ORIGINAL ARTICLE

Microbiological Profile of Chronic Burn Wounds among Patients Admitted in Burn Unit

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Abstract

A prospective study of bacterial wound colonization in 51 burn patients with chronic wounds of more than 3 weeks duration was carried out over a period of one year (2004) with an objective of determining microbial profile and antibiotic sensitivity patterns. A total of 178 surface swabs were taken, out of which 110 microbial isolates were cultured which included 104 solitary and 3 twin isolates. The most frequent isolate was coagulase negative Staph. epidermidis (56.36%) followed by Pseudomonas (18.18%) and Staph. aureus (13.63%). There was a high degree of resistance by these organisms to commonly available antibiotics. The most sensitive antibiotics in our setup were Gatifloxacin and Amikacin irrespective of the organisms cultured and should be used empirically pending reports of culture and sensitivity if systemic antibiotics need to be started. Restriction in the misuse of antibiotics on empirical basis, establishment of proper infection control measures and supportive measures like psychological support, physiotherapy and protein rich diet will help lower the incidence of infection.

Key words

Chronic burn wound, Bacteriology, Antibiotic sensitivity

Introduction

One of the key areas with which surgeons treating burn patients is concerned is septic complications, as burn wound is an ideal culture medium for microorganisms. To establish any gains in infection control measures, it requires a brief understanding of wound bacteriology. It is very crucial for every burn institution to determine the specific pattern of burn wound microbial colonization, the time related changes in the dominant flora and the antimicrobial sensitivity profiles(1). This becomes more important because of the fact that our hospital caters to majority of burn patients of this area. This study was carried out to document burn wound infection pattern in our setup so as to enable early treatment of imminent septic episodes with proper empirical systemic antibiotics without having to wait for culture results.(2,3)

Subjects and Methods

This prospective study was done on 51 patients admitted in burn unit . A total of 178 surface swabs were taken using standard methods and cultured for the growth of the bacteria which were then subjected to various antibiotic sensitivity testing .

Chronic wound for the purpose of this study was defined as any burn wound with skin loss which failed to heal or epithelize naturally within 3 weeks from the date of injury.

Results

Among 178 surface swabs taken, 104 solitary isolates were cultured from as many wounds whereas twin isolates were cultured from only 3 wounds. (Table 1)

2. The pattern of organisms cultured from the wounds show that a majority (56.36%) were Staph. epidermidis whereas G -ve organisms contributed 33% in total. (Table 2)

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Table 1:Distribution of bacterial isolates cultured

Isolates	Number (n =178)
Solitary	104 (58.42)
Twin	3 (1.68)
Nil	71 (39.88)

(The figures in parenthesis indicate percentages)

3. The sensitivity of organisms to different antibiotics varied depending on the isolate cultured. Staph. epidermidis was most sensitive to Amikacin (82.25%), while as Staph. aureus was found to be most sensitive to Gatifloxacin (86.66%). All the Gram -ve organisms in our series were most commonly susceptible to Amikacin. (Table 3)

Table 2:Types of organisms cultured from wounds

Organisms	number (n=110)
Staph. epidermidis	62 (56.36)
Staph. aureus	15 (13.63)
Pseudomonas	20 (18.18)
E.coli	10 (9.09)
Klebsiella	3 (2.72)

(The figures in parenthesis indicate percentages)

Table 3:Sensitivity of organisms cultured to various antibiotics

Antibiotic	(n =62)	(n=15)	(n=20)	(n=10)	(n=3)
	S. epidermidis	S. aureus	Pseudomonas	E. coli	Klebsiella
Gatifloxacin	42 (67.74)	13 (86,66)	11 (55)	2 (20)	2(66.66)
Amikacin	51 (82.25)	3 (20)	13 (65)	5 (50)	3 (100)
Azithromycin	28 (45.16)	5 (33.33)	10 (50)	3 (30)	2 (66.66)
Ceftriaxone	12 (19.35)	1(6.66)	3 (15)	-	2 (66.66)
Ciprofloxacin	20 (32.25)	4 (26.66)	6 (30)	3 (30)	1 (33.33)
Levofloxacin	13 (20.96)	7 (46.66)	1 (5)	1 (10)	-
Gentamycin	9 (14.51)	-	-	2 (20)	-
Erthromycin	2 (3.22)	6 (40)	-	-	-
Cefuroxime	6 (9.67)	1 (6.66)	-	-	-
Linezolid	6 (9.67)	1 (6.66)	-	2 (20)	-
Ofloxacin	11 (17.74)	-	-	1 (10)	1 (33.33)
Linkomycin	2 (3.22)	9 (60)	-	1 (10)	-
Ampicillin	-	-	-	-	-

(The figures in parenthesis indicate percentages)

Discussion

Burn wound if not excised and grafted early becomes an ideal culture medium for the growth of microorganisms. Majority of the patients in our setup are those who present quite late after having been maltreated by the quacks when they usually become malnourished and unable to bear the cost of treatment. Thus, most of these patients cannot afford the cost of serial wound cultures which compares poorly with 100% in developed countries where serial cultures are done on daily basis. Besides serial wound cultures would add tremendous burden on already overburdened laboratory staff. The obvious implication is that clinicians have to treat most of the cases empirically and this obviously contributes to the high degree of resistance by the isolates to commonly used antibiotics.

