

ROLE OF PARENTERAL ANTIBIOTICS IN THE MANAGEMENT OF EXTENSIVE BURNS

C. P. SAWHNEY, R. K. SHARMA AND S. P. LAGVANKAR

SUMMARY

A total of 458 burn patients admitted in the Plastic surgery department of the Postgraduate Institute of Medical Education and Research, Chandigarh during 1982-1985 have been analysed. The situations have been identified where the use of parenteral antibiotics is indicated. Emphasis is laid upon the judicious and rational use of systemic antibiotics during the course of extensive burns especially in cases of established invasive sepsis.

(Key Words : Burns, Infection, Antibiotics)

There is a tendency for indiscriminate use of parenteral antibiotics with a view to prevent and treat sepsis in extensive burns. This is not rational as delivery of effective concentration of drugs at burn wound site is not possible because of special characteristics of burn wound. Allen (1942) also cautioned against the indiscriminate use of antibiotics. However there are situations where judicious and timely use of antibiotics can prevent and treat the dreadful burn wound infection. The present study was undertaken with a view to identify the situations where antibiotics are particularly indicated and for this, the records of burn patients treated in our department have been analysed.

Material and Methods

In all, 458 patients admitted during 1982-1985 have been analysed. All the patients had burns involving 20-50% of body surface area (BSA). Patients with more than 50% BSA had high mortality and were not included in the study. Out of 458 patients only 109 (27.79%) received the antibiotics. Most of the patients were admitted within 10 hrs. of sustaining burns. However 43 patients were admitted after a delay of 72 hrs. The age varied between 1-78 years. This study included 58 children between the age of 1 to 12 years.

The management of the patients followed a standard regimen. After initial resuscitation, the burn wound was debrided and dressed with 1% topical Silver sulphadiazine. The dressings were changed daily. Monitoring of the bacterial flora colonizing the surface of the burn wound was done by getting surface swab cultures twice a week. Blood cultures were also taken once a week, or more frequently if patients developed high grade fever with deterioration of general condition. Whenever indicated, venepuncture/venesection sites were also monitored for infection.

The use of parenteral antibiotics was generally restricted to cases of established invasive sepsis. The following criteria were taken into account for suspecting invasive sepsis :

1. High continuous fever with deterioration in the general condition of the patient.
2. Conversion of partial thickness to the full thickness burn wound.
3. Focal or generalized black discoloration of the wound.
4. Degeneration of the granulation tissue with 'Neoeschar' formation.
5. Metastatic lesions in the unburned skin.
6. Positive blood cultures with high continuous fever.

Observation

We critically analysed our cases and have classified the indications for their use as under :

A. Prophylactic

(a) *Primary Excision* : Patients undergoing burn wound excision were covered with antibiotics which were started a day prior to the operation so that effective blood levels of the drug were established at the time of opening up of new tissue planes and vessels during surgery. The choice of antibiotics was usually determined by surface swab culture and sensitivity reactions of the organisms colonizing the burn wound. When the surface swab culture was sterile, the antibiotic given was in accordance with the sensitivity of the bacterial flora prevalent in the ward. None of these patients developed any evidence of invasive sepsis in the post-operative period.

(b) *Penicillin prophylaxis* : In the year 1982 and 1983, all patients routinely received penicillin prophylaxis against streptococcus for initial 3 days. However this was discontinued in 1984 and 1985 but no increase in the incidence of streptococcal wound infection was observed (Tab. I).

Table I. Showing incidence of streptococcal sepsis in burn wound

	1982	1983	1984	1985
Streptococcal infection	2.2%	1.1%	1.3%	2.4%

(c) 12 patients having electrical burns with gangrenous extremities and proximally spreading cellulitis necessitating urgent surgery were also given antibiotics preoperatively. 10 patients had burns associated with multisystem injuries like fractures, intra-abdominal injuries and they also received prophylactic drugs.

B. Established sepsis

Two groups of cases are included in this :

(a) *Invasive sepsis with positive blood culture* : In patients who had clinical signs of invasive

sepsis and where positive blood culture and sensitivity reports were available, the antibiotics were administered according to the sensitivity reports. The antibiotics were continued till the fever came down and the subsequent blood culture was sterile. A total of 53 patients belonged to this group.

