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Case Report

Hand replantation using loupe magnification in a resource constrained environment: Case report

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ABSTRACT

Hand replantation is a common surgical procedure worldwide. However, this practice is underdeveloped in many resource-constrained countries in part due to a lack of surgical microscopes. We present a patient successfully managed using loupe magnification.

A 17-year-old patient presented with an amputated right hand secondary to a chaff cutter. After an 8-hour surgical procedure, the amputated hand was successfully re-attached to the stump using loupes. The patient's functional recovery was satisfactory after two years of follow-up.

In conclusion, replantation of extremities can be successfully achieved using loupe magnification. Loupes should be considered an alternative to operating microscopes for replantation of extremities especially in resource-constrained countries.

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Figure 1. The hand was transported to the hospital in a cooler.

Introduction

Replantation refers to re-attachment of a severed part that has been completely detached from the body. The first case was reported by Malt et al. in 1962.[1] Since then, replantation centers have been established in many developed countries with majority using microscopes. There is little data or evidence on micro-surgery or replantation surgery in many resource-constrained settings, especially in Africa.[2] Coincidently, majority of these cases involve trauma requiring replantation services. Among the reasons for lack of these services is the unavailability of medical equipment, including surgical microscopes. We report herein our first case of successful replantation using loupe magnification.

Case report

History and physical examination

We managed a 17-year-old male patient who sustained an amputation of the right hand through a chaff cutter. The hand was cut at the wrist joint (Figure 1). Physical examination revealed an otherwise stable young man with an amputation stump at the distal forearm. Radiological examination revealed a detachment through the distal carpal bones.

Figure 2. The hand completely attached to the forearm; note the fasciotomy area that was intentionally left on the anterior lateral aspect. It was skin grafted 2 weeks later.

Figure 3. The patient was managed with the dynamic Kleinert splint for at least six months.

Figure 4. The patient was able to extend all of his fingers' metacarpal and inter-phalangeal joints at nine months after surgery.

Operative procedure: A multidisciplinary team comprising both plastic and orthopedic surgeons was assembled. The procedure was carried out in the operating room with two sources of Light Emitting Diodes (LED) lighting systems. Surgical toilet of the hand and stump was achieved. The anatomical structures were identified and tagged with sutures. Bony fixation was accomplished using K wires. Micro-surgical anastomosis via 4.5x loupe magnification was achieved using 9/0 nylon for both arteries and veins. A higher loupe magnification was chosen so as to allow for adequate magnification of blood vessels and nerves for ease of repair. Median and ulna nerves were repaired with interrupted 9/0 nylon sutures. Flexor and extensor tendons were repaired by Modified Kessler Technique using 4/0 nylon sutures and light dressings applied (Figure 2). The warm ischemic time was 2 h followed by 10 h of cold ischemia. Post-operative recovery was uneventful. The patient was discharged with a splint for six months and advised on physiotherapy (Figure 3). Physiotherapy was done at a regular interval.

Sensory recovery reached the proximal palmar crease at three months, distal palmar crease at 8 months, and distal inter-phalangeal joint at 14 months of follow-up. Assessment at one year of follow-up revealed full extension and flexion at the meta-carpo-phalangeal, proximal and distal inter-phalangeal joints (Figure 4). The patient could pinch and grasp grip at 18 months of follow-up.

Discussion

Replantation of a severed body part can be a demanding task because it requires considerable expertise. The success of the procedure varies widely. Factors affecting outcomes include ischemic time, patient age, type of injury, the reconstructive team's surgical experience and peri–operative patient monitoring.[3-4] Since the first successful case more than 50 years ago, many such cases have been reported from replantation centers in developed countries.[3-4] In resource constrained settings, there are few micro-surgical services let alone replantation despite the fact that there are potentially higher replantation cases in these countries.[2] The reasons range from a lack of technical skills, poorly equipped hospitals and few surgical microscopes among other factors.

Loupe magnification for free flaps has been well established with good outcomes reported similar to surgical microscopes.[5-6] However, their use in replantation surgery is not well documented. As demonstrated in our patient, positive outcomes can also be achieved. In our patient, other factors might also have contributed to the good results. The patient had a sharp injury, a short warm ischemic time of two hours, and was young. He was motivated and attended all physiotherapy sessions as recommended. The surgical team had attained adequate experience in micro-surgery with more than seven years of free flap surgery.[7]

The patient's functional outcome was considered satisfactory. He had grade 5 muscle power in his fingers' extensors and flexors with good flexion and extension of all of his hand joints. He regained protective sensation in all of his fingers at 18 months of follow-up. Two point discrimination was at 6 mm at18 months of follow up. He had a grasp and pinch grip that enabled him to carry out routine activities. He was able to return to his daily living activities by 18 months after surgery. Functional limitations included flexion and extension of the wrist joint, loss of fine touch and reduced two-point discrimination (6 mm, at the finger tips).

Conclusion

Loupe magnification is an option for replantation of extremities in resource-constrained settings. They are relatively inexpensive, readily available and should be considered in environments lacking surgical microscopes. Though microscopes have advantage of providing more magnification and extra illumination that is ideal for vessels and nerve repairs, they are expensive and difficult to maintain and may be unavailable in many resource constrained countries.

Declaration of Competing Interest

There is no conflict of interest to disclose.

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Ethical approval

Ethical approval was sort from The KNH/ Univeristy of Nairobi ethics reseach committee.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi: 10.1016/j.jpra.2020.11.006.

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