ORIGINAL ARTICLE

ROLE OF PROPHYLACTIC ANTIBIOTICS IN CLEAN SURGERY

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Background: In general surgery postoperative wound infection is one of the expensive and underrated causes of patient morbidity and the advantages of using prophylactic antibiotics have not been proven. In this study use of prophylactic antibiotics was compared in terms of decreasing postoperative wound infection in clean cases of general surgery. **Methods:** This study was conducted at Abbas Institute of Medical Sciences (AIMS) Muzaffarabad, from July 2016 to January 2017. The study was approved by Ethical Committee of AIMS. The study involved one hundred patients. Sample size was calculated with WHO sample size estimator to be 93, and was rounded to 100 patients. For patient selection, convenience sampling method was used. All these patients went through clean general surgery operations. These patients were randomly placed in two groups, A and B with fifty patients in each group. All patients gave written informed consent. Injection cephradine (1st generation cephalosporin) 1 g IV 30 minutes prior to operation was administered and continued for 24 hours postoperatively in Group A. On the other hand patients of group B received no antibiotics. **Result:** In Group A, one patient (2%) and in Group-B, three patients (6%) were found to have wound infection after surgery. According to Chi-square test this low frequency (1/50 *vs* 3/50) as compared between Group A and B respectively about postoperative wound infection was not statistically significant. **Conclusion:** Usage of prophylactic antibiotics in clean general surgery is not significantly associated with decreasing the incidence of wound infection after surgery.

Keywords: Clean general surgery, wound infection, antibiotics

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INTRODUCTION

Antibiotics have a great role in the prevention of surgical site infection (SSI) in general surgery. Antibiotic (antimicrobial) prophylaxis refers to a brief course of an antimicrobial agent administered just before an operation begins in order to reduce intraoperative microbial contamination to a level that will not overwhelm host defences and result in infection.[1] Proper use of prophylactic antibiotics reduces the SSI and drug resistance incidence. It is important to share microbiological data and give education to reduce the antibiotic use and to establish a better and rational antibiotic consumption.[2]

Surgical site infections are grouped into incisional and organ/space. Incisional SSI include superficial incisional SSI involving only skin and subcutaneous tissue and deep incisional SSI involving deeper soft tissues of the incision. Organ/space SSI are those which can involve any organ or space of the body other than incised body wall layers, that was opened or manipulated during an operation like infection, abscess, peritonitis, etc.[3] Clean surgery is the one in which no inflammation is encountered and the respiratory, alimentary or genitourinary tracts are not entered. There is no break in aseptic operating theatre technique.[4] According to the Cruse statistics, wound infection incidence was about 1% in clean operative procedure.[5] Two to five percent of patients having clean extra-abdominal operations and 20% having intra-abdominal operations develop SSI.[6] Nowadays peri-operative prophylactic antibiotics are very commonly used in clean operative procedures. The beneficial role of antimicrobial prophylaxis in the prevention of SSIs was established in the 1960s and since then it is being highlighted again and again.[7] The use of antimicrobial agents to prevent surgical infection has become a subject of controversy and disappointment in clinical practice. Despite advances in surgical science, infection still remains responsible for most of the postoperative morbidity and mortality.[8]

The basic surgical skills of preoperative preparation, excellent surgical technique, and fastidious wound care and postoperative management are corner-stones of infection prophylaxis.[9]

Antibiotics for prolonged period may be harmful to both individual and hospital economy whether they are given as prophylaxis or for therapy. This study was design to see the prophylactic role of preoperative antibiotic cover. Results of this study will serve as evidence for developing principles for the use of prophylactic antibiotics in clean elective general surgery cases.

METHODOLOGY

It was an interventional study conducted at Surgical Department of AIMS, Muzaffarabad from July 2016 to January 2017. The study was approved by Ethical Committee of AIMS. Convenient sampling technique was used. Sample size was calculated using WHO

sample size estimator. Assuming anticipated population at 50% with 10% of required precision and with 95% confidence interval the sample size was calculated to be 93. Sample was rounded to 100 patients undergoing clean elective general surgery operations at AIMS Muzaffarabad. Written informed consent was taken from all patients in the study. These patients were divided randomly into two groups (Group A and Group B) with 50 cases in each group at the time of operation. In Group A, injection cephradine (cephalosporin) 1 g IV was administered 30 minutes prior to operation and up to 24 hours postoperatively. On the other hand, patients in group B received no antibiotics. Selection of antibiotic was based on its broad spectrum coverage, effectiveness, safety and cost.[5]

Patients with following criteria were not included in the study:

- Patients younger than one year and older than 70 years
- Breach in aseptic technique (cases not done in elective theatres)
- Patients who are allergic to cephalosporins
- Patients with recent antibiotic therapy
- Patients having other co-morbid conditions like anaemia, jaundice, diabetes mellitus and uraemia
- Immunocompromised patients
- Patients who received blood transfusion prior to operation
- Individuals who already had some kind of infective focus in the body
- Duration of operations was more than two hours

