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THE MANAGEMENT OF SEVERE POST-TRAUMATIC, IATROGENIC AND INFECTED WOUNDS

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TAVOLA ROTONDA: RICOSTRUZIONE DELLE PERDITE DI SOSTANZA DELL'ARTO SUPERIORE

INTRODUCTION

There is no doubt that the free tissue transfer by the use microsurgical techniques is now routine for the salvage of traumatized extremities (1).

Particularly, in severe traumas of the limbs contaminated by mineral oils, ground and vegetable cleis or material from the asphalt sometime coming from road traumas it is compulsory to clean the site of trauma before the microsurgical coverage avoiding the risk of serious infection or septic non-union that could undermined the success of the reconstructive procedure.

In these cases it seems to be opportune to differ the soft tissue reconstructive time of 7-10 days, employing during this period all the medical support at the disposal of the therapy and any further repeated debridement to clean the site of the lesion, applying an intravenous specific antibiotic therapy too (2-5).

The medical support therapies very useful to treat the soft tissue infected or contaminated wounds are the HBO and VAC therapy, while in large bone loss with high risk of infection, we do before the radical surgical debridement and after we apply the spacer of cement with antibiotics. In the second stage (after 45-60 days) if the laboratory, clinic and x ray are silent for the infection, we use the fibula microsurgery transfer or, sporadically, the Ilizarov technique to complete the reconstruction.

MATERIALS AD METHODS

From 1996 to 2009, 18 patients were treated, suffering from severe large lesions of the skin and the soft tissue of the limbs, with exposure of bone fractures in consequence of serious crush injury

Whatever the origin the treatment consisted of a combination, at different pre-fixed stages, of debridement surgical procedures, medical supplies methods and definitive microsurgical reconstruction. In few cases we used the Ilizarov technique.

The average age of the patients (12 men and 6 women) was 23.25 years ranging from 8 to 58.

The follow up period ranging from 6 to 36 months.

The patients were selected for the combined Medical Support Methods and Microsurgery protocol according to the following criteria:

1. wide deep ulcers with exposure of bone fractures and tendon structures;
2. large distrophic tissue around the ulcer tending to become necrotic and ulcerous;
3. no chance of spontaneous repairing;
4. possibility to maintain or recover function with the repairing treatment.

All the patients were considered for a three-phase protocol: debridement, Medical Support Methods applying and microsurgical procedures.

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Results

The combined protocol (medical support methods and microsurgery) has allowed the complete and quick resolution of the clinical problem in the case of large lesions difficult to treat by traditional non-microsurgical procedures, creating the anatomic conditions most suitable for the flap transplant and therefore reducing the incidence of sequelae.

HBO, accelerating the healing process, makes it possible to transplant the flaps on recipient well vascularized trophic beds and favours the taking of the free skin grafts on the donor sites.

In particular, in our experience any time we used HBO treatment in accordance with the combined protocol after the debridement and before the definitive wound management by free-tissue transfer, no complication has occurred at the recipient site and a considerable reduction of the chronic phlogosis around the lesion has been observed. A well vascularized tissue bed received the free-flap.

Discussion

The treatment of the mangled extremities still presents a reconstruction challenge difficult to resolve. The massive extremities injury following crush high energy traumas characterized by massive necrosis of wide soft tissue areas and infections with large exposure of bone fractures and joint structures still remain a main indication for the limb amputation (6).

There is no doubt that in all these cases microsurgery procedures allowing the transfer of viable autologous tissue and, where necessary, restablishing continuity between the main vessels, enable the en bloc reconstruction of the morpho-functional unit without size limits and an aesthetic and functional recovery of the limb, sometimes allowing surgeons to salvage extremities in patients who would formerly have required amputation.

Also in less wide lesions microsurgery procedures are preferred to traditional ones because of a smaller number of sequelae and deficits at a local level.

The most important factors influencing the microsurgical reconstruction of the limbs are:

- the selection of free-flap;
- the timing for the microsurgical reconstruction of the upper extremities.

Primarly, the choice of the flap depends to the recipient site requirements or the type of tissue deficiency (isolate or composite replacement) and its volume, but anytime the vascular anastomoses have to be performed in a "safe zone" far from the "zone of injury", characterized by an high risk of thrombosis. For that, anytime, when the vascular pedicle of the flap is short, we use the "vascular loop technique" to perform the anastomoses in a safe zone (3).

Besides in order to transplant the free flap on a cleaned wound bed, on the base of the ideal "reconstructive ladder", the surgeon should decide to perform the "primary coverage" by a free flap only when the bacterial status of the wound allows the microsurgical reconstruction without risk of infection, within 7-15 days after the initial debridement using that period to prepare the recipient-site by medical support such as HBO or VAC therapy (3).

Frequently we use free muscular flaps, because is the best repairing procedure for infected and ischemic wounds (7, 8), also with chronic osteomyelitis, because provides coverage for the debrided bone and soft tissue, obliterate dead space, as well as improve vascularity and enhance leukocyte function (9, 10).

Otherwise in these cases on which the crush injury determines a large bone loss or the bone fracture exposition with bone infection, after a radical debridement, we always apply the spacer of cement with antibiotics and an external fixation be fore to transfer the free flap. In the second stage (after 45-60 days) if the laboratory, clinic and x ray are silent for the infection, we use the fibula microsurgery transfer or,sporadically, the Ilizarov technique, to complete the reconstruction. In these cases we always use the spacer because since 1983 the defense capacity of staphylococcus, that prevents the action of antibiotics as general treatment, has been revealed, so applying a cement spacer with antibiotics we obtain both: the recovery of the septic focus, maintaining high the local concentration of antibiotic, and keeping the correct length of the bone.

Recently we use pre-manufactured cement with antibiotic, which contains gentamycine and clyndamicine, because these cements seem to be more resistant than the self-made cements.

In conclusion, for the treatment of severe crush injuries of the upper limbs with an high risk of infection, we propose a protocol in 3 phases:

1) radical surgical debridement, multiple if necessary;
2) 10 seats of HBO or alternatively VAC therapy,
3) microsurgical reconstruction with well vascularized tissue.

When still remain a large bone loss, we use a cement spacer with antibiotics to fill the bone gap and after 2 months we perform the 4° stage: the bone reconstruction by means of a fibula free flap or, sporadically, with the Ilizarov technique.

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