There was predominance of G +ve organisms with Staph. epidermidis topping the list (Table 2). This is similar to observations from other studies. (4-6) Some studies cultured Staph. aureus as the predominant organism (7-9). However, in other studies G-ve organisms have been found to be the toppers with Klebsiella in some10,11,12 and Pseudomonas in others (13-19). Even though the pathogenicity of Staph. epidermidis has been questioned (20,21), it should be noted that these patients are immunocompromised and several studies have consistently suggested that coagulase negative staphylococci should be considered a significant pathogen in both burn patients and critically ill surgically patients(22,23). The second most frequent organism cultured in our study was Pseudomonas followed by Staph. aureus, E. coli and Klebsiella. Considering that more than 1 culture has been taken from most of the patients over a period of time , it is quite possible that the results may be dependent and caution may be exercised while interpreting the conclusions. Antibiotic sensitivity patterns revealed that many of the isolates were resistant to commonly used antibiotics like Ampicillin, Erythromycin, Ciprofloxacin, Gentamycin etc which are being indiscriminately used on empirical basis for prolonged duration of time (Table 3) .

Resistance to various antibiotics routinely used has been reported from several studies. (1,8,14,24) Staph. epidermidis was seen to be sensitive to Amikacin (82.25%) andGatifloxacin (67.74%). Staph. aureus was found to be sensitive to Gatifloxacin .Pseudomonas and Klebsiella were totally resistant to Gentamycin 12 with only around 30% sensitivity to Ciprofloxacin. Amikacin a second generation aminoglycoside was effective against Pseudomonas (65%), E.coli (50%) and Klebsiella (100%) in our study. Sensitivity of various organisms to Amikacin in our study has also been demonstrated in other studies (6,20,25).

Burn wounds can never be free of organisms as the granulation tissue in burn wounds forms a rich culture medium for the growth of various organisms however invasive infection seldom occurs presumably because of the great antibacterial capacity of such tissues coming from the large number of phagocytes present and the increased vascularity 26. Therefore, mere isolation of organisms from the wounds does not form the basis for institution of systemic antibiotics. Systemic antibiotics, moreover, can not reach the dead, necrotic and avascular sloughs of the burn wounds. Systemic antibiotic prophylaxis is of no value in controlling burn wound sepsis and might even favour the growth of Pseudomonas aeruginosa in the burn wounds. 27 So topical antibiotics along with wound debridement and strict environmental control should form the mainstay of treatment protocol and this may help to decrease the incidence of nosocomial resistant strains and cross infection3. Invasive infection in wounds is due to the combined effects of impairment of host's natural defense system and systemic dissemination of colonizing organisms in an immuno compromised host 13. Systemic antibiotics need to be started in such invasive infections guided by the clinical parameters like fever, tachycardia, hypotension, loose motions, leucocytosis, foul smelling and copious wound discharge. In such cases with culture sensitivity reports awaited Amikacin and Gatifloxacin form the empirical antibiotics of choice in our setup.

We have realized and conclude by saying that the problem of preventing infection in burns has 3 components.

1. Prevention of further contamination of wounds by sterilized dressings and strict environmental control like institution of simple measures like hand washing before and after attending to a patient and restriction of movements of people within burns ward (3, 8).
2. Effective topical antibacterial therapy for established contamination and restriction of prophylactic usage of systemic antibiotics (3,8).
3. Supportive measures to maintain the reparative and convalescent capacities of the patient such as psychological support to boost the confidence and relieve anxiety as it has been found to be associated with delayed wound healing(28). Physiotherapy both active and passive increases the blood circulation to the affected parts and also decreases the incidence of burn wound contractures. Diet forms the most important aspect to be seriously looked into. Foods like eggs, meat, cheese and other locally available high protein and carbohydrate diets need to be started as soon as possible.

In developing nations like ours with majority of burn patients belonging to low socioeconomic status, measures to alleviate poverty and ignorance will decrease the incidence of burn wounds and their complications and thus lower the surgeons management problems.

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