



RESEARCH ARTICLE

ROLE OF PROPHYLACTIC ANTIBIOTICS IN CLEAN AND CLEAN CONTAMINATED OPERATIONS-  
HOSPITAL BASED CROSS SECTIONAL STUDY

\*Ravi Kumar, H., Sai Kalyan Gupta. Achuta and Chandrasekhar, D.

Vydehi Institute of Medical Sciences and Research Centre

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ABSTRACT

**Introduction:** Prophylactic administration of antibiotics can be used to avoid surgical site infections, which are the primary cause of morbidity and mortality in patients. In spite of modern standards of preoperative preparation and refinements in anaesthetic and operative techniques, postoperative wound infections remain a serious problem.

**Objective:**

- To evaluate the incidence of surgical site infections following clean and clean contaminated operations.
- To identify the common organisms detected in above scenario.
- To identify the risk factors for postoperative wound infections.
- To study the clinical profile of patients with clean and clean contaminated operation scenario.

**Methods:** It is a hospital based cross sectional study of 200 patients tertiary care hospital over a period of one year and seven months from June 2015 to December 2016. Risk factors and post-operative wound infection rate was analyzed.

**Results:** Out of 200 cases 14 cases got infected in both clean 12 (6.6%) patients and clean-contaminated 2 (11.11%) patients. In our study, out of 14 cases, infected 4 patients had no associated risk factors.

**Conclusion:** Single dose of Cephalosporins can be used in clean operations and single dose of Cephalosporins and Metronidazole can be used for clean contaminated operations.

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INTRODUCTION

Infection of a wound is defined as invasion of organisms through tissues following a breakdown of local and systemic host defenses. The objective of preoperative prophylaxis is to prevent post-operative infections, which are the primary cause of morbidity and mortality in patients undergoing surgery. One can't predict with certainty when bacterial contamination at the operative site will occur during surgery. Further it has been suggested that a period of highest risk may actually be at the end rather than beginning of the operation. Therefore the effect of anti-microbial prophylaxis ideally should also cover peri-operative period of risk (Cameron, 1994) and the selection of an appropriate antimicrobial agent depends on the identification of the most likely pathogens that are associated with specific surgical operation. The prophylactic use of antibiotics for surgical procedures has become a standard practice. To achieve this aim, a great variety of antibiotics are currently administered before or during the operation.

\*Corresponding author: Dr. Saikalyan Gupta. Achuta,  
Vydehi Institute of Medical Sciences and Research Centre.

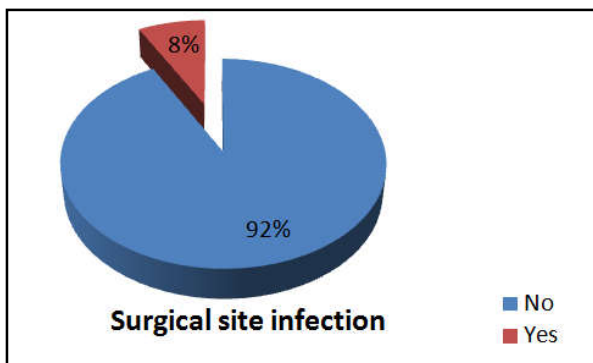
Operation can be classified according to the likely risk of infection (Nichols, 1993; Geroulanos, 1991 and Paluzzi, 1977). Clean' operations do not involve incision of the gastro-intestinal tract and are usually associated with wound infection rates of 1-5%, 'Clean -contaminated or 'potentially-contaminated operations are those that involve incisions of the gastro-intestinal, respiratory or genitor-urinary but without gross spillage of the contents and have risk of infection of 10%. Contaminated' operations generally involve serious spillage and are especially associated with colorectal surgery. 'Dirty' operations are those in which there is pre-existing infection or perforated viscera. These contaminated or dirty operations have infection rate of 20-70%. Other surgical factors influencing the incidence of postoperative infections include the efficiency of preoperative preparation, the duration of operation, surgical technique, the requirement of catheters or drains, and many others (Nichols, 1993 and Geroulanos, 1991). Different patients have different risks of postoperative infection for the same operations. Major risk factors include advanced age, obesity, coexisting disease, poor nutrition, and concomitant medication, especially by immunosuppressants (Geroulanos, 1991). Postoperative wound infections cause delayed healing.