For all these clean elective surgical procedures, World Health Organization guidelines for cleaning, disinfection and sterilization were strictly followed.[10]

Patients undergoing clean elective surgeries for excision of cysts, lipoma, lymph nodes and thyroid nodules, breast lump excision biopsy, trendelenburg and stab evulsion for varicose veins, low ligation and jubilee repair for varicocele and hydrocele, herniotomies and herniorrhaphies for hernia were included in the study. Data was analyzed using SPSS-21. The breakdown of operations in the two groups is depicted in Table-1.

Table-1: Distribution of diseases in operated cases

Operated Cases	Group A n=50	Group B n=50	Total 100
Excision of lymph nodes, cysts, thyroid nodules in Head & Neck	15	13	28
Breast lump excision biopsy	10	10	20
Surgery for varicose veins and lipoma excision on limbs	10	8	18
Low ligation for varicocele and jubilee for hydrocele	5	5	10
Herniotomies and herniorrhaphies for hernia	10	14	24

RESULTS

One hundred cases were grouped into group A and B having 50 cases each. In Group A (experimental group), age range was 1–63 years with mean age 35.60±16.17 years. In Group B (control group), the age range was 2–63 years with means age 36.94±15.78 years (Table–2). Most of the patients in both groups were male with male to female ratio 1.5:1 in Group A and 2.3:1 in Group B.

In Group A (with prophylactic antibiotics) 1 (2%) patient had postoperative wound infection, observed on 5th postoperative day whereas 3 (6%) patients in Group B (no prophylaxis) had postoperative wound infection observed on 4th postoperative day in 2 patients and on 6th postoperative day in 3rd patient (Table-3). According to Chi-square test this low frequency (1/50 *vs* 3/50) on comparison between Group A and B respectively about postoperative wound infection was not statistically significant.

Culture and sensitivity of pus from infected wound showed *Staphylococcus aureus* in 50% cases while *Escherichia coli* and *Pseudomonas aeruginosa* in 25% cases each (Table-4).

Table-2: Age distribution of the patients

Age in Years	Group A (n=50)	Group B (n=50)
1–10	4 (8%)	5 (10%)
11–20	5 (10%)	6 (12%)
21–30	11 (22%)	10 (20%)
31–40	12 (24%)	11 (22%)
41–50	9 (18%)	10 (20%)
51–60	6 (12%)	5 (10%)
60–63	3 (6%)	3 (6%)

Table-3: Postoperative wound infection

Wound infection	Group A	Group B	Total
Yes	1 (2%)	3 (6%)	4 (4%)
No	49 (98%)	47 (94%)	96 (96%)

Table-4: Organisms from surgical site infection

Organism	No	Percentage
Staphylococcus Aureus	2	50
Escherichia Coli	1	25
Pseudomonas aeruginosa	1	25

DISCUSSION

Clean surgery involves procedures where strict sterile technique is used and there is no surgical involvement of GIT, respiratory and genitor-urinary tracts.[11] There are several factors, which affect the frequency of postoperative wound infection.[7,12] Four main sources of infection are personnel, equipment used, the environment and patient's risk factors.[13] A surgeon's role is to prevent or reduce the risk of postoperative wound infection by controlling the factors involved in the development of postoperative wound infection.[14] Use of prophylactic antibiotics is no alternative for good surgical practice including strict aseptic technique.[15]

Under most circumstances antimicrobial prophylaxis is not required in a clean surgical procedure. However, prophylaxis should be considered in those situations where potential risk of infections is present such as in:

1. Implantation of a synthetic biomaterial device or prosthesis.
2. Clean surgeries in patients with compromised host defences.

3. Procedures in which infection would be disastrous, e.g., prosthesis placements, central nervous system operations, or cardiac procedures that use cardiopulmonary bypass.[7,12]

In clean surgeries like those involving body surface areas in the head, neck, trunk and limbs, inguinal herniorrhaphies, thyroid nodule resection, excision of benign breast lumps etc., prophylactic antibiotics are largely unnecessary.[5] On the other hand, where long duration is required for clean major surgery and they are invasive and patients have high risk factors of infection, prophylactic antibiotics are recommended.

Infection in a clean operation is always caused by exogenous bacteria, e.g., exogenous contact from breach in sterile technique by the operating team.[3] Patients with any breach in aseptic technique and with any risk factor for wound infection secondary to any other illness had been excluded from this study so they did not affect our study results.

