Bacterial Profile of Blood and Burn Wound Infections in Burn Patients

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Abstract

Infections are the major cause of morbidity and mortality in burn patients. Three fourth of deaths in burn patients occur due to infections. The objective behind this work was to find out the bacteriological profile of post burn infections in blood and wound in first week along with the evaluation of the antimicrobial susceptibility pattern of the organisms isolated.

Fifty burn patients were investigated for bacterial profile of blood and burn wound infections. Specimens were collected on 3rd and 5th day of burns in the form of blood and wound swabs. The organisms were isolated and identified by standard microbiological methods. Antimicrobial susceptibility test was done by Kirby Bauer disc diffusion method.

Gram negative organisms were found to be more prevalent. *Pseudomonas aeruginosa* was found to be the most common isolate followed by *Staphylococcus aureus, Staphylococcus epidermidis, E.coli, Klebsiella* and *Salmonella*. In most of the cases, same organisms were found in blood and pus sample. Amikacin, Norfloxacin, Erythromycin and cephotaxime were more effective antimicrobials while Co-trimaxazole, Amoxyclav and Ceforperazone were found to be the least effective. Psudomonas was found to be resistant to most of the therapeutic agents.

The study emphasizes the need to introduce strict aseptic measures in burns ward and to formulate an antibiotic policy in the hospital.

Introduction

Burn patients are ideal hosts for opportunistic infections (Cochran et.al, 2002). The burn site remains relatively sterile during the first 24 hour; thereafter , colonization of the wound by gram negative bacteria is common (Pruitt et.al, 1998). Pseudomonas aeruginosa has emerged as a predominant member of the burn wound flora and in the absence of topical therapy is cultured from the burn injuries of 70% patients by the third week (Church et.al, 2006). Microorganisms routinely isolated from burn wounds include aerobic organisms like *Staphylococcus aureus, Streptococcus pyogenes, E.coli, Klebsiella Spp., Proteus* etc., anaerobic organisms like *Bacteroides fragilis, Peptostreptococcus, Propionibacterium Spp., Fusobacterium Spp* and fungi like *Aspergillus niger, Candida Spp* and Zygomycetes (Revathi et al, 1998).

The surface of every burn wound is contaminated to some degree by bacteria (Lawrence et al, 1972). Because of this, surface bacterial growth is routinely monitored in most centres to facilitate management and treatment. It has been found by many investigators that the distribution of various species of bacteria from burn wound surfaces is similar to that from blood specimens (Li, 1989).

Use of antimicrobials has altered the flora that is found to colonize the wounds of patients with burns and trauma related injuries. *Staphylococcus aureus* remains a common colonizer and has developed resistance to several anti-microbial agents. Recent reports suggest that the incidence of *Pseudomonas* infections is decreasing, whereas multiple antimicrobial resistance has emerged in a number of gram negative organisms that were not therefore considered major pathogens (Li, 1989). Progress in this regard can be attributed towards improvements in anti-microbial therapy, wound management, & nutrition (Smith et al, 1992).

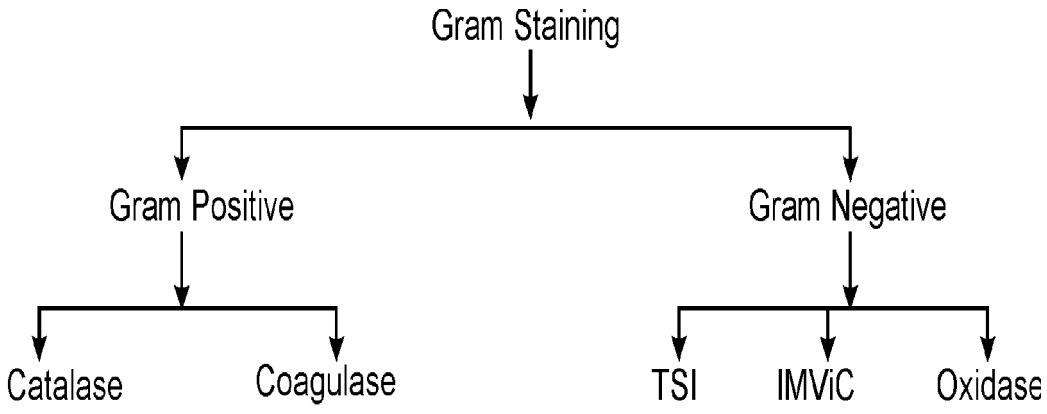
The present study is undertaken to study the micro flora in burn wounds and blood of the burn patients from a tertiary care medical hospital. This study will help to assess the burden of infections at the centre and antimicrobial susceptibility testing will help to formulate antibiotic policy for better management of these patients. The present study is undertaken with the following aims and objectives:

1. To find out the bacterial profile for post burn infection in pus and blood.

2. To evaluate the antibiotic sensitivity of organisms cultured and isolated.

Material and Methods

The present work includes the investigation of 50 post burn infection cases admitted in burn ward of Netaji Subhash Chandra Bose Medical College & Hospital, Jabalpur between 15.01.2006 to 15.06.2006. Blood and wound swabs were collected on 3rd and 5th day. Blood was collected aseptically in Glucose Phosphate broth and was incubated at 37^{0}c for 48 hours. It was then sub cultured on Blood Agar and MacConkey's Agar. Wound swabs were collected aseptically and brought to the laboratory. Swabs were inoculated on Blood Agar and MacConkey's Agar and direct smears were prepared. Smears were stained by Gram's staining method. Organisms were identified by using standard biochemical tests (Collee et.al, 1996) Antimicrobial Sensitivity Test (AMST) was done by Kirby-Bauer disc diffusion method (Koneman et.al).



