

Yeast infection of burns

Hefe-Infektionen bei Verbrennungspatienten

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Key words. *Candida*, candidosis, burns.

Schlüsselwörter. *Candida*, Candidose, Verbrennungspatienten.

Summary. In a prospective study, 132 patients were investigated for yeast infection of burn wounds. Ten patients (7.6%) were infected with *Candida* species. All patients with yeast infections were also infected with bacteria with the exception of one patient who was infected with *Candida tropicalis* alone. The predominant yeast recovered was *Candida krusei*. Yeast infection was found to be more common in the younger age group. The isolation of a *Candida* species alone from one patient and *Candida* isolation from patients with sepsis in burn wounds indicate a significant role for yeasts in the production of infection in burn wounds. Therefore, special cultures for yeasts are recommended for all cases of burn wound infection.

Zusammenfassung. In einer prospektiven Studie wurden 132 Verbrennungspatienten auf Hefe-Wundinfektionen untersucht. Zehn Patienten (7.6%) waren mit *Candida*-Arten infiziert. Die Patienten waren auch mit Bakterien infiziert außer einem, von dem nur *Candida tropicalis* isoliert wurde. Die vorherrschende isolierte Hefe war *Candida krusei*. Hefeinfektionen waren bei jungen Patienten häufiger. Die *Candida*-Monoinfektion bei einem Patienten und die *Candida*-Isolierung von Patienten mit Sepsis begründen die Empfehlung, sämtliche Wundinfektionen bei Verbrennungspatienten auch auf Hefen zu untersuchen.

Introduction

Prior to the advent of topical antimicrobials, invasive fungal infections were not common. With the use of these agents, 25% of burn wounds seen at post-mortem will harbour fungi [1]. Several investigators have found that the ratios of various species of organisms from the surface of burn wounds were roughly proportional to those from blood specimens or from biopsy cultures [2, 3]. Because of this, in most centres surface microbial growth is routinely monitored, enabling the evaluation of the effect of therapy and prediction of those microbial strains that may become involved in sepsis. The aim of this study was to investigate the prevalence and role of yeasts in burn patients with wound infection.

Patients and methods

A prospective study of 132 patients admitted to the burn units at three medical centres was initiated. The study extended from March 1996 to September 1997. The mean age of patients was 20 years (range, 1–67 years); 49 patients were under the age of 15 years; 59 were males and 73 were females. Only patients with clinical signs of burn wound sepsis were included in this study [4].

Specimens for yeast culture were collected either as a piece of subeschar tissue (nearly 0.5 g in weight) or collected by a cotton swab from subeschar exudate. The following media were used for isolation of yeasts: Sabouraud glucose agar, potato-carrot agar and potato-glucose agar. All of the media were supplemented with gentamicin and chloramphenicol.

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Table 1. Data for patients with yeast infection in burn wounds

