CASE REPORT

Trans-metacarpal hand replantation – case report

Replantacja ręki na poziomie śródręcza – opis przypadku

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Abstract
A 53-year old patient amputated his hand with a sheet metal guillotine while working in a workshop. After a preliminary assessment consisting of running diagnostics and wound dressing, he was transported and admitted to the Department of Orthopaedics and Traumatology of the Medical University of Gdańsk. The initial surgery took 8 hours. The microsurgical procedures consisted of anastomosis of the ulnar artery and three superficial veins. The radial artery remained unidentified. Ulnar, median and dorsal branch of the radial nerve neurorrhaphy was performed. Flexor and extensor tendons were sutured according to the standard protocol. Metacarpal osteosynthesis using K-wires, nail matrix perforation and forearm fasciotomy were performed. The patient was equipped with a cast. Antibiotics, fluids, LMWH and hyperbaric oxygen therapy were administered. While hospitalized, the patient experienced necrosis of the first radius and II finger as a result of insufficient arterial flow. Reamputation of the necrotic parts was necessary. As a result of immense tissue shortage, the defect was covered with a superficial inferior epigastric artery tubed flap. After detaching the dermal-tubed flap, the patient was treated in an outpatient clinic. He later returned to the Department several more times due to delayed wound healing. In the course of treatment, as well as reamputation of fingers I and II, a number of redressions were performed.

Key words: replantation, microsurgery, tubed flaps, replantation service

Streszczenie

Słowa kluczowe: replantacje, mikrochirurgia, płaty unaczynione, serwis replantacyjny

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Introduction

Hand replantation is an exceptionally difficult procedure but it is the patient’s only chance of restoring function of the lost limb. There are not many surgeons capable of reviving a hand. As a result, there are 7 qualified centers in Poland ready to consult and possibly admit the trauma patient.

Indications for replantation are very strict. [1-4] Careful assessment of the amputee is crucial before deciding to operate. Factors such as type of wound, injury mechanism, level of amputation, number of amputated digits, cold ischaemia time, associated diseases, social factors, support system, medical history, patient’s expectations, cultural norms, among others should be taken into consideration. Guillotine amputation of multiple digits or only a thumb is a strong indicator for replantation [5]. There is one exception: however, the effort to salvage even one finger is always made in the case of pediatric patients [6]. Crash wounds, blind force wounds, torn wounds or avulsed wounds tend to have a poor prognosis.

Aim

The replantation Service in Poland is an informal non law-regulated solution for trauma amputee patients all over the country. It was established in 2010 by Polish Hand Surgery Board. At the beginning, it consisted of only 3 hospitals. Today it combines 7 hospitals, with a team of surgeons ready on a daily basis, to consult and potentially operate on the trauma patient in one of these specialized facilities. Due to extensive costs of hospitalization, OR preparations and a small number of qualified microsurgeons, this type of solution has proven to be the most efficient way to help the victims in the shortest possible time.

The first successful replantation was performed by Malt and McKhann in 1962 [7]. They operated on a 12-year boy who lost his right forearm under the wheels of a train. After that, Komatsu and Tamai replanted a thumb in 1965 on a 28-year old man who cut it off with metal cutting machinery [8]. The first documented replantation in the Department of Orthopaedics MUG was performed in 1993 by professor Tomasz Mazurek and Adam Lorczyński MD PhD who replanted a severed thumb.

To report a patient to the Service, a phone call by a general surgery or orthopedic surgery specialist has to be made. Firstly, the patient should by preliminarily evaluated and have his wounds dressed in the first-contact facility. Pictures of the stump and amputated part should be sent via email or text message to the hospital on duty. The replantation facility is allowed not to admit the patient in case he doesn’t meet the criteria for replantation or if there is already another replantation in progress [9]. The patient should be transported to the final hospital by the LPR (Polish Medical Air Rescue) or by the ambulance [10].

Long-term outcomes can be estimated based on HISS or Tamai classification [11, 12]. They can be applied to predict the probability of going back to work after severe hand trauma.

Materials and methods

A 53-year old patient sustained traumatic hand amputation in the proximal half of metacarpus, zone III according to Kleinert and Verdan classification, type 1c, 2b according to Wei classification [13, 14].

The patient cut off his hand with a metal sheet guillotine on 17 March 2016. Preliminary assessment took place in the ER in Mielc close to Rzeszów in Subcarpathian Voivodeship. After a phone consultation with the Replantation Service, he was transported to the Department of Orthopaedics and Traumatology MUG.

