Need and duration of antibiotic therapy in Clean and Clean Contaminated Operations

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Abstract

Objective: To define the need and duration of prophylactic antibiotic administration in clean and clean contaminated surgery in the prevailing operating theatre environment in Karachi.
Setting: Surgical Department of Hamdard University Hospital and three other private hospitals in Karachi. Methods: One hundred consecutive patients undergoing elective clean and clean contaminated surgery were recruited from October 2000 to October 2001. Patients were admitted either a day prior to surgery or on the day of surgery, depending on the nature of procedure. Prophylaxis was provided by single dose of antibiotic at induction. The rest of the pre-operative preparation was done in standard way. Patients were discharged home as dictated by the nature of the operation and social circumstances. Wounds were examined for Surgical Site Infection (SSI) on day 4 and day 11. Patients who had post-operative pyrexia or signs of SSI were given extended antibiotic treatment for 5 days or until resolution of infection.
Results: Four out of 8 patients who developed SSI required extended antibiotic treatment.
Conclusion: Single dose prophylactic antibiotic therapy is satisfactory in our surgical environment. This practice would be efficient, cost effective and prevent the emergence of nosocomial infections in a developing country such as Pakistan with extremely limited health care resources (JPMA 52:284;2002).

Introduction

In clean contaminated surgery a single dose of prophylactic antibiotic(s) is sufficient to prevent the occurrence of pen-operative infection[1]. This practice has been well established in the environment where sterilization techniques are optimum[2-6]. The value of techniques such as barrier premises, laminar flow within the operating theatre, separate changing areas for theatre personnel and the minimal traffic of personnel in the theatre during the course of surgery is well recognized[7]. Modem sterilization techniques, including pre-packed instrument sets for individual surgical procedures, the establishment of centralized sterile supply department and infection control teams have all contributed to minimize pen-operative infections. However, despite all these precautions and techniques, the occurrence of this infection has not been abolished completely, with an incidence of 1.2% to 22% even in clean surgical procedures[5,8,9].
Despite all these established facts, there is a great deal of skepticism and reluctance to the use of single dose prophylaxis in clean and clean contaminated surgical operations in Karachi (personal communications). The reasons for this reluctance are: the obvious lack of modem sterilization facilities, lack of understanding of pen-operative infection and no standardized protocol of sterilization techniques amongst theatre personnel. The demands of private practice also dictate very strongly that no chance whatsoever should be taken for any complication particularly infection.
The unnecessary use of antibiotics is, however, a burden on patients' financial resources and the indiscriminate use of antibiotic results in the emergence of resistant strains of organisms responsible for

nosocomial infections[10-15]. This may have drastic consequences in a developing country[16] like ours. It is common knowledge in surgical practice that the sterility of various infusion lines are breached resulting in phlebitis, hub colonization, catheter colonization and catheter related bacteremia[17].
This study was done to establish whether the practice of single dose antibiotic prophylaxis would be feasible in the prevalent surgical environment in Karachi.

Patients and Methods

From 1st October 2000, 100 consecutive patients (excluding those who required minor operations like excision of lipomas, sebaceous cysts and other skin lesions) were recruited. Only patients undergoing elective clean and clean contaminated procedures were included. The definition used for clean and clean contaminated wounds was as follows: A clean wound is an aseptic wound for an operation that does not transect the gastroinetsinal, genitourinary or tracheobronchial system; a clean-contaminated wound is one in which the gastrointestinal or respiratory system is entered without significant spillage. A clean operation with a minor break in sterile technique also comes in this category[18].
Patients were admitted either a day prior to surgery, or on the day of surgery, depending on the nature of the procedure. Prophylaxis was provided by Cefuroxime 1.5gm or Co-Amoxiclav 1.2 gram intravenously at the time of induction. When the procedure involved the GI or urologicál tract, Metronidazole 500 mg or Gentamycin 120 mg were added, as shown in Table 1.

Table 1. Antibiotic prophylaxis.

Antibiotics	No. of patients
Co-Amoxiclav	57
Cefuroxime	30
Co-Amoxiclav and Gentamycin	7
Co-Amoxiclav and Metronidazole	5
Cefuroxime and Gentamycin	1

Ninety-eight patients received single dose of antibiotic(s) and two were given 3 doses.
The surgical site was prepared as per routine standard surgical practice, i.e., shaving, skin preparation with povidone iodine and standard draping procedure to maintain the sterile operating field. Skin closure was achieved by subcuticular prolene sutures (three patients had interrupted prolene sutures). The closed wound was protected by pre-packed sterile dressing (Mepore, Primapore or Primalite). Discharge from the hospital was determined by the nature of the operation. The wound was inspected on days 4 and 11 post-operatively and sutures were removed on the 2nd visit. The persistence of pyrexia for more than 24 hours after surgery or the occurrence of persistent pyrexia (more than 24 hours duration) at any time was taken as an indication of infection and antibiotic therapy was instituted

empirically awaiting the results of bacterial culture and sensitivity from specimens of any wound discharge, urine and sputum. Local signs of cellulitis or significant pain and tenderness at surgical site were regarded as sign of infection and patients were appropriately treated with continuing antibiotics. The patients, nursing, paramedical and ancillary staff were blinded, the primary surgical team i.e. the surgeon and the house officers were not. The study' was started at Hamdard University Hospital and later patients were recruited at PECHS Trauma and General Hospital, Memon Hospital and Mamji Hospital.