Case no.	Age (years)	Sex	Burn site	Temp. (°C)	Burned body surface (%)	Degree of burn	Dressing	Antibiotics		Bacterial isolates	Yeast isolates
								Topical	Systemic		
1.	12	M	Lower limb	38	7	3rd	Closed	Tetracyclin	Ampicillin (o)	None	<i>C. tropicalis</i>
2.	2	M	Trunk & extremities	37	15	1st & 2nd	Closed	Tetracyclin	None	<i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i>	<i>C. krusei</i>
3.	13	M	Trunk & extremities	37	20	1st & 2nd	Closed	Tetracyclin	Cefotaxime (p)	<i>Pseudomonas aeruginosa</i> <i>S. aureus</i>	<i>C. krusei</i>
4.	28	F	Trunk & extremities	37	15	2nd	Closed	Tetracyclin	None	<i>Pseudomonas aeruginosa</i>	<i>C. tropicalis</i>
5.	16	M	Lower limbs & trunk	37	35	2nd & 3rd	Closed	Tetracyclin	Erythromycin (o) Cefalexin (o) Metronidazole (o)	<i>Pseudomonas aeruginosa</i> <i>S. aureus</i> , <i>Proteus</i> spec	<i>C. krusei</i>
6.	35	F	Trunk & lower limbs	37	30	2nd & 3rd	Open	*Sulfa	Erythromycin (o)	<i>Pseudomonas aeruginosa</i>	<i>C. albicans</i>
7.	4	M.	Trunk & lower limbs	38.5	25	2nd	Open	Tetracyclin	Cefalexin (p)	<i>S. aureus</i>	<i>C. tropicalis</i>
8.	40	M	Trunk & lower limbs	37.5	15	1st & 2nd	Closed	Sulfa	None	<i>S. epidermis</i> <i>Strep. spec.</i> <i>Bacteroides</i> spec	<i>C. albicans</i>
9.	1	F	Extremities & face	38	20	2nd	Closed	Tetracyclin	Cefalexin (o)	<i>Pseudomonas aeruginosa</i> <i>S. aureus</i>	<i>C. krusei</i>
10.	8	F	Extremities & trunk	38	40	2nd & 3rd	Open	Sulfa	Ampicillin (o)	<i>Pseudomonas aeruginosa</i> <i>Klebsiella</i> spec <i>Proteus</i> spec <i>Fusobacterium</i> spec	<i>C. krusei</i>

Temperature and antibiotics were recorded at time of specimen collection.
M, male; F, female; (o), oral route; (p), parental route. *Sulfa=Silver sulphadiazine 1% Cream.

Aerobic and anaerobic bacterial cultures were also performed for all cases. The microbial growth was determined semi-quantitatively. Yeast colonization of a burn wound was regarded as positive when the growth was moderate or heavy or when the same organism was obtained from several wound sites or on several occasions or when direct microscopic examination revealed yeasts. Sparse microbial growth was regarded as negative. Yeasts and bacteria were identified using conventional methods [5].

The chi-square test of significance was applied for statistical analysis.

Results

Ten patients (7.6%) were infected with *Candida* species. Six patients were male and seven patients were in the age range, 1–16 years (Table 1).

There were 76 patients who were managed by use of occlusive dressing, of whom seven (9.2%) were infected with *Candida* species. The other 56 patients were managed by open dressing, of whom three (5.4%) were infected with *Candida* species. The difference in the incidence of yeast infection in the cases of occlusive and open dressing was statistically not significant ($\chi^2 = 0.68$, d.f. = 1, $P > 0.05$).

All yeast infections were mixed with bacterial infections except for one patient who was infected with *Candida tropicalis* alone. The predominant yeast recovered was *Candida krusei* (five isolates).

Cases with yeast and bacterial infections were given nystatin skin ointment in addition to the antibiotics in use. In these cases the improvement of the wound infection could not be evaluated because of associated bacterial infection. On the contrary, the patient with yeast infection alone was given nystatin skin ointment and the systemic and topical antibiotics were withdrawn. The signs of wound infection were improved within a few days and the culture became negative.

Discussion

The isolation of *C. tropicalis* alone from one patient and recovery of other *Candida* species

from patients with clinical signs of burn wound sepsis indicate an important role of yeasts in burn infection. However, yeasts may invade deep organs via the blood stream, leading to severe complications [6].

Although the difference was statistically not significant, the rate of recovery of yeasts was found to be more common in cases of occlusive dressing than of open dressing. This may be related to a moist environment in cases with occlusive dressing, favouring the growth of yeasts in burn wounds. On the other hand, anaerobic bacteria were found more commonly in the wounds of patients who were treated with the open dressing method [7]. Yeast infections were also found more frequently in the younger age group. This could be related to a higher sensitivity for *Candida* infection during childhood.

In view of these findings, it is recommended that routine yeast cultures are carried out for patients with burn wound sepsis and antimycotic chemotherapy is initiated in positive cases.

Acknowledgements

We would like to thank Mr Mohamed H. Khudor, Department of Biology, College of Science, University of Basrah for all the facilities provided.

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