BURNS AND BACTERIA THE INTERACTION

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In India those suffering from burn injuries are treated under various circumstances, in conditions ranging from the general ward of a small District hospital which is often inadquately equipped, a casulty ward of a busy hospital in a teeming metropolis, in a well equipped Burn Unit in some few centres, and in splendid isolation of a room in a sophisticated private clinic.

Management of burn wound infection has always been a problem in all such surgical units. Cross infection, and the too frequent indiscriminate use of anti microbial agents has added to increased uncontrollable sepsis. In Calcutta Medical College, over 300 major burns are admitted in the Casulty wards every year. The following is the analysis of results obtained in a study of 50 major (above 40%) burns admitted at this hospital. In this study an attempt has been made to highlight the nature of the invading bacteria, and the sensitivity or lack of sensitivity to the various antimicrobial agents which have been used in the treatment of such burns by different surgeons. In all cases in the study, the bacterial flora on the burn wounds have been established by pus cultures, and blood cultures. The bacterial sensitivity to several antibacterial agents in use has been assessed.

Swab cultures from the wound surfaces were taken from the day of admission and repeated daily. Majority showed the appearance of micro-organisms in the burn wound from the 2nd and 3rd post burn day (Figure I).

The organisms isolated were mainly Ps. aeruginosa and Staph. aureus. (Figure 2).

The Sensitivity tests were as follows :

Sensitivity of Staph. aureus (figure 3).

Sensitiivity of E. coli (figure 4).

Sensiitivity of B. proteus (figure 5).

Sensitivity of Klebsiella (figur 6).

Sensitivity of Pseudomona aeruginosq (figure 7).

Sensitivity of mixed growths (figure 8).

The total number of swab culture in the 50 cases were 495.

The total number of positive cultures were 422.

The appearance of clinical wound sepsis was rise of temperature, and the nature of the wound. Temperature varied greatly. The large burns when exposed evaporated fluid so rapidly that often the attendant caloric demands impaired the usual febrile response to infection. However if occlusive dressings were used, and in summer months temperatures of 105° to 106° F were seen. In gram negative septicemia preterminal hypothermia of 93° to 95° occured. The wounds showed areas of degeneration, suppuration. In Pseudomona sepsis there was often brown discoloration of the eschar, erythema gangrenosum, typical blue green pus, and petichae. The day on which wound sepsis was proven was

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by demonstrating 10^5 or more bacteria per gram of tissue. (figure 9) The organisms involved in wound sepsis showed a preponderance of Pseudomona aeruginosa (figure 10).

Septicemia was proved by blood culture studies. The day of positive blood culture was from the 5th to the 7th post burn day (figure 11) 12 positive blood cultures occured in 55 cultures performed (Figure 12). It is significant that whereas five microorganisms were involved in wound sepsis (in swab cultures and tissue biopsy), only two viz. Pseudomona aeruginosa and kebsiella were found in the blood cultures, all were mildly sensitive to Garamycin only, and all the six patients succumbed to rapidly developing septicemia despite the use of Garamycin. (Figure 13) In this study of burn wound infection of cases treated in a representitive general surgical casualty ward of a busy city hospital, the following facts could arrived at. Burn wound contamination followed by sepsis occured early within the 3rd and 5th post burn days. Clinical evaluation of wound sepsis almost invariably coincides with tissue study proven wound sepsis. Pseudomona aerugiosa was by far the commonest infective organism and responsible for rapidly developing sepsis and fatal septicemia, the onset of which occured between the 5th and 10th post burn days. The antibacterial sensitivity studies revealed a state of hospital cross infection with abundance of resistant strains.

Under such circumstances where burn wound is a veritable "bacterial zoo", where the exhibition of various antimicorbial agents seems almost futile. Early biologic cover may seem ideal but difficult to achieve due to shortage of blood, non availability of homografts and xenografts. In such a situation, the clinician is in a dilemma how to transform a burn wound with bacterial infection into a closed and healed wound, with the existing tools for controlling burn wound infection available to him.

Figures I

Day of appearance of organisms in burn wound first positive swab culture

Day	Number of Cases
1.	4
2.	24
3.	21
4.	1
5.	0

Figures 2.

Microorganisms isolated by swab culture from wound surface

Organism	Number of swab cultures
Pseudomona aer.	171
Staph aureus.	128
Ecn. coli.	42
Klebsiella aer.	14
B. proteus.	31
Mixed.	36

Sensitivity Tests of Different Organisms Isolated by Pus Culture

	Pen.	Strept.	Tetr.	Eryth.	Chloro.	Genta.	Mande.	Nitrofu.	Sulpha.	Amp.	Poly.	Nalid.
Staph. aureus	—	(2)+	(1)+	(13)+++	(7)+++ (6)++	(13)+++	—	—	—	—	—	—
E. Coli	—	(2)++	(1)+	—	(2)+++ (2)++	(4)+++	(3)++ (1)+	(2)++ (2+)	—	(2)+	—	(4)+++
B. Proteus	—	—	—	—	(2)+	(2)++	—	—	—	—	—	—
K. aeruginsoa	—	—	(2)+	—	—	(2)+++	—	—	—	—	—	—
Ps. pyocyaneus	—	—	—	—	—	(12)+++ (13)++	—	—	—	—	(5)+	—
Mixed organisms	—	—	—	—	—	(4)+++	—	—	—	—	—	—

(Pen.=Penicillin, Strept.=Sterptomycin, Tetr.=Tetracyclin, Eryth.=Erythromycin, Chloro.=Chloramphenicol, Genta.=Gentamycin, Mande.=Mandelamine, Nitrofu.=Nitrofurantoin, Sulpha.=Sulphadiazine, Amp.=Ampicillin, Poly.=Polymixin, Nalid.=Nalicdixic acid. Highly sensitive=+++, Moderativiely sensitive=++, Midly sensitive=+, number in ( ) indicates no. of cases.

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