

Patterns of post operative wound infection and their antibiotic sensitivity in Bir Hospital

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This study conducted in Bir Hospital to find out the nature of organisms responsible for wound infection in post-operative patients and their antibiotic sensitivity has shown that most of the organisms were Gram-negative ones and most of them were sensitive to gentamicin. Even the Gram positive *Staph aureus* was sensitive to this antibiotic. However, most of these organisms were resistant to commonly used ampicillin. This study has also shown that the nails of the persons caring for the patients and instruments used in the theatre particularly the emergency theatre were also responsible for the infection.

INTRODUCTION

This study was carried out in Bir Hospital which is the main referral Centre of the country providing emergency as well as elective surgical service. More than 1000 emergency and 2000 elective surgical operations are performed annually. Wound infection is a major problem amongst the post-operative patients which threatens life, prolongs hospital stay, thereby increasing the demand on nursing care and is responsible for incurring extra expenses.

The aim of this study was to find out the nature of micro-organisms responsible for wound sepsis in patients undergone elective as well as emergency surgery and to see whether or not the commonly used antibiotics were effective against the commonly isolated organisms. Another objective of this study was to establish relationship between the incidence of wound infection and the bacterial flora of

the hands and noses of the persons involved in patient care and the sterility of instruments used during surgical procedures.

MATERIALS AND METHODS

This study was commenced on 1st February 1990 and was continued until 15th November 1990 with a gap of two and half months due to some unavoidable circumstances, thereby covering a total period of seven months. Patients who were admitted in surgical units of Bir Hospital and underwent surgical procedures were included in the study.

Patients' history and clinical data were recorded on a specially prepared form. All post-operative patients who developed pyrexia, pain over the wound, pus discharge or dehiscence of wound were considered for more detailed study. swabs of the discharge from the wounds of operated cases, nasal

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swabs and nail clippings of the doctors, nurses and dressers and swabs from instruments were collected aseptically and transported to Central Health Laboratory in Teku in two media - Stuart's Transport Medium for aerobic and Robertson's Cooked Meat Medium for anaerobic culture. Antibiotic sensitivity was done by Kirby Bover Method (Disc Diffusion method).

RESULTS

During the period of seven months 1071 elective (70.14%) and 456 emergency (29.86%) operations were performed in Bir Hospital amounting to total of 1527 operations.

A total of 100 swabs were collected from the patients who has shown features of wound infection as indicated by pus discharge, pain, pyrexia and wound dehiscence after undergoing some form of surgical procedures. The swabs were submitted for both aerobic and anaerobic cultures and antibiotic sensitivity. Five swabs from drainage sites from the patients suspected of having infection, 25 nasal swabs, 25 nail clippings and 25 instruments swabs were also submitted for culture and sensitivity.

Table 1: Swabs taken for culture

Specimen	No.
Wound swabs	100
Drain swabs	5
Instrument swabs	25
Nasal swabs	25
Nail clippings	25
Total	180

Out of 105 infected cases (wound and drains), 56 (53.3%) had undergone emergency operations and 49 (46.7%) had undergone elective operations thereby making the infection rate of 4.57% in elective and 12.28% in emergency operations.

All the wounds were divided into 4 categories depending upon their degree of contamination which reflect their potential for infection.

- Clean*: If there is no chance of endogenous infection.
- Clean-contaminated*: If a viscus like gall bladder (which is usually sterile) is incised.
- Contaminated*: If a viscus like colon (which contains bacteria) is entered.
- Dirty*: If the wound is exposed to pus or visceral contents known to be infective.

The wound infection following operation on the type of wound is shown in Table 2

Table 2 : Infection rate in types of wounds.

Types of wound	No. (%)
1. Clean wound	17 (16.19%)
2. Clean - contaminated wound	51 (48.57%)
3. Contaminated wound	21 (20%)
4. Dirty wound	16 (15.2%)

The bacterial growth pattern is shown in Table 3

Table 3: Bacterial growth pattern.