## MATERIALS AND METHODS

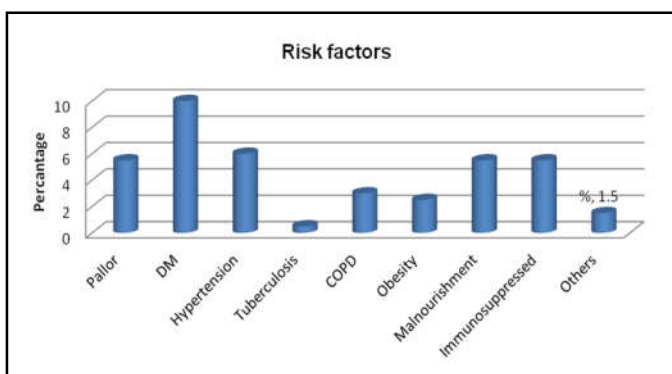
In this study 200 patients were taken (from Vydehi institute of medical sciences and research center) from June 2015 to December 2016. It's a hospital based cross sectional study. Prophylactic administration of drugs intravenously for clean operations were with inj. Ceftriaxone, clean-contaminated operations with ceftriaxone and metronidazole. Age of the patients range from 14-80 years. Information regarding antimicrobials prescribed, name of antibiotics, duration of prophylactic administration of drug, indications for which patients underwent surgery and incidence of postoperative infection were recorded in a data collection form. Variables recorded in the study were – age of the patient, gender, risk factors, diagnosis, duration of hospital stay, comorbidities, microbial organism grown in culture with a necessary laboratory support. All analysis was done using the statistical package for social science (SPSS) software for windows. After surgery each patient was followed up to check any sign of infection till discharge.

## RESULTS

In our study included 200 cases, which included clean - 182 patients, clean contaminated – 18 patients. 14 cases got infected. Out of clean 12 (6.6%) patients and clean-contaminated 2 (11.11%) patients. In our study, out of 14 cases, infected 4 patients had no associated risk factors and patients with risk factors appear to gain a greater protective effect from surgical prophylaxis.



Risk factors were noted Pallor 5.5%, Diabetic Mellitus 10%, Hypertension 6.0%, Tuberculosis 0.5%, COPD 3%, Obesity 2.5%, Malnourishment 5.5%, Immunosuppressed 5.5%, others like IHD and epilepsy 1.5%. In our study febrile morbidity was 10%.



The P value 0.002 was significant for both clean and clean contaminated operations and calculated by Chi square test.

Organisms isolated from clean operation wounds includes Klebsiella, MRSA, Pseudomonas Aeruginosa, *S.aureus*, Coagulase Negative *Staphylococcus*, *Enterococcus*, E Coli, MRCONS, MRSA. Organisms was isolated from clean-contaminated operation wounds included *Staphylococcus aureus*, Klebsiella.

## DISCUSSION

Post-Operative infection is a common complication associated with surgical procedures. The first prospective controlled trial sought to find an answer to the question of postoperative duration of antibiotic prophylaxis was published in 1977. A single preoperative dose of Ceftriaxone versus a regimen of Ceftriaxone given for a period of five postoperative days was tested. The infection rate with a single dose was 3% and with multiple five day-dosing, 5%. Although no significant difference could be shown by statistical evaluation, the slight numerical difference in favor of the single dose seen in this study was found in many subsequent studies that tested the same hypothesis for various indications. A recent multicenter surgical study found 565 infective episodes in 11,363 patients. Incidence of surgical site infection 5% is taken as historical control, as against 7% in our study. Observation might be of particular importance to patients with specific risk factors such as Malnutrition, Diabetes, COPD, Obesity and Tuberculosis who appear to gain a greater protective effect from prophylaxis. Single antibiotic agent or combination should be relied on for effective prophylaxis for all operations. The antibiotic should be chosen primarily based on their efficacy against exogenous and endogenous microorganisms known to cause infectious complications, as well as safety profile and cause. Common infective microorganisms in our study were *Staphylococcus aureus*, *Pseudomonas aeruginosa* and Methicillin resistant *Staphylococcus aureus* in clean operations, *Staphylococcus aureus* and *Klebsiella* were commonest in clean contaminated operations. Worldwide, Cephalosporins are the most widely used antibiotics for surgical prophylaxis. Recently increased number of these infections had been reported due to *Staphylococcus epidermidis*, an organism which has significant degree of resistance. For this reason, Cephalosporins, which exhibit good activity against most of the organisms commonly causing postoperative sepsis in these patients, now appears to be the drug of choice. The effective use of prophylactic antibiotics depends to a great extent to appropriate timing of their administration. Current recommendations are that parenteral prophylactic antibiotic used should be given in a sufficient dosage within 30-60 minutes preceding incision.<sup>6</sup> Evidence from clinical trials is mounting that a single preoperative dose of antibiotic has the same efficacy as multiple doses of prophylaxis and it is recommended that another dose be given in operations lasting more than 3 hours.

