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A CASE OF SUCCESSFUL RECONSTRUCTION IN SEVERE OPEN INJURY OF THE UPPER LIMB WITH IMPAIRED CIRCULATION AND EXTENSIVE SKIN AND SOFT TISSUES DEFECT

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ABSTRACT

This article discusses a case from practice. A 53-year-old patient received an open compression injury of the upper limb at the time of a traffic accident. The upper limb was saved. Restoration of arterial blood flow and free skin grafting were performed. Subsequently, due to the development of focal necrosis of the graft, secondary closure of an extensive skin-soft tissue defect of the forearm was performed by transplanting free split auto skin grafts taken from the anterior wall of the abdomen and lateral surfaces of the thighs. The results of treatment were found to be good, despite the presence of pronounced functional disorders of the hand and fingers with the likelihood of subsequent development of elbow joint contracture.

KEYWORDS: Skin and Soft tissue defect, Decompensation of blood circulation, Necrosis of Skin and Soft tissues, Free skin plastic surgery.

INTRODUCTION

Traumatic defects of the skin and soft tissues of the extremities with exposure and damage to the underlying anatomical formations - tendons, muscles, bones, blood vessels and nerves, belong to the category of severe injuries and, according to different authors, make up from 20 to 45% of the total number of open injuries of the extremities. They are quite often encountered in production, when working on various processing machines, when using household appliances or tools with rapidly rotating elements, as a result of traffic accidents, when the road surface itself acts as an abrasive surface, as well as when squeezing a limb between hard surfaces. surfaces. Incorrect, untimely or inadequate treatment can lead to the development of severe wound complications, and as a result, not only dysfunction, but even loss of a limb.[1]

In such cases, to replace defects in the skin and soft tissues, it is necessary to apply methods that allow, with the necessary minimum amount of surgical intervention, to restore the lost ability to work as soon as possible.

With such injuries, if the patient has traumatic and hemorrhagic shock, against the background of increasing limb ischemia, there is often no time for special instrumental studies (MSCT, MRI, angiography). In such cases, the question of the possibility and method of closing such defects, i.e. the preservation of the limb or its amputation is decided exclusively intraoperatively and only after a thorough revision of the wound and damaged structures.[2] When plastic closure of extensive traumatic skin-soft tissue defects, it is necessary to take into account:

Simultaneously with a defect in the skin, there is often abundant contamination and crushing of the underlying formations (muscles, tendons, nerves, blood vessels, bones);

It is far from always possible to clearly define the boundaries of non-viable tissues;

The probability of occurrence in the postoperative period of purulent-necrotic complications is high;

In the long-term period, already after wound healing, the development of cicatricial, skin-muscular-tendon and articular contractures of varying severity is inevitable.[3,4,5]

Almost all authors rightly believe that in the treatment of combined injuries with damage to the main vessels and the development of acute ischemia, the priority is to restore adequate blood circulation.[2,6,7]

Performing primary skin grafting is desirable, but, unfortunately, not always technically feasible stage of the operation, which may be due to both the severity of the patient's condition and the extent of the lesion and the degree of contamination. The method of choice for deep traumatic defects, according to most authors, is plastic surgery with vascularized flaps,[8,9,10] which, unfortunately, is not always feasible, especially with a large area of damage. This stage, in the absence of conditions, can sometimes be delayed and carried out after the cleansing of wounds and the appearance of granulations.[12,13]

The method of plastic surgery is selected individually, taking into account the area of the defect, the nature and depth of the lesion.

Thus, to ensure a high probability of a successful outcome, it is necessary to comply with the mandatory conditions - a full-fledged revision, precision primary surgical treatment, thorough sanitation using modern antiseptics, restoration of adequate blood circulation, and a rational technique for closing the defect. Correctly selected method of skin grafting reduces the risk of postoperative complications and also reduces regeneration time and thus, diminishes the total period of disability.

A clinical case

Patient M., 53 years old, was admitted on 05/07/2021 with complaints of an extensive wound of the right upper limb, limitation of active movements and lack of sensitivity in the periphery, dizziness, weakness, nausea, and thirst. According to the patient, 30 minutes before admission, she was injured as a result of a traffic accident, while in a moving bus, as a result of a collision with a passenger car, the patient's hand was sandwiched between the seats. The patient was delivered to RRCEM.

Photos from the traffic accident place are shown in Figures 1 - 2.

