Fishing Rods and Severe Electrical Injuries of The Limbs.

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The Burn Unit & Plastic Surgery Department, The Teaching Hospital of Targu Mures Medical School, Romania. Long carbon-made fishing rods have been the main cause of leisure time accidents which were admitted in the Burn Unit of Targu Mures in the last ten years. The majority o these accidents occurred on occasional contacts of fishing rods with medium and high voltage electrical power lines (over 1000V). There are in fact two classifications of the electrical energy transported by power lines(2):

 Clinical classification, describing low voltage injuries produced by sources less than 1kV and high voltage injuries involving currents over 1kV;

 Industrial classification distinguishes low voltages (under 600V), high voltages (between 115~300kV), extra-high voltages (350~750kV) and ultra-high voltages (over 1MV). Most of these power lines transport alternating current which is 3~4 times more destructive for tissues than the direct one(1). Biological effects of electricity are local (destruction of skin and underlying structures) and systemic (cardiac, respiratory, nervous and so on). These effects are produced by direct tissue heating (Joule phenomenon) and by cell disintegration due to electroporation.

Carbon-made fishing rods are very conductive, transporting a huge amount of energy from the power line to the body, thus producing deep and extensive injuries, involving the hand in over 90% of cases. Rods burn instantly when touching the wire, this explaining why there is no "let-go" effect; at least 2/3 of such electrical injuries are associated with extensive flame burns due to electrical arcs, with very high temperatures (5,000~6,000C°), igniting clothes and footwear. All patients with such electrical lesions, admitted in the Burn Unit, underwent early extensive debridement for removing dead tissue, thus avoiding local and systemic complications (infection, toxic shock, renal failure and so on). Despite all accurate treatment (including limb salvage procedures and intensive care), at least half of these patients required amputations of fingers and other limb segments, followed by delayed complex reconstruction. Claw deformity,

the main sequela of electrical injuries of the hand, requires wide excisions of constrictive scars, skin grafting and even flaps for covering the postexcisional defects. General mortality is high, especially when high voltage injuries associate with extensive full-thickness burns.



CASE PRESENTATION:

A 63 year old male patient suffered a complex electrical injury by accidental touch of the railway power line (27kV) with his 6m long carbon made fishing rod; flame burns and electrocution involved his right upper limb, face, right abdomen and right foot (the "exit point", despite the fact he worn rubber boots). The image from above shows the initial aspect of upper limb lesions, when the patient has been admitted in the Burn Unit.



Facial burns have been produced by the initial electric flame as well as by the ignition of his synthetic raincoat; important edema developed soon after the accident.



A full-thickness burn developed on the dorsal aspect of his right foot (thrombosis of dermal blood vessels which can be seen in the above image, usually indicate a deep burn), involving all skin layers and the underlying structures (fascia and extensor tendons).



A thick black dry burn eschar is formed 48 hours after the accident; this patient underwent a delayed excision (72 hours after the injury), due to the initial shock, requiring accurate intensive care and preventing all aggressive surgery.



All dead tissue has been removed by sharp debridement (skin, superficial fascia and some of the extensor tendons involved in the necrotic process).



The image from above shows the excised eschars, including some extensor tendons as mentioned before.



The sharp debridement of the eschars has been completed by the amputation of the small toe (which has been destroyed by the so called "electric kiss" at the exit point). The remaining defect underwent a short conservative debridement by Ligasano PURfoam dressings, in order to improve the local blood flow and to obtain a good granulation bed (the so called WBP – wound bed preparation).



The good granulation bed from the previous image is then covered by a STSG harvested from the anterior aspect of right thigh.



The graft is sutured with interrupted sutures and covered by a paraffin gauze completed by a bolster dressing; this dressing is removed 3 days later and replaced by a similar one, for another 3-4 days.



One week later the graft has a full "take", as shown in the image from above.





Despite the accurate dressing and splinting of the electric lesions of the right hand, important scar contracture developed on both dorsal and volar aspects; the image from above shows the scar band involving the first web space.



As already mentioned before, the volar aspect of the right hand demonstrates the same scar contracture involving the first web space and the thenar and hypothenar eminences (the first web space and the proximal palm are more involved, because these are the points by which the rod has been held in the hand).



The scar contracture from the first web space and the palm is then excised under tourniquet, and several incisions are made in order to release tension and to prevent further scaring.



The remaining defect is then covered by a FTSG, harvested from the lower abdomen; the graft is sutured by interrupted sutures, tied on a tie-over bolster dressing.



One week later follow-up demonstrates a good "take" of the graft, excepting a small area over the distal palmar crease, where a hematoma formation has prevented graft adherence and integration. Sutures have been removed 10 days after the operation.



Two weeks later, the FTSG demonstrates a good blood supply; even the small area (where the graft didn't "take") has epithelialised.



One month later the FTSG has a very good color and all fingers show a very good extension; beside this, the first web space has a complete opening, with full abduction and extension of the thumb.



The same good appearance can be seen on the dorsal aspect of the first web space.



This patient has worn permanent pressure garments (in this case a customized special pressure glove with silicon insertions to the web spaces and the palm); according to our experience, customized pressure garments are always a very important postoperative step in the burn scar management.



One year later, there is a very good appearance of the right hand, all fingers showing an excellent ROM (range of motion); beside this there is no new scaring process on the palm and the first web space.



The same good result can be seen on the dorsal aspect of the right hand and on the first web space especially.

CONCLUSIONS:

Leisure time accidents produced by direct contact of carbon fiber fishing rods with power lines, are dramatic and have very destructive consequences, requiring long hospitalization and complex surgery; such injuries are often followed by permanent infirmity with disastrous somatic, psychological and social effects. The best way to prevent such accidents is to limit the use of these fishing rods near power lines and to follow the general precaution protocols recommended by all fishing rod manufacturers.



J THANK YOU VERY MUCH FOR YOUR ATTENTION.