

MASSIVE SOFT TISSUE LOSS AND BONE DEFECT OF THE UPPER EXTREMITY IN A MIDDLE-AGED PATIENT - CASE REPORT

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Abstract: Crush injuries of the forearm are characterised by multiple nervous, tendinous, vascular and bone defects, which can severely influence the quality of the patient's life. The plastic surgeon's work is to find the most optimal surgical technique for managing the crushed area. In our case, the groin flap and the free vascularised bone flap are the solution. The groin flap represents a method which is frequently used due to its ability to cover massive soft tissue damage in the lack of muscular mass. Free vascularised fibular transfers primal aim is to guarantee a successful osteosynthesis and a good functional recovery of the forearm.

INTRODUCTION

Tissue loss in the upper extremities is highly frequent and it can be the result of various etiology, such as crush injuries, burn, electric shocks and other type of traumas. Furthermore, especially the crush injury and traumatic lesion, can aggravate the case, exposing the vessels, nerves and tendons to a functional impairment. This fact confirms the need to a severe and instant surgical treatment.

In these cases, the attending surgeon needs to take into consideration multiple aspects to have an optimal outcome in both aesthetical and functional meaning. Since 1972, when McGregor and Jackson described the groin flap, it has been in a constant opposition with the development of free flaps, however it has various and clear-out advantages. The groin flap is preferred in many surgical centers because it is easily harvested, especially in obese patients.(1-5)

For the optimal outcome, it is highly relevant the extraction of the necrotic tissue, the absence of contamination and the good circulation.(6) The groin flap represents an axial pattern flap, as its center is crossed by the superficial circumflex iliac artery, arisen from the femoral artery.(7) This can easily imply hypo perfusion or ischemia, as a consequence of a problematic transposition of the flap.(8) Furthermore, this case also presents an orthopedic problem, which is resolved with a free vascularised fibular transfer.

This technique was introduced by Taylor et al. in 1975, but for a few years its use in the reconstruction of the forearm was limited.(9-13)

The aims of this study were to evaluate the results in a middle-aged patient's evolution and the recovery after a massive upper limb crush injury with tendinous and bone defect on the dorsal side of the right forearm, whose forearm soft tissue and skin defect was reconstructed with a groin flap, and a free vascularised fibular transfer was used in order to reconstruct the bone defect.

CASE REPORT

We present the case of a 42-year-old male patient, the victim of a work accident at a forestry company. Initially, the patient came from a different service, where an emergency

wound cleaning and dressing was done, after which he arrived at the Emergency Room SMURD at Târgu-Mureș. The patient was referred to the Traumatology and Orthopedic department of the County Clinical Emergency Hospital of Târgu-Mureș, unconscious and intubated with a crush injury of the right forearm, open fracture type III Gustillo Anderson of the distal third radius and a 15cm long bone defect of the ulna. Furthermore, at the level of the trauma, a wide loss (17-20 cm) of soft tissue was presented (figure no.1).

Figure no. 1. a) The patient's forearm before surgery; b) intraoperative view of the fracture and the minimal fixation of the fracture site with Kirchner wires



The patient was referred with touchable both ulnar and radial pulse, however with a severe tendinous and bone defect. Also, the Mangled Extremity Severity Score was 8. At this time, the patient presented with posttraumatic anemia, hypoalbuminemia, hypoproteinemia and hyperpotassemia. Two days later, he was transferred to the Plastic Surgery ward of the same hospital.

Regarding the paraclinical examinations, we asked for radiography of the right upper extremity and hemoleucogram. On admission, the patient got a treatment consisting of antibiotics (Cefort and Metronidazole).

The patient's blood test showed the following deviations from the normal values: Leucocytes 19,57 uL, Neutrophils 89,22%, Lymphocytes 5,96%, Hematocrit 35,95%, glucose 112 mg/dl.

The patient underwent a damage control surgery,

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CLINICAL ASPECTS

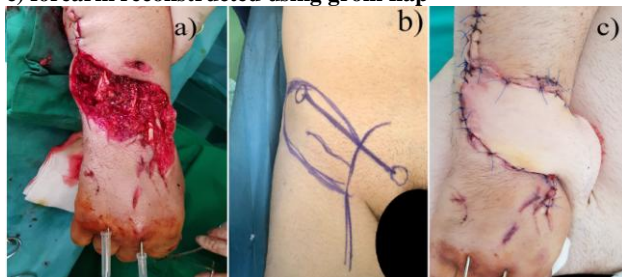
assisted by both orthopedic and plastic surgeons on the day of the admission. During the surgery, the patient was anesthetized by orotracheal intubation. The devitalized tissue was excised and the ulnar and radial bone defect was confirmed, such as the integrity of the ulnar and radial artery. Furthermore, the orthopedic team performed a minimal fixation of the fracture site with Kirschner wires (figure no. 1b). The right upper limb was immobilized until further interventions.

