Original article:

Bacteriological profile and susceptiblity pattern of burn wound isolates in a tertiary care hospital

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Abstract

Burns patients are highly susceptible for opportunistic infections.A retrospective study was cinonducted to analyse the bacterial isolates from burns wound.

Keywords: Antibiotic susceptiblity Burns, Infection

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Introduction

Burn patients are highly susceptible for opportunistic infections[1].Infection is a major problem in the management of burns patients. Approximately 75% of mortality following burns are because of infection[2,3,4].Burn wound monitoring requires the study of changing bacterial flora and their antibiotic susceptibility pattern.[5]. This will help toassess the organisms that are predominant in a particular treatment 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 method

This is a retrospective study of bacterial isolates from 200 wound swabs taken from 179 patients admitted to the burn unit of a tertiary care hospital in Mangalore.The specimens were transported in sterile, leak-proof containers to the Microbiology department. All specimens were inoculated on 5% blood agar, Mac Conkey agar and Chocolate agar plates and incubated overnight at 37°C aerobically. Bacterial pathogens were identified by conventional biochemical methods according to standard microbiological-techniques.

Antimicrobial susceptibility was performed on Mueller-Hinton agar by the standard disk diffusion method recommended by the The antibiotics tested for gram-positive cocci were: Ampicillin (10 mg),Cefoxitin (30 mg),Ceftriaxone (30 mg), Ciprofloxacin (5 mg), Aziththromycin (15 mg), Vancomycin (30 mg), Linezolid (30 mg); for gram-negative bacilli: Ampicillin (10 mg), Amikacin (30 mg), Gentamicin (30 mg), Ciprofloxacin (5 mg), Piperacillin/Tazobactum(30/10 mg), Cefoperazone /Sulbactam (75/30 mg),Imipenem (10 mg) and for non-fermenters ceftazidime, (30 mg), piperacillin (100 mg), cefepime (30 mg), amikacin (30 mg), gentamicin (30 mg), ciprofloxacin (5 mg), cefoperazone / sulbactam (75/30 mg),Piperacillin /Tazobactum(75 /30 mg), Meropenem (10 mg) and

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Imipenem (10 mg) were used. The antimicrobial susceptibilities were determined according to the Clinical and Laboratory Standards Institute (CLSI) guidelines.Extended spectrum beta lactamase (ESBL) production was tested by double disk approximation method.Methicillin resistant Staphylococcus aureus was screened using Cefoxitin (30 mg) disk.

Results

A total of 230 bacterial isolates were obtained from 179 patients' wound swab over a 3-year period. The most predominant bacterial isolate was *Acinetobacter* spp(34 %) , *Pseudomonas aeruginosa* (*P. aeruginosa*) (29%), *Klebsiella pneumonia* (22%) *Staphylococcus aureus* (*S. aureus*) (8%),*Escherichia coli* (*E. coli*) (1%) and *Enterococcus spp* (4%)as shown in Table 1.

Table 1/Fig 1

Distribution of microorganisms isolated from burns wound

Microorganism	**n**	**%**
Acinetobacter spp	78	34
Pseudomonas aeruginosa	68	29
Klebsiella pneumonia	51	22
Staphylococcus aureus	19	8
Enterococcus spp	9	4
Escherichia coli	4	1

Table 2/Fig 2

Susceptibilities of gram negative isolates to various antimicrobials

	Acinetobacter spp		Pseudomonas spp		Klebsiella spp		Escherichia coli	
Antimicrobial	N *	R (%)†,	N	R (%)	n	R (%)	n	R (%)
Ceftazidime	NT‡	-	68	36 (52.9)	NT	-	NT	-
Piperacillin	NT	-	68	43 (63.2)	NT	-	NT	-
Ceftriaxone	78	74 (94.8)	68	53 (77.9)	51	36 (70.5)	4	0
Gentamicin	78	67 (85.8)	68	42 (61.7)	51	32 (62.7)	4	2 (50)
Amikacin	78	62 (79.4)	68	40 (58.8)	51	29 (56.8)	4	1 (25)
Ciprofloxacin	78	72 (92.3)	68	45 (66.1)	51	14 (27.4)	4	1 (25)