In the present study, Cefazolin 1gm (1<sup>st</sup> generation cephalosporin) in clean operations and Cefazolin and Metronidazole in clean-contaminated operations was given 30-60minutes prior to induction of anesthesia, intravenous administration is currently preferred for most of the patients undergoing surgical procedures. The pharmacokinetics of each antibiotic agent largely determined the time in which efficacious levels in serum are attained. Therapeutic tissue levels of antibiotics are more rapidly achieved by intravenous infusion or intramuscular bolus. In previous five studies conducted by Wittman. *et al.*, the infection rate in 210 patients who received

cefotaxime pre-operatively was 6.2% (Wittmann, 1991). In the present study, who underwent clean operations 181 patients received single dose of Ceftriaxone 30-60minutes preoperatively and the infection rate was 6.6%. One patient received Ceftriaxone and Azithromycin. The infective rate in clean-contaminated operations was 11.1% and 18 patients received Ceftriaxone and Metronidazole as a single dose 30-60minutes preoperatively. In the present study of clean operations Trendlenberg surgery 1, modified radical Mastectomy 1, Webster's procedure 1, Umbilical hernia 2, Inguinal hernia 2, Lipoma excision 2, Incisional hernia 2 had surgical site infections. Incisional hernia repair, (1) patient had infection at drain site. The P value was 0.042, significant.

- In, open cholecystectomy (1) and open appendicectomy (1) both got infected.
- In the study by Agarwal, febrile morbidity was 10%. Our study showed similar febrile morbidity at 10%.
- Study conducted by Agarwal, wound infection rate was 2.22% in clean and clean contaminated operations is 10%. In our study, the wound infection rate was 6.6% and 11.11% in clean and clean contaminated operations respectively.

Antibiotic prophylaxis is not recommended in clean operations unless prosthesis is inserted during the operation or the patient is immunosuppressed or has impaired host defense mechanisms from another cause. One of the major reasons for not recommending antibiotic prophylaxis in clean operations has been the inability to demonstrate a benefit of prophylaxis due to the low rates of infection (<4%) which are thought to characterize clean operations (Wittman, 1985). Recent reports (Wittman, 1990; Garcia-Rodriguez, 1989 and Wittmann, 1999), however, document that for selected clean operations, the infection risk may be higher than what has been assumed and that antibiotic prophylaxis may be of benefit. Low infection rate in clean operations was best obtained by strict adherence to aseptic methods.

An effective and thoughtful prophylactic regimen is no substitute for exquisite surgical technique and competent post-surgical management. Other factors, which help to keep infection rate minimum, are short preoperative hospital stay, avoiding of shaving the part until before the operation, pre-operative bath, minimizing the duration of operation. However, presence of any foreign body (prosthesis) disables the wound healing. Drains have been shown to faster the development of the wound infection in an animal model. Drains placed after abdominal procedures, frequently grow skin flora from interior of the drain, where it is removed (Nora, 1989). 1 out of 4 got infected in clean operations, where close drainage tube was placed. Total number of the patients who had placement of drainage tube was 26. 1 out of 2 got infected in clean-contaminated operations with closed drainage tube. Total number of the patients who had drainage tube was 4. Thus the placement of the drainage tube has definite increasing incidence of wound infection. Prophylactic antibiotic use is not without cost. However, short courses of antibiotics have been shown to be cost effective, even when risk of infection is less than 3%.

## Summary

Prophylactic antibiotics are indicated in all clean-contaminated and many clean procedures, especially in view of the low surgical site infection with Ceftriaxone. They are best administered immediately before operation in a manner that ensures maximum tissue level at the time of incision and should target pathogens commonly associated with the specific operation undertaken. Therapeutic tissue concentrations should be maintained throughout the period of potential bacterial contamination but not beyond 24 hours after surgery. This study was undertaken, to evaluate wound infection rate in elective surgical procedures and to identify causative organism and antibiotic sensitivity pattern and also to evaluate cost effectiveness of single dose antibiotic prophylaxis. Cephalosporins are most commonly used antibiotics for surgical prophylaxis. 1.0 gm of Ceftriaxone for clean operations and 1.0 gm of Ceftriaxone plus 500mg of Metronidazole were used for clean-contaminated operations. Usage of multiple dosage of drugs can cause development of resistant microorganisms and can not be recommended.

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