Results and Discussion

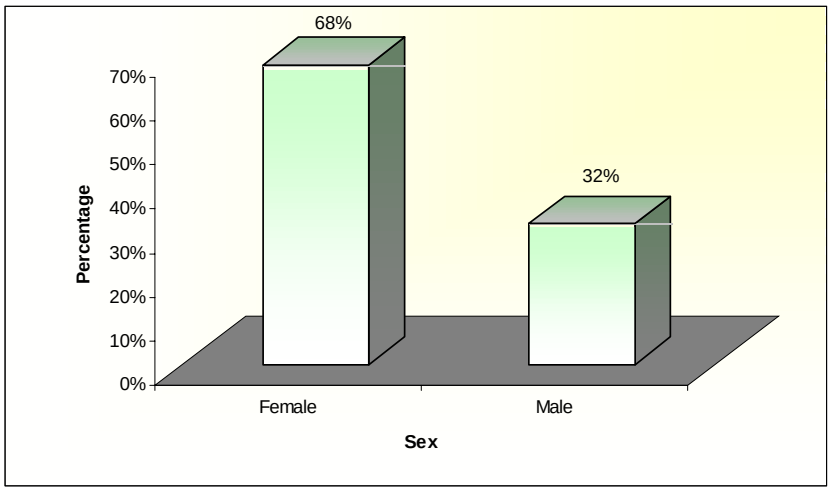
Infections remain the leading cause of death among patients who are hospitalized for burns. The risk of burn wound infection is directly correlated to the extent of the burn and is related to impaired resistance resulting from disruption of the skin's mechanical integrity and generalized immune suppression.

In the present study females (68%) were affected more than that of males (32%) (Fig.1). This may be because of the reason that accidental burns are more common in females as they tend to spend more time near fire. Most common age group affected was 20 – 40 (Fig. 2).

Fig. 1: Age distribution of burn cases



Fig. 2: Sex distribution of cases



In our study culture positivity of pus was 95 % while in 5% of cases, pus samples were sterile (Table 1). In case of blood the culture positivity was 53 %. Santucci et al (2003) in their study on burn wound infections found the culture positivity of blood to be 49% while the culture positivity of pus in their study was 21%. Culture positivity in our study was corroborative to the report of direct smear.

Table 1: Sensitivity of culture method

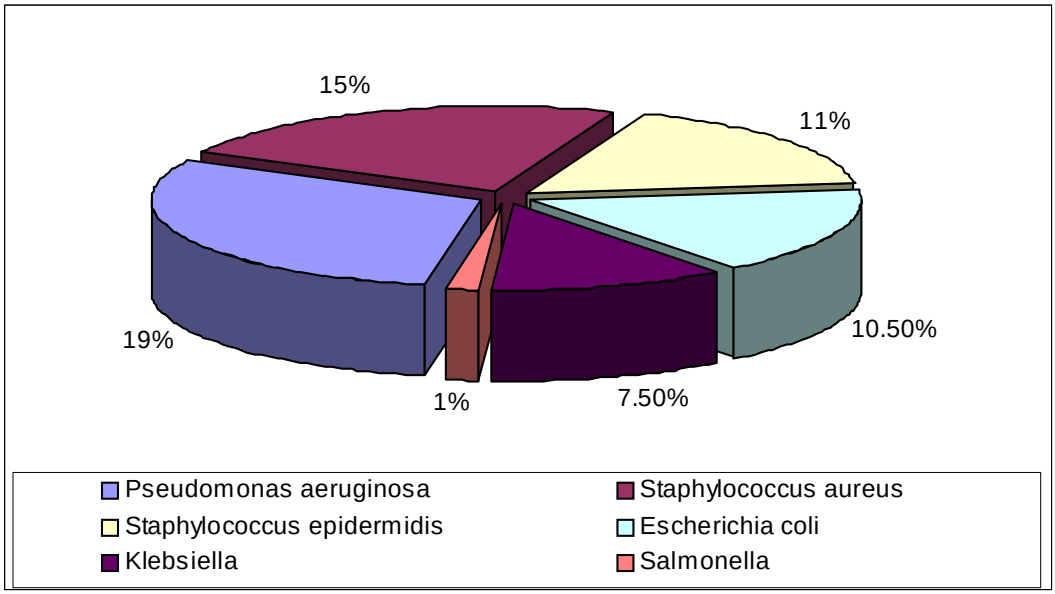
Sr.no	Specimen	Culture positive	Culture negative
1.	Pus	95 (95.00%)	5 (5%)
2.	Blood	53(53 %)	47 (47 %)