Fig. 1: The bus in which the patient was located.

Fig. 2: The car colliding with the bus.

The general condition of the patient at admission is severe. Consciousness is clear. Pulse 96 in 1 min, satisfactory qualities. BP 90/70 mm Hg.

Locally: on the right upper limb, starting from the axillary region to the lower 1/3 of the forearm, there is an extensive irregularly shaped wound about 75×15 cm in size, with uneven, strongly crushed and raw edges, in the form of hanging skin-subcutaneous flaps. Crushed, torn muscles of the forearm and shoulder are visualized in the wound. There is pathological mobility and deformity in the area of the elbow joint. The pulse on the arteries of the forearm is not determined, the hand and fingers are cold to the touch, active movements are sharply limited, capillary tests are not called. There is no pulse curve on the pulse oximeter, saturation 0. In the area of the distal interphalangeal joints of the III-IV-V fingers of the right hand, there are irregularly shaped wounds in the form of superficial skin defects, contaminated, in size,

respectively. 2×1.5, 2×12 and 2×2 cm. There are multiple facial abrasions.

The view of the upper limb upon admission is shown in Figures 3-4.

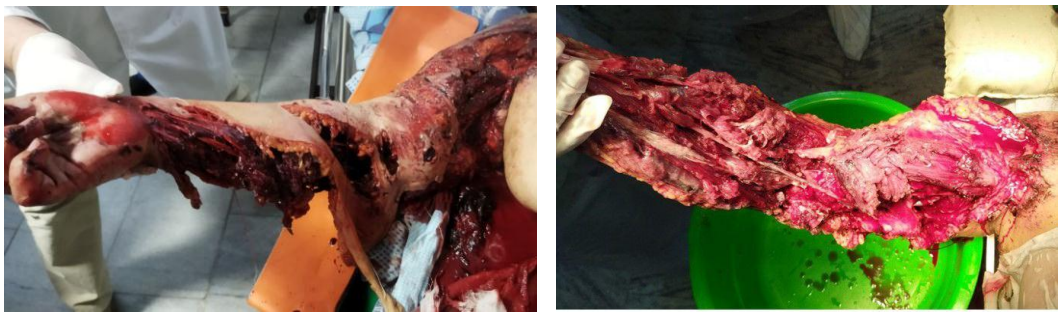

Fig. 3 – 4: The view of the upper limb of the patient M. at admission.

Diagnosis

Extensive torn-crushed contaminated wound of the right upper limb from the level of the axillary region to n / 3 of the forearm with a defect in the skin and soft tissues, with crushing of the biceps brachii muscle, muscles of the radial and ulnar flexors of the hand and superficial flexor of the fingers. Open dislocation of the forearm. Separation of the brachial artery at the level of the bifurcation, traction rupture of the median nerve, rupture of the v.cephalica at the level of the third shoulder. Bruised wounds with skin defects III - IV - V fingers of the right hand. Decompensation of blood circulation of the forearm and hand. Multiple abrasions to the face, closed craniocerebral injury. Brain concussion. Traumatic shock II degree. Posthemorrhagic anemia III degree.

Operation

Primary surgical treatment and revision of the wound of the right upper limb. Excision of crushed muscles. Open reduction of dislocation of the forearm and transarticular fixation with pins. Revision of the neurovascular bundle, anastomosis of the brachial and radial arteries end. Resection and epiperineural suture of the median nerve. Free skin grafting of defects with free autoskin grafts from salvaged skin and from the anterior wall of the abdomen. Wound drainage.

By the end of the operation, the fingers were cyanotic in color, cold to the touch, the capillary reaction was somewhat accelerated, with an injection - bleeding of a venous nature.

The main stages of the operation are shown in Figures 5-8.

Fig. 5: The view of the wound after excision of crushed tissues.

Fig. 6: Excised tissues.

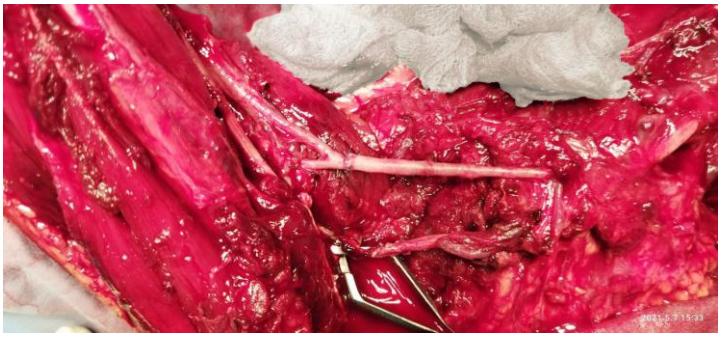

Fig. 7: Anastomosis of the brachial artery.

