was found not in association with the diabetic status of the patient these 5 patients were further categorized based on the southhamptons grading (Table 1).

In these patients a wound swab was sent and the patients were restarted on antibiotics. 15 patients in group A underwent clean contaminated surgery and were not associated with any infection (Table 4).

The group B patients included 62 patients in the clean surgery category with a infection found in 8.06 % of the patients. There were 7 patients with diabetes mellitus but only one patient was found to develop infection. Appropriate antibiotics were started in the

Table 1: Southamptons grading system

Southhamptons Criteria:
Grade 0 - normal healing
Grade 1- normal healing with mild bruising or erythema
Grade 2-erythema plus other signs of inflammation
Grade 3- clear or hemoserous discharge
Grade 4-pus
Grade 5-deep or severe wound infection with or without tissue breakdown or haematoma requiring aspiration

Table 2: 3 Dose regimen

Type of surgery	Number (%)	Infection (%)	Southampton grading	Total diabetic	Infection rate among diabetics	Type of anesthesia
Clean	62 (77.5%)	5 (8.06%)	GRADE 2 - 3 (60%) GRADE 4 - 2 (40%)	7	1 (14.2%)	GA - 25 SA - 23 LA - 14
Clean Contaminated	18 (22.5%)	0	0	0	0	SA - 15 GA - 3
Total	80	5	GRADE 2 - 3 (60%) GRADE 4 - 2 (40%)	7	1	SA - 38 GA - 28 LA - 14

Table 3: Duration of surgery by type of surgery (group B)

Type of Surgery	Mean Duration	SD	95% C.I.
Clean	72.74	48.15	60.51-84.97
Clean Contaminated	48.88	24.10	36.90-60.96

t(78)-2.02, p=0.04, significant

Table 4: Single dose regimen

Type of Surgery	Number (%)	Infection (%)	Southampton Grading	Total Diabetic	Infection Rate among Diabetics	Type of Anesthesia
Clean	60 (80%)	4 (6.6%)	GRADE 2 - 2 (50%) GRADE 4 - 2 (50%)	4	0	GA - 32 SA - 16 LA - 12
Clean Contaminated	15 (20%)	0	0	0	0	SA - 14 GA - 1
Total	75	4	GRADE 2 - 2 (50%) GRADE 4 - 2 (50%)	4	0	GA - 33 SA - 30 LA - 12

Table 5: Duration of surgery by type of surgery (group A)

Type of Surgery	Mean Duration	SD	95% C.I.
Clean	68.46	62	52.46-84.46
Clean Contaminated	40.33	26.28	25.81-54.85

t(73) - 1.73, p-0.09, not significant

Table 6: Infection rates (3 dose VS single dose regimen)

Antibiotic	Rate	Proportion
3 Dose Regimen	5	6.25%
Single Dose Regimen	4	5.33%

Table 7: Duration of surgery by antibiotic prophylaxis

Antibiotic	Mean Duration	95% C.I.
3 Dose Regimen	67.37	57.39-77.35
Single Dose Regimen	62.8	49.56-76.04

t(153) - 0.55, p-0.58, not significant

Table 8: Comparison of infection rates with other studies

		Sami et al ³	Surahio et al ¹	Present study
Group A	Clean	10.7 %	4.54 %	6.66 %
	Clean Contaminated	13.9%	3.33%	0
Group B	Clean		7.77 %	8.06 %
	Clean Contaminated		8.18 %	0

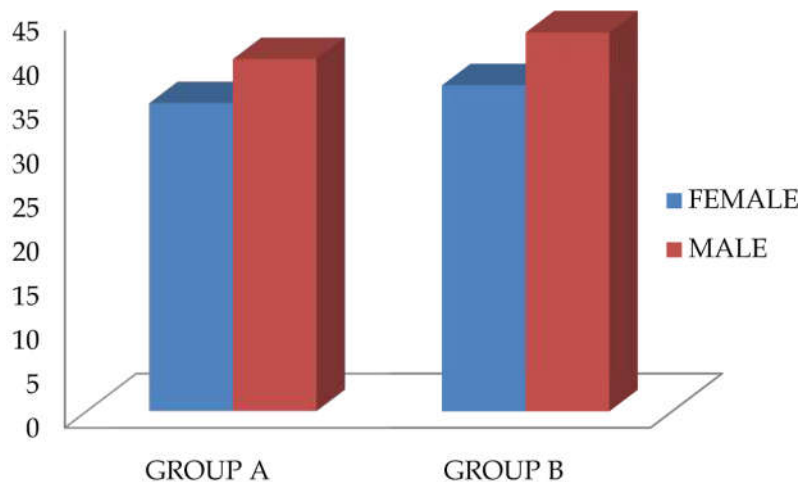


Chart 1: Patients enrolled in the study

patients with surgical site infection based on culture sensitivity. 18 patients were in the clean contaminated category of group B. there was no infection reported in this category (Table 2). The mean duration of surgical time was seen to be higher with 3 dose regimen (67.37 min) as compared to single dose (62.8 min) though the difference was not statistically significant (Table 7).

The highest incidence of infection in both groups was for trendelenburg surgery. no infection was noted for thyroidectomy in both groups. The overall proportion of infection in our study was higher with group B (6.25%) as compared to single dose (5.33%) (Table 6).

The cost of antibiotic in the group A patients was Rs 257 for clean case and Rs 270 for the clean contaminated cases whereas the cost of antibiotic in group B patients was Rs 771 in clean cases and Rs 810 for clean contaminated cases.

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