In the present study *Pseudomonas aeruginosa* (19%) was the commonest isolate from burn wounds followed by *Staphylococcus aureus* (15%), *Staphylococcus epidermidis* (11%) , *E.coli* (10.5%), *Klebsiella species* (7.5%) , *Salmonella Spp*. (1%) (Graph 3, Table 2). It is evident that *P.aeruginosa* has emerged as a great threat in burn wound infection and it's very important that antibiotic policy is formulated to keep a check on it. *P.aeruginosa* was the most common isolate from blood also followed by *S.epidermidis, Klebsiella, S.aureus* and *E.coli*. Santucci et.al (2003) found *S.aureus* to be the most common isolate from blood followed by *P.aeruginosa*, Acinetobacter and Coagulase Negative Staphylococci (CONS). In most of the cases the organisms isolated from blood were the same as isolated from pus. This indicates that the organism has entered the bloodstream through the wound and is a potential threat for disseminated infection which can be life threatening.

Table 2: Pattern of organisms isolated on 3rd and 5th day of burns

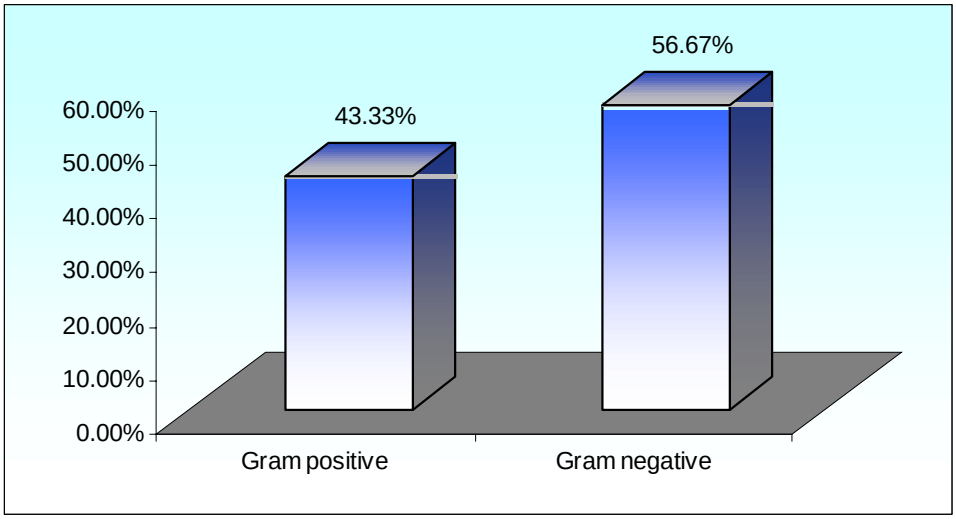
Sr.No.	Organisms	Blood		Pus		Total	Percentage
		III day	V day	III day	V day		
1.	Pseudomonas aeruginosa	5	11	10	12	38	19%
2.	Staphylococcus aureus	1	5	11	13	30	15%
3.	Staphylococcus epidermidis	2	6	7	7	22	11%
4.	Escherichia coli	-	6	7	8	21	10.5%
5.	Klebsiella	3	4	5	3	15	7.50%
6.	Salmonella	-	-	-	2	2	1%
7.	Diplococci	-	1	-	-	1	0.5%
8.	Sterile	35	12	5	-	52	26%
9.	NI	4	5	5	5	19	9.5%

Fig. 3: Organisms isolated from burn cases



In our study gram negative organisms were more common on both 3rd and 5th day of infection (Fig. 4). We did not find much difference in the pattern of organisms isolated on 3rd day and 5th day of admission (Table 2). Many investigators have found that initially there is colonization by gram positive organisms which is replaced later by gram negative organisms. Ahmad et.al (2006) in their study have demonstrated that infections by gram positive organisms were more common in first 5 days of burns while gram negative organisms dominate the infection scene thereafter.

Fig. 4: Differentiation of organism by gram staining



In our in vitro antimicrobial susceptibility testing, Amikacin was the most effective antibiotic followed by Norfloxacin, Erythromycin and Cefotaxime. Co-trimaxazole, Amoxyclav and Ceforperazone were found to be the least effective (Fig. 5).

Fig. 5 : Antimicrobial susceptibility pattern of the isolates



Conclusion

It is quiet clear that infections are serious problem among burns patients. *Pseudomonas aeruginosa* has emerged as the commonest organism causing infection and is resistant to most of the antibiotics. To keep a check on burn wound infections it is important for every hospital to have a data on prevalent organisms and their antibiotic susceptibility pattern. This study should be done frequently to check the changing pattern of the organisms and their susceptibility pattern. Based on this, the hospital should formulate an effective antibiotic policy.

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