

OPERATIVE GUIDELINES IN BURNS EMERGENCIES IN A BATTLE ENVIRONMENT

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SUMMARY. An account is presented of the current rules to be followed in the approach to burn patient treatment, in the light of the experience gained by the Italian Army Medical Corps in the numerous humanitarian missions performed outside Italy's national borders.

Introduction

In the last fifteen years the Italian Army Medical Corps has been engaged in numerous peace-keeping and peace-enforcing missions in various parts of the globe, with tasks of assistance directed towards both the multinational contingent and the civilian population.

The experience gained in a wide variety of operative conditions has been assimilated in all its different aspects as a lesson learned, i.e. as a precious and unchallengeable treasure-chest of knowledge acquired in the light of all the events - both positive and negative - that occurred.

The development of guidelines for burns emergencies is the natural result of a process of care and assistance planning aimed at achieving the greatest possible numerical efficiency of the armed contingent engaged in the field and the best possible technical-logistic training for Medevac.

The programming of care and assistance activities beyond a country's national borders, in nations that are socially and economically developed, has to take into account all the characteristic features of the battle environment (*Table I*). Most importantly, although health care is provided in mobile facilities located where the local terri-

tory offers the most suitable environmental conditions, the means available in terms of clinical diagnosis and therapy are limited compared with those available in hospital facilities back in the home country. The use of means and materials in medical facilities in the field has to conform to criteria of economy and correct distribution because of the great length of the logistic sanitary supplies chain and the reduced possibility of using local health facilities.

Other important features are the sometimes precarious hygienic conditions, the risk of burn patients' conditions deteriorating, and the difficulty of organizing evacuation procedures.

The most frequent circumstances of thermal burns in the battle environment are related to the accidental catching fire of combustible material (especially kerosene) and to the explosion of bombs, in which specific case the heat effect is associated with a blast wave of varying strength.

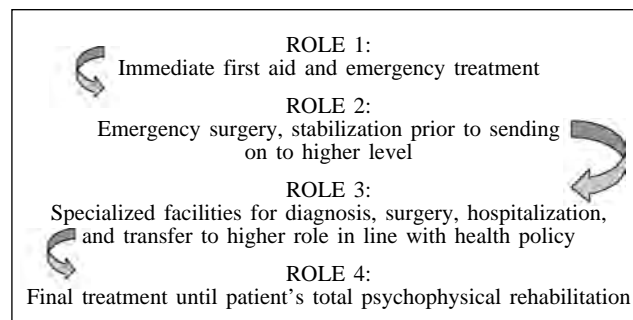
Field organization

In the Italian Army, medical organization in the battle environment is articulated in four progressively numbered structures, known as ROLES, of different levels of complexity (*Table II*).

Table I - Battlefield environment

<ul style="list-style-type: none"> • Services supplied in mobile field facilities • Reduced availability of vehicles • Precarious hygienic conditions • Extended health supplies chain • Limited opportunities for recourse to local health facilities • Risk of deterioration • Difficulty of clearance operations
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Table II - Field health organization



ROLE 1 provides the wounded arriving from the battlefield with first aid and emergency treatment.

ROLE 2 is a more articulated facility, possessing an operating room and diagnostic equipment, where it is possible to perform emergency operations and stabilization procedures prior to sending patients on, if necessary, to a higher level. ROLE 2+ is more complex and has resuscitation beds. However, the basic ROLE 2 offers ample hospitalization facilities either in pneumatic tents or in accommodation units.

ROLE 3 is able to provide high-profile surgical, medical, anaesthetic, and reanimation procedures; it is also equipped with diagnostic, laboratory, and radiology facilities as well as an adequately equipped pharmacy. ROLE 3 also has ample facilities for patients with complications.

ROLE 4 is represented by the Rome Military Polyclinic, Medevac's end-point health facility. The ROLES diagnostic and operative battle capacity is however conditioned by a series of factors that have to be foreseen and that always have to be tackled in health activities in operational zones.

The conditioning elements are: a) the overall number of victims of a heat-related event - the proportions and characteristics of the event determine the number of persons affected directly or indirectly by burns; b) the distance of the field hospital from the site of the event - associated with the topography of the territory; c) constitutes a basic element for estimating waiting time and the arrival of the wounded in hospital; d) the selection of patients on the basis of the seriousness of their injuries (war-triage) is the key to the beginning of all therapeutic programmes - the distribution of the wounded among field hospital workers is much influenced by the number of personnel; e) also, the presence of diagnostic and therapeutic facilities; f) of a certain level will affect the appropriateness of the treatment; g) the presence of independent health facilities in the vicinity of the hospital and the viability of appropriate means of transport are a fundamental therapeutic reserve in the event of an overload of injured persons (*Table III*).

Table III - Operative capacity in battlefield conditions

CONDITIONING ELEMENTS
• Overall number of casualties
• Distance between place of event and field hospital
• Timing of patients' arrival and triage on basis of gravity
• Topography of territory
• Size of medical staff
• Capacity of diagnostic and therapeutic facilities
• Distance to local health facilities
• Means of transport available

A preliminary study of the geographical, environmental, and social characteristics of the territory where the field facility is to be set up is extremely important for both organizational and practical purposes.

Knowledge of the ethnic and religious differences among the population being assisted averts inappropriate action both during preliminary medical examinations and in the therapeutic stage; it may also be of considerable value to be informed of any cultural or behavioural diversities.

An analysis of the territory and the climate assists in the preparation of the materials and medical equipment that are most appropriate for the activity of collecting and evacuating the wounded.

Battlefield treatment algorithm

In line with American authors we use in battlefield operations the rule of the three T's: Triage - Treatment - Transport.

