

## Timing, choice and duration of perioperative prophylactic antibiotic use in surgery: A teaching hospital based experience from Eritrea, in 2009

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### Abstract

**Background:** The continuum from surgically clean, through antiseptic techniques to the use of perioperative antibiotic prophylaxis has revolutionized surgical practice and significantly reduced morbidity. Adherence to use of prophylactic antibiotic guidelines varies in different set ups and different diseases.

**Objective:** To document the practice of perioperative prophylactic antibiotic use in a teaching hospital in Eritrea

**Methods:** This is a prospective study conducted in 2009 in Halibet Hospital, Asmara, Eritrea

**Results:** One hundred and one patients were enrolled in the study. Sixty nine percent received prophylactic antibiotics. Of these, 30% were preoperatively and 39% postoperatively. Twenty one percent the majority of whom were in the clean/contaminated group did not receive the required prophylaxis. The surgery site infection rate was 6% mostly from emergency operations recognized during the period of hospitalization.

**Discussion and conclusion:** The use of prophylactic antibiotics in Halibet Hospital needs to be standardized and monitored based on evidence and international benchmarks.

## Introduction

The introduction of antiseptic techniques to prevent and combat surgical site infections dates back to the prehistoric times although most of the credit is given to Joseph Lister<sup>1-3</sup>. Surgical wounds can be classified into four distinct categories namely; clean, clean and contaminated, contaminated and dirty based on the level of risk exposure of microbial contamination<sup>2,4,5</sup>.

The continuum of preventive measures against surgical site infection from cleanliness, antiseptic techniques to application of antibiotic prophylaxis varies according to prevailing international guidelines guided by evidence based meta-analytical studies<sup>6</sup>.

The choice, timing and duration of antimicrobial perioperative prophylaxis is diverse not just the procedure but also individual surgeons preferences<sup>7-8</sup>. Although guidelines have been set for specific surgical procedures universal practice has not always been forthcoming.

The improvements made in morbidity and mortality made from wide spread use of prophylactic antibiotics has drawn some caution from observation of increased cost and antimicrobial resistance. The uncontrolled use of these agents coupled with increased resistance has led to situations where there are no suitable drugs to combat serious infections. The issue of cost effectiveness and efficacy has also been raised<sup>9</sup>. In cases of deep or extensive infection this resulted in a mortality rate of 70-80%. Since then a number of significant developments, particularly in the field of microbiology, have made surgery safer. However, the overall incidence of healthcare associated infections remains high and represents a substantial burden of disease<sup>10</sup>.

Surgical site infections are commonest hospital

acquired infections. The overall infection rate is around 2-5% for extra abdominal surgeries and about 20% for intra abdominal injuries but varies from surgeon to surgeon, hospital to hospital, one procedure to another and even from one patient to another patient<sup>11</sup>.

Prevention of surgical site infection remains the basic concern of the surgeon and prophylactic antibiotics are frequently used to prevent these potential infections. Apart from antibiotic prophylaxis good homeostasis, minimal tissue trauma, avoidance of dead space and fluid collection, sterilization of theatre equipments and theatre premises are important factors in minimizing infection.

When appropriate antibiotic prophylaxis is used, the incidence of surgical site infections is between 2 and 5% and the associated mortality is 0.6%. Inadequate prophylaxis leads to an increased incidence of surgical site infections of up to 15%. Studies have shown inappropriate antibiotic prophylaxis, hyperglycemia, preoperative condition, wound classification and duration of the operation to be independent risk factors for such infections<sup>12</sup>.

The etiology of surgical site infections is dependent on the location of the surgery, the bacterial load in the tissue or blood perioperatively and the integrity of host defenses. Adequate prevention of such infections is important because they are associated with increased mortality and hospital costs of up to tenfold. Inappropriate use of antibiotics (including over prescription and the unnecessary use of broad-spectrum antibiotics) can also lead to increased bacterial resistance<sup>10</sup>. A sound and restrictive policy minimizes antibiotic resistance, prevents surgical site infections and is cost-effective<sup>7,11</sup>. Therefore, judicious use of prophylactic antibiotic is essential.

This study was carried out to assess the incidence of wound infections after using prophylactic antibiotics without changing other parameters.

### Methodology

**Study setting:** The study site was a 30 bed general surgical unit within a 210-bed general Halibet Teaching Hospital in Asmara from January 13 to March 19, 2009. The site was selected because the first author was a staff member but also because the hospital is an influential teaching institution. The residents and interns had responsibility for antibiotic prescriptions while senior surgeon supervised the prescriptions.

Information was completed for each patient. age, sex, date of admission, diagnosis, co-morbid conditions, remote site infections, date of operation, type of operation, length of operation, antibiotic therapies, duration and type of therapy, specimens submitted for testing, results of investigations, wound condition and date of discharge were prospectively recorded on a questionnaire paper form. After discharge, all prospectively collected data were verified and completed by chart review.

The operation theatre conditions including the hand washing conditions, technique of sterilization of equipments and traffic were kept as they were before the study.

### Measurements

During the study period, eligible patients took antibiotics as the developed protocol (see annex 1) and patients were evaluated on a daily basis for any surgical site infection until discharge. Follow up was given for all patients included in the study. The follow up was divided into two, the first was early follow up, which is 3<sup>rd</sup> to 5<sup>th</sup> days after discharge; for those patients with post operative hospital stay less than 7 days and patients with some signs of infection during discharge. The second was a delayed follow up which is two weeks to one month after discharge. During follow up patients were checked for any signs of surgical site infection.