Results

Overall 100 patients (53 males and 47 females) were included in the study. The mean age was 37.8 years (range 2-78). Mean Body Mass Index was 23 (range 13.8 - 41.5). Mean Haemoglobin was 11 gm % (range 7.9-14). Twenty five patients had hypertension, twelve were diabetic, nine had various malignancies and twelve had tuberculosis.
Categories of operations included 51 major and 49 intermediate. Sixty four were clean and 36 clean-contaminated. The variety of operations are listed in Table 2.

Table 2. Types of operations.

Clean 64		Clean contaminated 36	
Hernias *	32	Gall bladder ##	21
Breast **	10	Genito Urinary***	7
Genito Urinary #	10	Stomach ###	3
Thyroid	4	Small bowel+	2
Miscellaneous	8	Colon ++	3

Eighty four operations were carried out by the first named author and 16 by the second. Mean duration of operation was 58 minutes (range 15-220). Mean post-operative hospital stay was 2.4 days (range 0-15).

* inguinal 22, incisional 3 and others 7
** mastectomies 3, breast lump excisions 7
# varicoceles 5, hydroceles 3, orchidopexy 1, nephrectomy 1
includes 2 CBD exploration

*** renal stones 5, ureteric stones 2
gastrectomy I, gastroenterstomy 1, gastrostomy 1
+jejunostomy 1, interval appendicectomy 1
++ right hemi-colectomy 1, reversal of Hartmann's 1, left hemicolectomy 1
Four out of 8 patients developed Surgical Site Infection (SSI) and required extended antibiotic treatment. The number of patients and the reasons for continuation of antibiotics are listed in Table 3.

Table 3. Indications of postoperative antibiotic therapy.

Chest infection and pyrexia	2
Wound infection and pyrexia	2
Wound infection without pyrexia	2
UTI and pyrexia	1
No cause found for pyrexia	1

Out of four patients who had wound infection, one developed wound sinus at day 11 (reversal of Hartmann's procedure), second patient developed pain and induration at operation site with pyrexia at day 4 (hernia repair), third patient showed local erythema and cellulitis at day 4 (hernia repair) and the fourth developed purulent discharge on day 8 (right hemicolectomy). The specimen from wound discharge did not grow any organism on culture. In 3 of these patients the co-morbid factors were identified. One had hypertension and obesity, one hypertension only and one patient had pre-existing Crohn's disease. All three were seen and managed in the out-patients department after discharge from the hospital. The fourth patient developed SSI during hospital stay.

Discussion

Post-operative infection is a major cause of morbidity and may even lead to mortality in surgical patients. It also incurs significant expenses on the treatment of each infected patient. In USA, as far back as 1993, it was estimated that post-operative infection added more than $12,000 to the cost of patient-care[2].

With the demands of private practice and the obvious need to reduce post-operative morbidity and expenses, it is not surprising that surgeons in our country wish to take all possible measures to reduce surgical site infections and febrile post-operative complications.

Even though the rate of infection in clean surgical cases is reported to be up to 22%[8,9]. The role of antibiotic treatment in these cases is debatable[19,20]. However the fact that the sterility in our operative environment is frequently breached, even clean surgical procedures here should be classified as clean-contaminated.

Using this premise and the fact that prophylactic antibiotics are of practical significance only if administered in the 2 hour crucial window before incision[2], all our patients received antibiotics in theatre by the anaesthetist at the time of induction of anaesthesia. This protocol ensured crucial aspect of antibiotic prophylaxis and eliminated any chance of error by other members of the team.

Contrary to the locally prevalent belief we found that the widely accepted practice of pre-operative antibiotic prophylaxis can be safely practiced in our compromised surgical environment. Our study shows an SSI rate of 4% which is in the lower range reported in literature[5,8,9]. Surgeons have used various regimes[1,20-23] ranging from single drug (single dose) to combination of antibiotics (multiple doses) even in clean surgery. Our study found that in our surgical environment the single dose regime provided a highly desirable prophylaxis.

It has been reported that surgeon related factors are also important causes of SSI[24-26]. Our study has been carried out by two surgeons and at various sites in the city, with variable operating theatre facilities to avoid the chance of inducing bias as much as possible. It should be easily reproducible by other surgeons in our environment and we believe such a study will help to rationalize the antibiotic regime in clean-contaminated surgery in our country with its beneficial economic consequences and most of all would be a positive step against the emergence of nosocomial infections which are a cause of serious concern worldwide[10,11]. This should be regarded even more seriously in developing countries like ours where the healthcare resources are extremely limited.

We recommend that single dose antibiotics, administered in the optimum way (dosage and timing) should be used in all clean and clean-contaminated cases. This should reduce the cost, infection rate and certainly would help in reducing nosocomial infection in our surgical environment with its inherent health and economic consequences.

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