The operative flowchart is articulated in the following steps: 1. Collection of the wounded on the field. 2. Transport. 3. Distribution of the wounded among the personnel. 4. Approximate and rapid classification of the gravity of the lesions. 5. Triage of patients. 6. Immediate therapy and delayed therapy.

The immediate treatment of patients who can be transported to a field hospital includes resuscitation therapy and local therapy. Resuscitation therapy consists of the elements presented in *Table IV*, with particular attention being paid to the search for objective signs of the inhalation syndrome and to its early treatment. Local therapy immediately follows the phases indicated. Immediate treatment aims at the stabilization of the vital functions, correct sup-

Table IV - Immediate treatment

INTENSIVE CARE
• Basic life support / Battlefield advanced trauma life support
• Ventilatory assistance
• Emergency laryngobronchoscopy
• Analgesia / sedation
• Hydrous electrolyte balance
• Intravenous fluid therapy
LOCAL THERAPY
• Removal of clothing?
• Cleansing / disinfection
• Emergency escharotomy
• Specific covering of wounds

Table V - Immediate therapy targets

CORRECT PARAMETERS	
• Haematocrit	< 50%
• Diuresis	0.5-1.5 ml/kg/h
• Systolic arterial pressure	adults > 100 mm Hg children > 70 mm Hg
• Heart rate	adults < 100 b/min children < 140/120 b/min
• Body temp.	< 38.5°
• Acid-base equilibrium	
• Electrolytes	
• Glycaemia/protidaemia	
CHECK FUNCTIONS	
• Clean	
• Distend	
• Debride	
• Prevent heat loss, dehydration, protein loss, haemorrhage	

Table VI - Immediate intensive therapy

DEEP BURNS	
• Adults* (> 15%)	- 2 v.v. periph.
	- Ringer's lactate 20 ml/kg - first h
	- R. L. 2 ml/kg/% - 1-8 h
	- R. L. 1 ml/kg/% - 9-24 h
• Children* (> 10%)	- 1-2 v.v. periph.
	- R. L. 500 ml/1st h
	- R. L. 3 ml/kg/h - 1-24 h
	- Dextrose 5% (NaCl 0.45%) 4 ml/kg/h first 10 kg
	2 ml/kg/h second 10 kg
	1 ml/kg/h last 10 kg
* Enteral nutrition after 24 h - 0.5 cal/ml (25 m/h)	

port of blood circulation, and efficient perfusion of the renal excretory system (*Table V*).

Fluid therapy consists of the use of Ringer's lactate both in adults and in children in association with 5% dextrose and the use of albumin in more extensive burns (*Table VI*).

Early enteral nutrition is an element of great importance for the restoration of a patient's general condition and for a good immune response.

Immediate local therapy is conditioned by the extent of the burns but is in all cases based on early application of hydrogel with a cooling sponge and antiseptic medication (*Table VII*).

An accurate assessment must be made of full-thickness circumferential burns in the limbs and thorax, for which emergency escharotomy may be necessary.

Secondary local therapy of limited burns is based essentially on the use of petrolatum gauze in association with antiseptic compounds (chlorhexidine, iodopovidone, or bismuth tribromophenate). Necrectomy is performed early (day 3 or 4), especially if the burns affect "noble" body parts.

In more extensive burns it is advisable to organize a Medevac towards appropriate Centres for burns treatment; depending on the distance from the destination facility (friendly territory or the homeland), transport can be either by road or by air. In whichever case, the preparation of patients for a Medevac includes the performance of a series of standard manoeuvres, as shown in *Table VIII*.

The deployment of complex health facilities requires the transport and mounting of modules equipped as operating and intensive care units. The patients can be kept in

Table VII - Immediate local therapy

DEEP BURNS*	
• Limited burns (>20%)	
	- Hydrogel on cooling sponge
	- Silver sulphadiazine
	- Chlorhexidine-based dressings
	- Silver-based dressings
• Extensive burns (<20%)	
	- Hydrogel on cooling sponge (>20%)
	- Electric blankets**
	- Silver sulphadiazine
	- Silver-based dressings
* Emergency escharotomy	
** NB risk of systemic hypothermia	

Table VIII - Preparation for medical evacuation

• Cannulation of several venous routes (one central!?)
• Monitoring of diuresis (child 1 ml/kg/h - adult 0.5 ml/kg/h)
• Insertion of nasogastric probe
• Sedation and/or analgesia
• Cleansing of wounds
• Tracheal intubation
• Devices to prevent heat loss

Table IX - Type of hospitalization

<ul style="list-style-type: none">• Limited burns (<20%)<ul style="list-style-type: none">- Filter tent- Two-four bed pneumatic bed- Two-bed living unit- Internal temperature control (heaters and thermoconvectors)- Internal humidity unverifiable• Extensive burns (>20%)<ul style="list-style-type: none">- Medevac in a specialized Centre

pneumatic tents, respecting all the standards indicated in *Table IX*, or in two-bed modules.

Conclusions

With regard to therapy, the Italian Army Medical Corps is in many aspects in the forefront and it could not fail to include among its numerous specialities such a modern and currently important branch of medicine as burns therapy, especially in the light of the experience it has gained in battlefield conditions and of the therapeutic challenges that the delicate sociopolitical balance of the new millennium will expect the Institutions to come to terms with.

RÉSUMÉ. L'Auteur présente ses observations sur les règles actuelles qu'il faut observer dans l'approche aux soins des patients brûlés, à la lumière de l'expérience gagnée par l'Unité Médicale de l'Armée Italienne dans les nombreuses missions humanitaires effectuées hors des frontières nationales italiennes.

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