### Eligibility criteria

All persons of any age and sex undergoing surgery in the departments of general surgery of Halibet Hospital were eligible for inclusion into the study. We excluded patients with

### Results

One hundred one cases were studied. The majority of procedures were carried out on men 82 (81.2%) and the mean age was 29 years (standard deviation 18 years). Most patients were from Zoba Maekel 82 (81.2%), followed by Zoba Debub 15 (14.9%), and 4(3.9%) from the rest zobas. The most frequent operation was repair of various hernias, 19.8% and transvesical prostatectomy 19%. The most frequent operations were carried out between 60-75 years (31%) and next common age group was between 31-45 years, (19.8%) (Table1).

Type of disease	No of case	Type of disease	No of case
Benign prostate hypertrophy	20	Sigmoid valvulus	2
Hernias (inguinal & incisional)	20	Renal stone	2
Goiter	9	Ureteric stone	2
Undescended testis	7	Varicose vein	2
Hydrocele	6	Achalasia	1
Hemorrhoids	5	Appendicitis	1
Peritonitis	4	Breast mass	1
Perianal fistula	3	Gallbladder tumor	1
Colostomy closure	3	Sarcoma	1
Cholelithiasis	3	Small bowel lymphoma	1
Redundant sigmoid colon	3	Testicular mass	1
Gastric outlet obstructions	2	Varicocele	1

The average length of hospital stay was higher on clean-contaminated cases, 12 days.

Of all surgical wounds, 52% were clean (C), 41% were clean contaminated (CK), 6% were dirty (D) and 1% contaminated (K).

Category	C	CK	D	K
Pre operative stay (days)	3	4	1	2
Post operative stay (days)	3.3	8	5.3	5

Thirty patients took preoperative antibiotic prophylaxis while 39 patients took the antibiotics operatively. However 3 cases received preoperative prophylactic antibiotics without indication and all were from the clean wounds. Twenty one patients did not receive the indicated prophylaxis, 15 of them from clean contaminated, 1 from contaminated, and 5 from dirty wounds.

Post operatively 39 patients received short term antibiotics, most of the antibiotics were given only for one day, 26 (66.7%), and only 6 (15.4%) given for 5 to 7 days.

Thirteen patients did not receive the indicated postoperative antibiotics, among them 11cases were from clean contaminated and two from dirty wounds.

Out of the 101 eligible cases the surgical site infections (SSIs) rate was 5.94% (6/101). Of the six SSIs, four of them were emergency procedures. Regarding the detection of infections, four of the SSI cases were identified in the hospital within 5-7 days after operation

and two after discharge but within two weeks of operation. Surgical site infections happened in 1.9% (2) of the clean, 2.09% (3) of clean contaminated and 0.99 % (1) of the dirty wounds.

## Discussion

The study was conducted to determine the pattern of use of prophylactic antibiotics to patients undergoing surgery in a teaching hospital in Eritrea. One hundred and one patients were enrolled in the study. Sixty nine percent received prophylactic antibiotics. Of these, 30% were preoperatively and 39% postoperatively. Twenty one percent the majority of whom were in the clean/contaminated group did not receive the required prophylaxis. The surgery site infection rate was 6% mostly from emergency operations recognized during the period of hospitalization. This study identified a need for adherence to guidelines for prophylactic antibiotic use in surgery.

The presence of SSIs in nearly 6% of cases is relatively although it can be attributed to the emergency nature of the majority of cases<sup>11</sup>. Previous studies have cited poor adherence to guidelines, an observation we also made in our study<sup>7,10</sup>. Early clinical trials in 1950's reported either no benefit or higher infection rate with antibiotic prophylaxis. Experimental studies published during the early 1960s helped clarify many of these problems and resulted in a more scientifically accurate approach to antibiotic prophylaxis. A crucial relationship between timing of antibiotic administration and its prophylactic efficacy was demonstrated in a multi-centre study<sup>13</sup>. This study and others fostered the attitude that to prevent subsequent infections the antibiotic must be in the tissues before or at the time of bacterial contamination.

Prophylactic antibiotics have been documented to be of considerable value in reducing the incidence of wound infection in several areas of surgery. At present, prophylactic antibiotic therapy seems indicated whenever: 1) the consequences of wound infection are uniformly disastrous, even though the occurrence of this sepsis is uncommon; 2) the incidence of wound infection is great, yet seldom does it ever threaten life or limb; and 3) the patient has such an extreme impairment in host defense mechanisms that any infection, no matter how minor, has a propensity for becoming systemic and thereby fatal.

The benefits to be gained from a preventive antibiotic program include reductions in both morbidity and mortality. Additional and certainly the other advantages are a conservation of hospital bed space and the potential for great savings in moneys to be expended for individual patient care.

## Recommendations

The objective of this study was to evaluate the incidence of SSI on patients who received short term

antibiotics and result is encouraging. The study had limitations in sample size, lack of proper follow up and proper communication among the stake holders. We hope this will initiate prospective, randomized, controlled trials to be conducted to improve the system of rational utilization of antibiotics in Eritrea.

It is also to be emphasized that there is a great deal of importance to have a uniform and standard practice of antibiotic administration to be followed by all physicians as there is a practical observation that prolonged courses of antibiotics are used when there is no convincing evidence as to their benefits to surgical patients.

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