Fig. 8: The view of the wound after skin grafting.

In the postoperative period, blood and plasma transfusions, dressings and sanitation of wounds were performed, analgesics, antibiotics, anticoagulants, agents that improve rheology, antispasmodics were administered.

The patient's condition in dynamics with improvement. On the 2nd day, an improvement in the blood circulation of the hand was noted. A pulse curve appeared, saturation 96 - 97% (Fig. 9).

Fig. 9: Pulse oximetry on the 2nd day.

The patient's condition stabilized during the treatment. The patient gradually became more active. From the side of the right upper limb, scanty hemorrhagic discharge in the area of postoperative wounds, multiple subepidermal conflicts were noted. The drains were removed on the 3rd day. Body temperature during the last 6 days within 37 - 38 degrees. On the 10th day, the gauze compression pads in the area of the shoulder and forearm were removed. Partial, about 40%, engraftment of free autoskin grafts was noted, however, there are also multiple areas of skin necrosis in the region of the posterior and lateral surfaces of the forearm, requiring further sanitation (Fig. 10, 11). After performing a staged necrectomy, the areas gradually cleared, the appearance of granulation tissue was noted.

Fig. 10 – 11: The view of the wound on the 17th day after the operation.

46 days after the injury, the patient underwent a RE-OPERATION: Free plasty of granulating wounds in the area of the shoulder and forearm with free split autoskin grafts.

The course of the postoperative period is smooth with complete engraftment of grafts (Fig. 12 - 13).

Fig. 12 – 13: The view of the upper limb before discharge (the 6th day after repeated free autodermoplasty).

At the control examination after 2 months, there are normo- and hypertrophic scars at the site of transplanted autoskin grafts, skin-articular contracture of the elbow joint and contractures of the interphalangeal joints of the fingers are noted (Fig. 14-15).

Fig. 14 – 15: The view of the upper limb of patient M. 2 months after discharge.

DISCUSSION

In the described case, there was an extensive contaminated lacerated wound of the upper limb with a defect in the skin and soft tissues with crushing of the muscles, complicated by a rupture of the brachial artery with decompensation of the circulation of the limb. During the operation, the crushed muscles were radically excised, the blood circulation of the limb was restored by resection of the damaged part of the artery and end-to-end arterial anastomosis, the median nerve was restored, and free skin grafting of the defect was performed. Subsequently, treatment was carried out aimed at normalizing the blood circulation of the limb and preventing purulent-septic complications, as well as replenishing blood loss. In the postoperative period, focal necrosis of the transplanted autoskin graft developed, which required a staged necrectomy followed by closure of the already granulating wound with a free split perforated autoskin graft.

As a result of long-term staged treatment (54 days), we managed to save the limb, achieve both 100% engraftment of the free autoskin graft and complete healing of all postoperative wounds. At present, due to the nature and severity of the damage, it is rather difficult to predict a further functional outcome. The inevitable development of skin-scar and articular contracture may subsequently require additional operations aimed at improving the function of the elbow joint and hand. Nevertheless, the patient herself assesses the achieved result, namely, the preservation of the upper limb as an organ, as positive.

CONCLUSIONS

1. In severe open combined injuries of the extremities with skin and soft tissue defects and circulatory disorders, special attention must be paid to careful surgical treatment with excision of all non-viable tissues, restoration of adequate blood circulation, and plastic closure of wounds.
2. The question of the possibility itself, as well as the choice of the method of plastic replacement, is decided intraoperatively and individually, considering the mechanism of damage, the nature of the wound, the general condition and age of the patient.
3. The use of split auto-skin grafts is possible only after the creation of an optimal recipient bed and allows successful closure of large-area traumatic defects.
4. The development of skin-articular contractures and long-term persistent functional disorders of the limb after such injuries, in the late postoperative period, should be considered as not entirely pleasant, but predictable and, in most cases, correctable outcome.
5. Nevertheless, the preservation, even if not fully functional, of the upper limb as an organ, has not only functional, but also great psychological significance for the patient.

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