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Imipenam	78	32 (41)	68	16 (23.5)	51	6 (11.7)	4	0
Meropenem	78	30 (38.4)	68	18 (26.4)	51	5 (9.8)	4	0
Cefoperazone +Salbactum	78	43 (55.1)	68	22(32.3)	51	6 (11.7)	4	1 (25)
Piperacillin + Tazobactum	78	37(47.4)	68	21 (30.8)	51	7 (13.7)	4	2 (50)
Tigecycline	78	2(2.5)	68	0	51	0	4	0
Colistin	78	0	68	0	NT	-	NT	-

N: number of isolates which were tested, R: resistant, NT: not tested

Table 3 /Fig 3

Susceptibilities of gram positive isolates to various antimicrobials

	Staphylococcus aureus		Enterococcus spp	
Antimicrobial	N	R (%)	N	R (%)
Ampicillin	19	16 (84.2)	9	2 (22.22)
Cefoxitin	19	5 (26.3)	NT	-
Ceftriaxone	19	5 (26.3)	NT	-
Gentamicin	19	09 (47.3)	NT	-
Amikacin	19	09 (47.3)	9	3 (33.33)
Ofloxacin	19	10 (52.6)	9	2 (22.22)
Vancomycin	19	0	9	0
Linezolid	19	0	9	0
Azithromycin	19	07 (36.8)	9	5 (55.55)

Acinetobacter spp was the most predominant organism isolated from the burns wound. Followed by Pseudomonas aeruginosa and Klebsiella pneumoniae.Among all the Acinetobacter spp and Pseudomonas spp38% and 23% respectively were multidrug resistant.Tigecycline and Colistin were the only antimicrobial active against these isolates.Among all the Enterobacteriaceae 42% of Klebsiella and 26% of E.coli were extended spectrum beta lactamase (ESBL) producers.The most effective antimicrobial against Klebsiella and E.coli was Meropenem.

Among the *S.* aureus isolated from patients within the burn center, the incidence of methicillin-resistant *S. aureus* (MRSA) was 26% and the most active antimicrobial agents were found to be Vancomycin and Linezolid against *S. a*ureus isolates respectively. None of the Enterococcus spp. was found to be resistant toVancomycin.

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Discussion

Colonisation of burn wounds with microorganisms is almost certain to occur in patients with major burns.The most obvious reason is the unparalleled excellence of the burns wound as a bacterial microbiological culture medium.Devitalised tissues serves as a pabulum for microbial growth and with decreased blood flow to burn wound as a contributing factor[6].

The most commonly isolated organism in the present study was Acinetobacter baumanii followed by Pseudomonas aeruginosa and Klebsiella pneumoniae.Acinetobacter spp was shown to be an important cause of nosocomial infection in burns unit [7]. Several studies have reported it to a predominant organism in burns unit. Some of the reasons for this trend is its presence as a normal commensal and easy spread due to multidrug resistance in hospital settings[8,9].Pseudomonas aeruginosa was isolated from 29% of wound swabs .This is in contrast to other studies where Pseudomonas aeruginosa was the commonest isolate[10].Klebsiella pneumonia was the third in line. However its frequency is higher as compared to other studies[11,12]. The isolation rate of gram negative bacilli was higher as compared to the gram positive cocci.. This is in contrast to other studies where the isolation rate of Staphylococcus aureus was much higher[13,14]. Amongst the gram positive cocci Staphylococcus aureus was predominant followed by Enterococcus spp.

Acinetobacter spp and Pseudomonas aeruginosa were multidrug resistant with only Tigecycline and colistin active against these organisms. Singh et al.also reported high prevalence of multidrug resistant gram negative bacilli in burns unit. In this study Carbapenems like Imipenem and Meropenem and combination drugs like Piperacillin/Tazobactum and Cefoperazone/Salbactum showed good efficacy. This is in agreement with other studies. One of the reasons stated by Mehta et al.was that these third generation drugs are used as reserve drugs[15,16].ESBL production was lesser as compared to other studies[9]. Guggenheim *et al* have showed that Imipenem and Meropenem were the most active antimicrobial agents for ESBL producing strains[17].Our results were in agreement with this study.MRSA was found among 26 % of the Staphylococcus aureus isolates which was lesser in comparison to other studies[18,19].MRSA isolated in this study were sensitive to Vancomycin,Linezolid and Amikacin.

Conclusion:

In conclusion high antimicrobial resistance is a major concern in burns unit. Aggressive infection control measures, judicious use of antibiotics as per the prevailing antibiotic susceptibility patterns should be applied to limit the emergence and spread of multidrug-resistant pathogens.

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