In literature 1.5 and 4% wound infection rate is reported for clean wounds[7,16] which is nearly similar to that of our study, i.e., 2% and 6% with and without prophylactic antibiotics respectively. This 2% infection rate in Group A as compared to 6% in group B is not statistically significant so there is no beneficial role of prophylactic antibiotics in clean general surgery cases which is in accordance with most of the studies conducted in Pakistan[11, 14] and abroad[17].

It is, therefore, advisable that before the use of prophylactic antibiotics, both beneficial and harmful effects should be considered especially in case of clean elective surgery. Judicious use of prophylactic antibiotics in these cases should be checked as it can result in antibiotic resistance, severe hypersensitivity reactions and undermining the sign and symptoms of infection.

CONCLUSION

Usage of prophylactic antibiotics in clean general surgery is not significantly associated with decreasing the incidence of wound infection after surgery. Role of antibiotic in surgery is just like a double edged sword. If the antibiotics are properly used, this can prevent postoperative infection and also reduces the cost of treatment. Improper usage of antibiotics, on the other hand, not only leads to drug resistance but also wastage of resources.

RECOMMENDATIONS

For the usage of prophylactic antibiotics, the guiding principles are not very strict and different treatment regimes do not involve these principles for every type of surgery. As a result the ratios of an inappropriate antibiotic usage and the antibiotic consumption are very high. It is need of the hour to establish treatment plan for prophylactic use of antibiotics with the help of Department of Microbiology and Surgery that should be according to the 'guiding principles for clinical application of antibiotics', in order to standardize the application of prophylactic antibiotics.

REFERENCES

1. National Nosocomial Infections Surveillance (NNIS) report, data summary from October 1986–April 1996, issued May 1996. A report from the National Nosocomial Infections Surveillance (NNIS) System. Am J Infect Control 1996;24:380–8.
2. Evirgen O, Onlen Y, Ertan O. The intensity of antibiotic usage in the university hospital and the investigation of an inappropriate use of antibiotics. Bratisl Lek Listy 2011;112(10):595–8.
3. Qvist G. Himterian Oration, 1979. Some controversial aspects of Ohn Hunter's life and work. Ann R Coll Surg Engl 1979;61(4):309–11.
4. Zinn JL. Surgical wound classification: communication is needed for accuracy. AORN J 2012;95(2):274–8. doi: 10.1016/j.aorn.2011.10.013
5. Surgery Branch of Chinese Academy of Medical Sciences, Editorial Board of Chinese Journal of Surgery. Guideline for use of Antibiotic Perioperative Prophylaxis. Chin J Surg 2006;44(23):1594–6.
6. Auerbach AD. Prevention surgical site infections. In: Shozania KG, Duncan BW, McDonald KM, *et al*. (Eds). Making health care safer: a critical analysis of patient safety practices. Evidence Report/Technology Assessment 43. AHRQ Publication 01-EO58. Rockville, MD: Agency for Healthcare Research Quality; 2001.p. 221–4.
7. Polk HC Jr, Lopez-Major JF. Postoperative wound infection: a prospective study of determinant factors and prevention. Surgery 1969;66:97–103.
8. Astagneau P, Rioux C, Golliot F, Brücker G; INCISO Network Study Group. Morbidity and mortality associated with surgical site infections: results from the 1997–1999 INCISO surveillance. J Hosp Infect 2001;48(4):267–74.
9. Shah JB. The History of Wound Care. J Am Col Certif Wound Speci 2011;3(3):65–66.
10. Rutala WA, Weber DJ. Disinfection and sterilization in health care facilities: What clinicians need to know. Clin Infect Dis 2004;39:702–9.
11. Damani NN, Ahmed MU. Prevention of surgical wound infection. Ann Abbasi Shaheed Hosp Karachi Med Dent Coll 1999;4:131–2.
12. Bhatti HA, Shahid A, Ahmad I, Qureshi AI. Role of antibiotic prophylaxis in clean surgery. Pak Postgrad Med J 2000;11:87–8.
13. Schaberg DR, Resistant gram-positive organisms. Ann Emerg Med 1994;24(3):462–4.
14. Obaidullah, Sabir S. Clinical audit of antibiotic use and infection rate in a plastic surgery unit. J Coll Physicians Sur Pak 2001;11:103–5.
15. Howard RJ. Surgical infections. In: Schwartz SI, Shires GT, Spencer FC, Daly JM, Fischer JE, Galloway AC, (Eds). Principles of Surgery. (7th ed). New York: McGraw-Hill; 1999.p. 123–37.
16. Leaper DJ. Wound infection. In: Russell RC, Williams NS, Bulstrode CJ, (Eds). Bailey and Love's Short Practice of Surgery. 23rd ed. London: Arnold; 2000.p. 87–98.
17. Charles VM, Russel RCG, Williams NS. (Eds). Bailey and Love's Short Practice of Surgery. Bailey and Love: The practical 22nd ed. London: Chapman and Hall; 1995.p. 63–4.

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