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Original Research Article

A Cross-Sectional Analysis to See how Common Aerobic and Fungal Infections are in Post-Operative Wound Infections.

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Abstract

Aim: To determine the incidence of aerobic and fungal infection in post-operative wound infection. **Methods:** The study was a cross sectional study which was carried in the Department of Microbiology, Nalanda Medical College and Hospital, Patna, Bihar, India for 1 year. Total 220 patients with post operative wound infection either sex or any age, who had surgical wound pus, discharge, or signs of sepsis were include in this study. Using sterile cotton swabs, two pus swabs/ wound swabs were collected aseptically from each patient suspected of having post operative wound infection. Gram stained preparations were made from one swab for provisional diagnosis. The other swab was inoculated on nutrient agar, 5% sheep blood agar (BA) and MacConkey agar (MA) plates and incubated at 37°C for 24-48 hours before being reported as sterile. Growth on culture plates was identified by its colony characters and the battery of standard biochemical tests. **Results:** Out of 220 samples, 100 samples were culture positive (45.45%) (Table1). Among 100 positive samples 55(55%) were males. Maximum no. of culture positive samples in age 25-35 years (32%) followed by 35-45 (17 %) and then followed by 45-55 (16%) of age group respectively. The predominant bacterial isolates *S. aureus* (36%), *P. aeruginosa* (23%), *E. coli* (14%), *Proteus* spp. (7%), *K. aerogenes* (7%), *Streptococcus* spp. (4%) and one fungal isolate *C. albicans* (9%). **Conclusion:** It has been concluded that wound infections in this were polymicrobic in nature and, in most cases, associated with S. aureus, E.coli and Pseudomonas aeruginosa. A continuous inspection should be carried out to monitor the susceptibility of these pathogens and chose appropriate regimens both for prophylaxis and treatment of surgical wound infections.

Key words: Aerobes, *Candida albicans*, post-operative wounds, infections.

Introduction

Despite an improved understanding of the pathophysiology, methods of prevention and prophylaxis and technological advances that have been made in surgery and wound management, surgical wound infections remain the most common cause of post operative morbidity and mortality.[1] A surgical wound may get infected by the exogenous bacterial flora which may be present in the environmental air of the operation theatre or by the endogenous flora.[2] Surgical wound infection remains one of the most important post-operative complications, accounting for 10 to 20% of the hospital costs. Although total elimination is not possible, a reduction in the infection rate to a minimal level could have significant benefits in terms of both the patient comfort and the medical resources which are used.[3] The rate of infection of the surgical wounds is influenced by the duration of the pre-operative hospitalization, administration of the prophylactic antibiotics, the duration of the surgery and by the fact as to whether the surgery was emergency or elective. Patient factors and environmental factors, both local and general, like age and nutritional status and preexisting illnesses also determine the final outcome. Postoperative wound infection can occur from first day onwards to many years after an operation but commonly occurs between the fifth and tenth days after surgery.[4] It may originate during the operation i.e. as a primary wound infection or may occur after the operation from sources in the ward or as a result of some complications i.e. secondary wound infection.[5,6] and can be characterized by various combinations of the signs of infection (e.g. pain, tenderness, warmth, erythema, swelling, drainage).4 Most post-operative wound infections are hospital acquired and vary from one hospital to the other and even within a given hospitals and they are associated with increased morbidity and mortality.[5] The site of infection may be limited to the suture line or may become extensive in the operative site and the infecting microorganisms are variable, depending on the type and location of surgery, and antimicrobials. Surgical site infections (SSIs) which account 17% of all health care-associated infections are the second most common HAIs next to urinary tract infections. They occur after approximately 3% of all operations and result in greater lengths of stay and additional costs.6 The emergence of poly antimicrobial resistant strains of hospital pathogens has also presented a challenge in the provision of good quality inpatient care.[7] The battle between bacteria and their susceptibility to drugs is yet problematic among public, researchers, clinicians and drug companies who are looking for effective drugs.[8] This study was carried out to determine the bacterial etiology of wound infections in patients in Hospital Bihar India and to proffer ways and means for the prevention of post-operative wound infection.

Material and Methods

The study was a cross sectional study which was carried in the Department of Microbiology, Nalanda medical college and Hospital, Patna,Bihar, India for 1 year. Total 220 patients with post operative wound infection either sex or any age, who had surgical wound pus, discharge, or signs of sepsis were include in this study. Patients with cellulitis and suture abscess were exclude from this study.

Using sterile cotton swabs, two pus swabs/ wound swabs were collected aseptically from each patient suspected of having post operative wound infection. Gram stained preparations were made from one swab for provisional diagnosis. The other swab was inoculated on nutrient agar, 5% sheep blood agar (BA) and MacConkey agar (MA) plates and incubated at 37°C for 24-48 hours before being reported as sterile. Growth on culture plates was identified by its colony characters and the battery of standard biochemical tests.[9,10] All dehydrated media, reagents were procured from Hi Media Laboratories Pvt. Ltd., Mumbai, India.

Statistical Analysis: Data was entered in Microsoft excel spreadsheet and analysed using appropriate statistical software application.

Results

Out of 220 samples, 100 samples were culture positive (45.45%) (Table1). Among 100 positive samples 55(55%) were males (Table 1). The age wise distribution of the gender has been shown in the (Table 2) with maximum no. of culture positive samples in age 25-35 years (32%) followed by 35-45 (17 %) and then followed by 45-55 (16%) of age group respectively.