Specimen	Number	-ve growth	+ve growth	Single isolate	Mixed isolate
Wound swab	100	10	90	64	26
Drain swab	5	1	4	2	2
Nasal swab	25	-	25	22	3
Nail clipping	25	18	7	6	
Instrument swab	25	18	7	6	1
TOTAL	180	32	148	116	32

Table 4: Bacterial growth pattern in culture specimen

Types of organisms Isolated	Wound swabs	Drain swabs	Nail clippings	Nasal swabs	Instruments swabs	Total
Staph. aureus	16%	1/5(20%)	18/25(72%)	6/25(24%)	1/25(4%)	42
Staph. epidermidis	5%	1/5(20%)	3/25(12%)	19/25(76%)	-	28
Strep. faecalis	2%	-	-	-	3/25	4
Strep. pneumoniae	-	-	-	1/25	-	1
Peptostreptococcus	1%	-	-	-	-	1
Esch. coli	23%	-	-	-	-	28
Pseudomonas	18%	1/5(20%)	-	-	-	19
Klebsiella	10%	1/5(20%)	-	1/25(4%)	-	12
Enterobacter cloacae	11%	-	-	-	-	11
Citrobacter sp.	1%	-	-	-	-	1
Proteus sp.	13%	-	-	1/25(4%)	-	14
Providentia sworti	1%	-	-	-	-	1
Acinetobacter sp.	9%	2/5(40%)	-	-	3/25(12%)	14
Salmonella paratyphi A	-	1/5(20%)	-	-	-	1
Aerobic spore bearing Gram +ve rods	1%	-	-	-	2/25	3
Diphtheroids sp.	-	-	1/25(4%)	-	-	1
Clostridium welchii	1%	-	-	-	-	1
Bacteroids melnogenicus	3%	-	-	-	-	3

By single isolate we mean only one type of organism was isolated from that specimen whereas mixed isolate means more than one organism were isolated from the specimen.

The types and prevalence of organism isolated from the wounds, drains, nail clippings, nasal swabs and instruments swabs are shown in Table 4.

The number of wound infection following operation on various organ system is shown in Table-5

Table 5: Type of operations, which developed wound infection.

Operations	No.
1. Compound fractures	22
2. Skin wounds	18
3. Urinary system	15
4. Genital organ	1
5. Peritonitis	10
6. Gastrointestinal	9
7. Burns	6
8. Biliary tract	4
9. Bed sores	3
10. Vascular	3
11. Thyroid	3
12. Chest wall	3
13. Animal bite	2
14. Hernia	1
Total	100

Majority of the organisms causing wound infection were gram-negative bacteria (75%) of which *E.coli* was found to be the commonest (23%), followed by *Pseudomonas* sp. (18%), *Proteus* sp. (14%), *Enterobacter* sp. (11%) and *Klebsiella* sp. (10%). *E.coli* was isolated from the wounds following operation on the urinary tract, GIT and operation close to the perineum. *Pseudomonas* was isolated from wound following orthopaedic operations. *Proteus*, *Enterobacter cloacae* and *Klebsiella* species were isolated from traumatic wounds following debridement. *Acinetobacter* was isolated from the wounds following surgery of the GIT. *Staphylococcus* was isolated from wounds after surgery in GIT, skin graft, and surface wounds. *Bacteroids* and *Clostridium welchii* were isolated from cases where tissue necrosis was present.

Culture of nail clippings taken from fingers of nurses, doctors and dressers showed growth of *Staph. aureus* (81.8%), *Staph. epidermidis* (13.6%) and *Diphtheroids* (4.5%).

Culture of nasal swab taken from the noses of nurses working in the surgical wards and operation theatres, dressers and doctors showed growth of *Staph. epidermidis* (76%), *Staph. aureus* (24%), *Klebsiella* (4%) and *Strept. pneumoniae* (4%).

Swabs taken for culture from instruments used in the main Operating Room, Emergency Room and Surgical Wards showed growth of organism in 28% - 12% of Operating Theatre instruments and 16% of the instruments used in the Emergency Room and in Surgical Wards.

Regarding the sensitivity of the organisms, 95% of *E.coli*, 77% of *Pseudomonas*, 92% of *Proteus*, 81% of *Enterobacter cloacae* and 70% of *Klebsiella* were found to be sensitive to Gentamicin and less than 10% of the Gram-negative organisms were sensitive to the commonly and empirically used Ampicillin which was used in more than 50% of the operated cases.