After 10 days of rehabilitation, surgical reintervention was performed with the aim of tendon repair and covering the soft tissue defect.

The extensor digitorum tendons were sutured, while the extensor pollicis longus tendon was sutured to the extensor carpi radialis tendon. Because of the lack of the soft tissue and muscle mass, the use of skin graft was not an option, so it was decided that a pedicled flap transfer was the most advantageous technique for the coverage of the wound. More specifically the groin flap was chosen, as it can cover a large soft tissue defect. Firstly, the dissection of the donor site was made, after we estimated the dimension of the groin flap by the defect of the recipient area.

After marking the anterior superior iliac spine and pubic tubercle, the drawn line between them was the mark of the inguinal ligament. Furthermore, by the palpation of the femoral artery, the location of the superficial circumflex iliac artery was estimated, representing the blood supply of the pedicle. After removing the fat below the superficial fascia, the pedicle was dissected. We were able to suture the donor area directly, using non-absorbable sutures and drainage (figure no. 2).

Figure no. 2. a) Soft tissue defect; b) groin flap preparation; c) forearm reconstructed using groin flap



20 days post-operatively, the flap was viable, the patient was hemodynamically stable. The drainage was removed 3 days post-operatively. Because of an infection suspicion, a bacteriological examination of the wound was requested. The patient presented infection with *Clostridium Difficile*, treated with Vancomycin for 7-10 days.

During the third surgical intervention the division of the pedicle from the right forearm was performed. The flap presented to be normally integrated into the recipient area, without necrotic parts (figure no. 3). The extremity in question was dressed and immobilized.

Figure no. 3. Groin flap integrated in the recipient site



Our patient was discharged for the time from our hospital after 4 weeks and 4 days, but he would return to our ward for a follow-up orthopedic intervention accomplishing the free vascularised fibular transfer. As long-term treatment we prescribed Ketoprofen (100 mg), Omeran (20 mg), Aspenter (75 mg).

For the last surgical intervention, the most difficult one, we have made a free vascularised fibular transfer in order to reconstruct the forearm bone defects. The patient was positioned supine on the operating table. A lateral approach was chosen to simplify the bone harvesting and to shorten the operating time. After incision of the superficial aponeurosis, the dissection was directed straight towards the bone shaft. The bone was reached quickly and we harvested 20 cm of it along with its vessel, after that the leg was closed on a suction drain. While the plastic surgery team operated on the leg, the orthopedic team prepared the forearm, in order to make the osteosynthesis. 5 cm of the fibula were used as a bone graft and interposed between the two ends of the radius using plate and screws. For the ulnar defect, we used 15 cm fibula along with the vessel that we harvested with it. Plate and screws were also used after which we made a latero-terminal anastomosis of the vessel with the ulnar artery and vein. The postoperative evolution was favourable and the patient was discharged 3 days later (figure no. 4).

Figure no. 4. a) Drawing of the incision for the vascularised fibular harvesting; b) fibula and vessel harvested; c) osteosynthesis of the fibula to the ulna and the vessels anastomosis



DISCUSSIONS

This case presents a complex surgical involvement, which is outstanding by the polytraumatic character of the injury. The application of the groin flap for the reconstruction of the massive soft tissue and skin damage has a significantly positive outcome, while it has its own blood supply (a. circumflexa iliaca superficialis), because the traumatic region is unable to support a free skin graft.

However, the free vascularised fibular transfer from the lower extremity to the upper extremity itself represents a factor to further complications. Among the various techniques currently used, such as the non-vascularised fibular graft, shortening of the limbs, external fixations, the free vascularised fibular graft was settled as the most optimal one.(9-13)

The aim of a plastic surgeon's work is to give both functional and aesthetic solutions, keeping in mind the patient's best interest and excluding all kinds of complications.

CONCLUSIONS

In conclusion, the use of the groin flap both for the donor and recipient area showed to be advantageous and easily inset, while the donor site did not need a skin graft, as it could be directly closed. The free vascularised fibular transfer proved its advantages viewing the stable osteosynthesis and functionality of the forearm.

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