After taking microbiological samples from both the stump and the amputated part, thorough wound cleaning with Ringer solution and Octenisept was performed to dispose of several oddments [15]. The operation was performed according to ischemic protocol.

The team of surgeons was able to identify and dissect common palmar nerves, arteries of superficial palmar arch on the ulnar side, superficial and deep flexor tendons. All of
the structures were marked with threads. K-wires were introduced into metacarpal bones I-V.

On the first day following operation, every 2 hours, heparin compresses were administered into drilled holes on the nails. As a result of previous unpleasant experiences, the Department’s postoperative protocol no longer includes leech-therapy [18, 19].

On the fifth day following the operation, indication of arterial flow blockage resulting in ischemia of fingers I-II was observed. Although, as the second digits’ blood flow seemed to be improving, necrosis of the thumb bulb progressed.

As a result of the advancing soft tissue necrosis, necrectomy of the thenar muscles and intercostal muscles was performed, the index finger on the level of proximal phalanx was reamputated.
Fig. 6. Dry necrosis of fingers I and II.

Fig. 7. Hand after secondary necrectomy.

Fig. 8. Skin-fat flap covering the tissue shortage.

Fig. 9. Information line reminding the patient of the importance of tension free position on the flap.

Fig. 10. Hand covered with the flap.

Due to immense soft tissue shortage, closing the wound would have been impossible. Due to this obstacle, it was decided to sow the hand into to the abdominal layers and cover the defect with an inferior superficial epigastric artery tubed flap.

Firstly, the patient was equipped with Dessault's dressing made of cast, but it was later exchanged for a less thick dressing made of bandages.

3 weeks later he came back to the Clinic to detach the flap. The vascular clamp on the pedicle didn't compromise the blood flow in the flap, so separation was performed. Stamp coverage and closing of the abdominal layers were performed. The patient was discharged in overall good form. After which he complained about nonspecific shoulder pain.

4 weeks later, the patient was hospitalized once again as the purulent discharge from the wound was bothering him. Debridement was performed, necrotic tendon of FDS II, common palmar nerve and proximal phalanx of the second finger were removed. He was equipped with a negative pressure wound therapy device.

After a year since replantation, the patient came back to the Clinic because of infected skin fistula. Debridement surgery was performed one more time, because of osteitis resulting in necrosis of II metacarpal head.
of only one artery was not sufficient, and what seemed to be attitude and life quality expectations, are also crucial.

replantation outcome. Beyond successfully performed anastomoses - the type of wound, time of ischemia, level of amputation, anatomical differences, rehabilitation, patient’s attitude and life quality expectations, are also crucial.

The case report shows how many factors influence the final replantation outcome. It is crucial to inform patients about the possible outcomes, risks and make it perfectly clear that the motor and sensory function in replanted hand will never be fully restored.

Fig. 11. Delayed healing of the hand.

Fig. 12. 2 years since the replantation. A – palmar side, B – dorsal side.

Results

2 years after the first surgery, full range of motion in the wrist has been restored, the patient uses the replanted hand as a supportive limb and undergoes rehabilitation sessions. He complains of hyperalgesia where the hand was stitched together with abdominal wall, he complains of extensive cold feeling. Furthermore, at least once a week, he experiences phantom pains where the thumb used to be. He continues to undergo hand and shoulder rehabilitation.

The surgical team plans on continuing surgical therapy. II toe to thumb transfer is being considered to restore opposition function in the hand. [22-24]

Conclusion

The case report shows how many factors influence the final replantation outcome. Beyond successfully performed anastomoses - the type of wound, time of ischemia, level of amputation, anatomical differences, rehabilitation, patient’s attitude and life quality expectations, are also crucial.

In conclusion, in this case it seems that the anastomosis of only one artery was not sufficient, and what seemed to be previously efficient hand circulation showed signs of ischemia. Even though the replantation is an immensely difficult and demanding procedure, it may turn out to be only the first step of multiple surgeries in the future. It is crucial to inform patients about the possible outcomes, risks and make it perfectly clear that the motor and sensory function in replanted hand will never be fully restored.

References

18. Kumar S, Dobos JG, Rampy T: Clinical Significance of Leech Therapy in Indian Medicine, Journal of Evidence-Based Complementary & Alternative Medicine 18(2) 152-158.