Staph. aureus was sensitive to Cloxacillin (85.7%), Gentamicin (85.7%),

Cephalexin (61.9%), Erythromycin (59.5%) and Chloramphenicol (64%). Only 18% of *Staph. aureus* causing wound sepsis was sensitive to Penicillin whereas 61% of *Staph. aureus* isolated from nail clippings were sensitive to Penicillin. *Staph. epidermidis* was sensitive to Gentamicin (86%), Cloxacillin (58.6%), Chloramphenicol (51%) and Ampicillin (48%). In the later part of study, newly available chemotherapeutic agents - Ciprofloxacin and Ofloxacin were used for sensitivity tests which showed that more than 95% of the Gram-negative organisms were sensitive to these antibiotics.

DISCUSSION

Wound infection is defined as the discharge of pus from the wound and it is a major clinical problem following surgical operations. The effects of wound infection vary from local to general and from negligible to death. The local effects include discomfort and pain to the patients, abscess formation, ugly scars, sinus formation, synergistic gangrene and wound dehiscence. General effects include bacteraemia and septicaemia. It not only increases hospital stay but also incurs extra expenses.

Infection is the invasion of the body by pathogenic organisms, the source of the organisms being either endogenous i.e. from the patients body itself or exogenous i.e. from the persons caring for the patients or a break in sepsis in the theatre or wards, whilst some contaminants are air-borne.

Other important considerations are the local and general factors affecting the multiplication of bacteria are the virulence of the organisms, immunity of the patients, patients age, presence of concurrent disease, use of steroids and chemotherapeutic agents and the adverse effects of prolonged anaesthesia and hypotension. Local factors which encourage bacterial multiplication or inhibit local defense mechanism include poor surgical technique resulting in tissue damage, ischaemia or haematoma formation, obesity and surgery in contaminated viscus.

Scrutiny of various large surveys in the world literature over the past two decades indicate that the incidence of infection varies with the type of surgery.

Infection is least common in clean elective surgery (1-2%). In potentially contaminated surgery where the biliary, respiratory, urinary and GIT is entered the incidence increases to 5-10%. In abdominal surgery when the peritoneal cavity is already soiled and contaminated with bacteria at the time of operation the infection rate is about 20% while operations performed in presence of pus carry an infection rate of 40-50%. Allowing for these generalization, it must be realized that the fluctuation in infection rate occurs even with standard operations and the incidence may increase during the outbreak of sepsis.

RECOMMENDATIONS

In this study the incidence of post-operative wound infection was 12.28% in emergency surgery and 4.57% among elective cases. This study also showed that the organisms isolated were resistant to the commonly and empirically used antibiotics. A serious consideration is needed in order to reduce the incidence of wound infection and to prevent injudicious use of antibiotics and there by to prevent the emergence of resistant strains of organisms. To achieve this goal following recommendations are made:

1. Depending upon the nature of operation performed, the most likely organism should be anticipated and the most effective antibiotic as shown by the study be used prophylactically or in established cases of wound infection, pus should be cultured and sensitivity of the organism established. Pending the arrival of the report, the most

likely antibiotic to be sensitive for the cases should be commenced. According to our study, Gram-negative organisms were commonest to cause wound infection (75%) and they were sensitive to Gentamicin (79%), Cephalexin (82%), Chloramphenicol (87%) and Tetracycline (29%). *Staph. aureus* caused wound infection in 16% cases and was found to be sensitive to Gentamicin (93%), Cloxacillin (81%), Erythromycin (56%), Cephalexin (50%), Ampicillin (25%) and Penicillin (18%). Since Gentamicin is found to be most effective of all and less expensive as compared to Cephalexin and Cloxacillin, this should be the drug of choice and when used judiciously, the nephrotoxicity and ototoxicity are negligible.

2. As 72% of nail clippings, 24% of nasal swabs and 18% of the wound swabs had shown growth of *Staph. aureus*, this calls for attention towards controlling the bacterial flora of the hands and noses of the persons involved in care of surgical patients. This is possible by adequate trimming of nails, use of antiseptic hand wash and nasal creams and by repeating the cultures of nail clippings and nasal swabs from time to time to check whether adequate control has been achieved.
3. This study has shown high incidence of wound infection amongst those cases which had undergone emergency surgery amounting to 12.28%. The percentage of instrument swabs showing growth was as high as 28%, most of the positive swabs coming from instruments used in emergency unit. This calls for measures to improve the sterilization techniques and handling the instruments.

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