(b) *Invasive sepsis with blood culture report awaited* : In patients who had established sepsis as evidenced by high continuous fever, tachypnoea, tachycardia, decreasing urine output and where the blood culture report was awaited, the antibiotics were given according to the latest culture sensitivity reports of organisms colonising the burn wound. Out of 18 cases, the choice of antibiotic was correct in only 10 patients. In the rest, either the blood culture later grew different organism, or the organisms grown were found to be resistant to the antibiotic given.

75% of the patients who received antibiotics had deep burns. Only 9.2% patients having deep dermal burns needed the drugs. These were either children below the age of five year or had burns involving more than 40% B.S.A. 15.8% of patients receiving the antibiotics had mixed depths of the burns (Deep + Deep dermal) (Chart-1). Fifty nine percent patients had

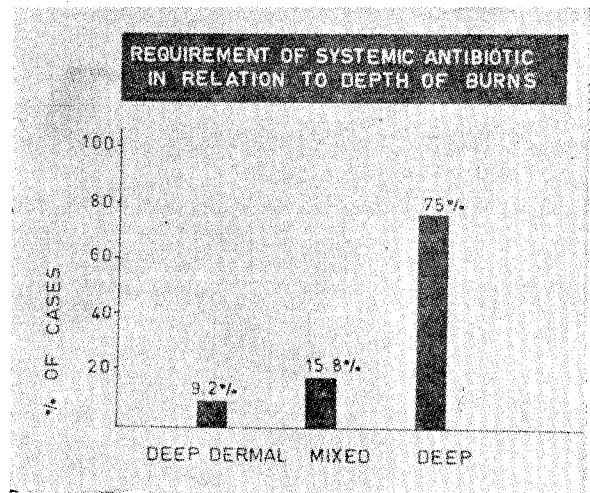


Fig. 1. Requirement of systemic antibiotics in relation to depth of burn.

burns between 40-50% B.S.A. Only ten percent of the patients receiving antibiotics had burns of less than 30% B.S.A. (Chart-2).

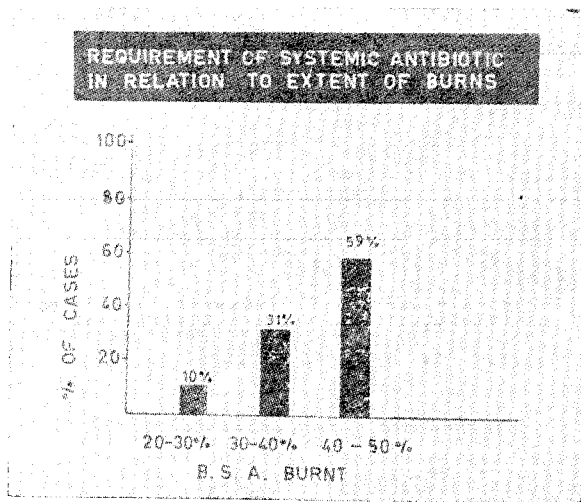


Fig. 2. Requirement of systemic antibiotics in relation to extent of burns.

The antibiotics were needed mostly in the second week (40.8%) and third week (28.3%). During the fourth week and beyond fourth week the number of patients requiring drugs were quite small (14.7% and 12.3%) respectively. Only 16 patients (14.7%) were given antibiotics in the first week out of these 5 were children below the age of 5 years, 3 came late to hospital with already established sepsis and 8 patients had electrical burns (Chart-3).

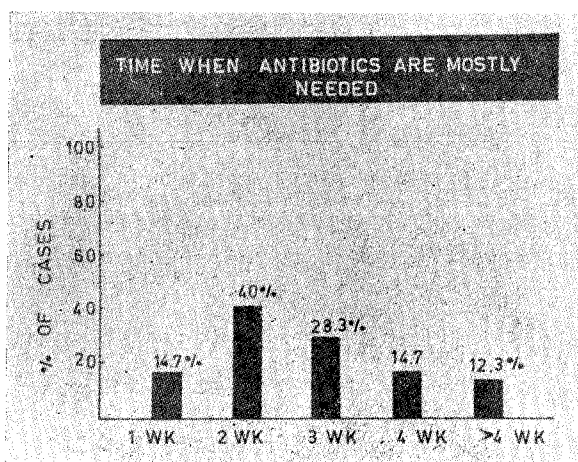


Fig. 3. Time when antibiotics are mostly needed.