Table 1: Sex distribution of Culture positive Patients

Sex	No of patients=100	Percentage
Male	55	55
Female	45	45

Table 2: Age wise Distribution of Culture Positive Patients

Age in year	Culture Positive	Percentage
Below 25	13	13
25-35	32	32
35-45	17	17
45-55	16	16
55-65	13	13
Above 65	9	9

Table 3: Distribution of Organisms Causing Surgical Site Infection

Organism	No. of isolates	Percentage
Staphylococcus aureus	36	36
Pseudomonas aeruginosa	23	23
Escherichia coli	14	14
Klebsiella aerogenes	7	7
Proteus spp.	7	7
Streptococcus spp.	4	4
Candida albicans	9	9

The predominant bacterial isolates *S. aureus* (36%), *P. aeruginosa* (23%), *E. coli* (14%), *Proteus* spp. (7%), *K. aerogenes* (7%), *Streptococcus* spp. (4%) and one fungal isolate *C. albicans* (9%).

Table 4: Susceptibility pattern showing number (%) of the different bacterial isolates sensitive to various antimicrobial agents

Organisms	No of isolates	CMX	AUG	CFX	CFL	AMP	GN	FX	CFF	ERY
		No (%) of isolates sensitive to various antibiotics tested								
Staphylococcus aureus	36	16 (44.44)	29 (80.56)	6 (16.67)	1 7 (47.22)	17 (47.22)	24 (66.67)	19 (52.78)	6 (16.67)	24 (66.67)
Pseudomonas aeruginosa	23	4 (17.39)	13 (56.52)	9 (39.13)	4 (17.39)	5 (21.74)	17 (73.91)	2 (8.69)	7 (30.43)	2 (8.69)
Escherichia coli	14	10 (71.43)	14 (100)	12 (85.71)	10 (71.43)	14 (100)	8 (57. 14)	6 (42.86)	12 (85.71)	2 (14.29)
Klebsiella aerogenes	7	2 (28.57)	4 (57.14)	4 (57.14)	2 (28.57)	5 (71.43)	7 (100)	4 (57.14)	4 (57.14)	2 (28.57)
Proteus spp.	7	4 (57.14)	4 (57.14)	2 (28.57)	5 (71.43)	2 (28.57)	4 (57.14)	2 (28.57)	4 (57.14)	0 (0)
Streptococcus spp.	4	0 (0)	0 (0)	0 (0)	4 (100)	4 (100)	4 (100)	0 (0)	4 (100)	4 (100)

CMX = Cotrimoxazole. AMP = Ampicillin. CMY= Clindamycin. GN = Gentamicin. AUG= Augmentin. FX = Floxapen. CFX = Ciprofloxacin. CPX = Cephalexin. OFL = Ofloxacin. ERY= Erythromycin

Discussion

From a microbiological perspective, the primary function of normal, intact skin is to control microbial populations that live on the skin surface and to prevent underlying tissue from becoming colonized and invaded by potential pathogens. Exposure of subcutaneous tissue following a loss of skin integrity (i.e., a wound) provides a moist, warm, and nutritious environment that is conducive to microbial colonization and proliferation. However, the abundance and diversity of microorganisms in any wound will be influenced by factors such as wound type, depth, location, and quality, the level of tissue perfusion, and the antimicrobial efficacy of the host immune response. Whereas the microflora associated with clean, surgical wounds would be expected to be minimal, the presence of foreign material and devitalized tissue in a traumatic wound is likely to facilitate microbial proliferation unless early prophylactic antibiotic treatment and surgical debridement is implemented.[11]

Out of 220 samples, 100 samples were culture positive (45.45%). Whereas various other studies from India have shown the rate of SSI to vary from 6.1% to 38.7%.[12-15]

The predominant bacterial isolates *S. aureus* (36%), *P. aeruginosa* (23%), *E. coli* (14%), *Proteus* spp. (7%), *K. aerogenes* (7%), *Streptococcus* spp. (4%) and one fungal isolate *C. albicans* (9%).

The relative high number of Enterobacteriaceae isolated in this study points to the fact that the presence of enteric organisms in the wounds at operation probably resulted to subsequent sepsis. Gorbath and Barlet (1974) reported similar findings. The findings therefore infer that enteric organisms are important determinants of healing in surgical wounds.[16]

The high incidence of Gram-negative organisms, especially *P aeruginosa, E. coli, K. aerogenes* and *Proteus* spp., confirms the observation that most wound infections arising from abdominal procedures are presently acquired from the patient’s own faecal flora. Bhattacharyya and Kosloski (1990) and Okodua (1996) also reported similar findings.[17,18]

The high isolation of *S. aureus* (35.0%) agrees with the findings of earlier work carried out by Enweani et al. (2003).[19] The predominance of *S. aureus* is, however, not surprising as it forms the bulk of the normal flora of the skin and nails (Junet et al., 2004).[20]Although the individual immune status of subjects used for this study was not ascertained at any time during this study, the age ranges in which there were high rates of infected wounds may be due to a decline in immunological competence among people in such age groups. This is, however, at variance with the work of Olagoke (2004).[21]

The *in vitro* antimicrobial sensitivity studies showed that organisms react differently to various antibiotics, as demonstrated by their sensitivity patterns. None of the isolates scoredless than 50% sensitivity to Augmentin and Gentamicin. It is likely that these antibiotics may not have been misused or because the organisms may not have been frequently exposed to the antibiotics in this locality.

Conclusion

The report provides a good picture of the pathogens that cause wound infections in this hospital. Wound infections in this study were polymicrobic in nature, with S. aureus, E.coli, and Pseudomonas aeruginosa being the most common bacteria found. The resistance of these pathogens should be monitored on a regular basis, and suitable regimens for both prophylaxis and treatment of surgical wound infections should be chosen. In order to avoid and monitor surgical wound infections at a low cost, regular communication between the microbiology department and the surgeons is highly advised. This will push the use of antimicrobial agents to be more realistic, and it will aid in the prevention of infections.

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