Discussion

Antibiotics therapy has resulted in dramatic improvement in the survival of serious burn patients, but their indiscriminate use is not rational. The burn wound has an avascular eschar, and there is occlusive vasculitis in the vicinity of the burn site. As a result of these features, the parenterally given antibiotic will not always be reaching the burn site in effective concentration. Another draw back of extensive use of the antibiotics is the emergence of the resistant strains of opportunistic organisms (Moncrief, 1964). The antibiotic should be used only when specific indications are there. Another point worth considering is the duration for which the antibiotics should be continued (Weselay, 1971). On the basis of our experience the following conclusions about the administration of systemic antibiotics to burn patients can be made:

1. Prophylactic systemic antibiotics should not be used, since even penicillin may result in disturbance of wound ecology and lead to emergence to opportunistic pathogens (Fernando, 1962). Routine penicillin prophylaxis against streptococcus is not really needed. However, prophylactic antibiotic should be administered in patients undergoing burn wound excision. The antibiotics should be started a day prior to surgery and be continued post operatively for about a week. Patients of electrical burn with proximally spreading cellulitis necessitating surgery would also benefit if the systemic antibiotics are given likewise. In such patients, generally gentamycin/cotrimaxazole were given.
2. As a general rule, systemic antibiotics should only be used if there is clinical or bacteriological evidence of invasive burn wound sepsis with positive blood culture and septicaemia. The choice of antibiotic should be according to reports of bacteriologic surveillance. However, if no culture sensitivity reac-

- tion data is available and the patient has irrefutable evidence of invasive sepsis, it is prudent to administer a broad spectrum antibiotic covering organisms prevalent in the burn unit. Gentamycin or third generation cephaloridine like cofoxitin were used in such cases.
3. Frequent bacteriological monitoring of the burn wound should be done to aid in selection of appropriate antibiotics if needed.
 4. Once started systemic antibiotic should not be given for more than 5-6 days without careful reappraisal of the indications for their use and confirmation that antibiotic chosen continues to be the most suitable one (Weselay, 1971).
 5. The diagnosis of invasive sepsis may need not necessarily include recovery of positive blood cultures, but should reflect a careful clinical evaluation. Wound swab is a poor guide regarding choice of antibiotic in such a case. Here it would be advisable to use a broad-spectrum antibiotic effective against the prevalent wound flora of the burns unit.
 6. Antibiotics are usually needed in the 2nd and 3rd week. This correlates well with the experimental laboratory work, showing marked depression of cellular and humoral immunity during this time (Allen et al., 1982).
 7. Patient with burns less than 20% B.S.A. usually do not need antibiotics. However after more than 25% B.S.A. burns,
- the need for antibiotics increases as body's defence mechanisms are markedly depressed above 25% B.S.A. burns (Menon, 1984). However, in children below 3 years of age, the systemic antibiotics may be needed even with burns lesser than 20% B.S.A.
8. Deep dermal burns would usually not require the administration of antibiotics; however if involvement is more than 40% B.S.A. the need for antibiotic increases.

Conclusions

Systemic antibiotics are a valuable therapeutic modality in the management of burned patients when properly used. Injudicious use can be detrimental as it would lead to emergence of resistant strains of bacteria. Routine penicillin prophylaxis against streptococcus is no longer recommended as the incidence of the invasive sepsis does not increase even without its use. The prophylactic antibiotics could be justifiably used in the immediate pre-operative and post-operative periods in patients undergoing burn wound excision, and in patients with multisystem injuries where other conditions call for use of the antibiotics. Children below the age of three years would also benefit by the use of prophylactic antibiotics. The penetration of the systemic antibiotics into the burn eschar remains doubtful, hence these can't be the only therapeutic modality to treat the burn wound infection. The active surveillance and monitoring of the burn wound and the environment in which the patient is being treated is mandatory for choosing the correct antibiotic.

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