Replantation: factors maximizing the functionality of a replanted body part

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ABSTRACT

Replantation is a surgical operation to reattach an amputated body part. The probability of success is greater for a limb that has been amputated by a sharp-cut injury than by a crush injury. This varied success rate indicates that certain factors can help to restore the functionality of the replanted body part. These factors can be categorized as preoperative, procedural, and postoperative. Preoperative factors include the process of determining the possibility of performing replantation, as well as the time elapsed between the incidence of amputation and the performance of the surgery. Procedural factors affect the surgical process, and include the skills of the surgical team. Postoperative factors include physical therapy, rehabilitation, the psychological aspect of recovery, and other factors occurring after the surgical operation. Each of these factors plays a role in restoring the functionality of the limb to the pre-amputation level. A study by King Khalid University Hospital demonstrated the importance of these factors in the level of functional recovery achieved after follow-up care for a specific period.

Keywords: Amputation, factors, functionality, replantation.

Introduction

Amputation can be defined as the surgical or traumatic detachment, either total or partial, of a body part. Traumatic amputation is not a rare injury, and its consequences—which are typically severe—may include psychological changes, permanent functional defects, and the inability to handle work demands [1,2]. Furthermore, amputation often results in significant financial losses, both directly and indirectly, to the patient and to society at large [3]. Under certain circumstances, an amputated limb can be surgically reattached through a microsurgical operation that primarily aims to maximize recovery of the functionality of the replanted limb; this surgical operation is known as “replantation” [4]. Maximizing the retrieval of functionality is dependent on preoperative, procedural, and postoperative factors, alongside certain other considerations [5].

Review

Preoperative factors include the assessment of whether replantation of the amputated limb is possible at all. One consideration is the mechanism of injury, which can be either a crush injury or a guillotine injury [5]. A crush injury to a limb lessens the likelihood of successful replantation surgery because such an injury often causes major tissue damage. Furthermore, successful replantation of a limb amputated through a crush injury will most likely lead to defects in functionality [6]. On the contrary, a guillotine injury, also known as a “sharp-cut injury”, has a better chance of achieving successful replantation [6]. However, the ability to perform replantation also depends on the patient’s overall condition and the time elapsed between the injury incidence and the resultant medical response [5]. For example, severe injuries may prevent the quick assessment of the probability of success for replantation surgery, creating an unfavorable extension of the time elapsed between the incidence of the injury and the performance of the surgery. Too much time causes further damage to the amputated limb, including vascular changes like hardening of the arteries [5]. Proper preservation of the amputated limb will increase its resistance to the early development of ischemia. Proper preservation also decreases the vulnerability of the amputated limb to infections despite the absence of blood circulation [5]. One means of preserving an amputated...
Replantation

limb is to place it inside a plastic bag containing normal saline [6].

Procedural factors, such as quick and accurate performance of the surgical operation, the presence of a skilled surgical team, and ensuring a high level of hygiene for the damaged tissue, are all critical in predicting the functionality of a replanted limb [7]. For instance, good surgical skills and thorough experience in microsurgery are required to perform a successful reattachment and to avoid other complicated secondary procedures [8]. Moreover, an unfavorable extension of the duration of the surgical operation may result from complications when the amputation of multiple individual digits occurs. The longer it takes to complete the surgical operation, the greater the vulnerability of the limb to infection [6]. The surgical team must keep the damaged tissue of the amputated limb clean during the surgery to avoid infections [6].

Postoperative factors that facilitate recovery and increase the functionality of replanted limbs include physical therapy, rehabilitation, the patient having a healthy lifestyle, follow-up care, and the psychological aspect of recovery [9,10]. For instance, putting the patient under observation for the first 2 days is necessary to control side effects that may appear during recovery [6]. Blood-thinning medications are given to the patient to prevent the formation of clots [5,6]. Physical therapy and rehabilitation are crucial for achieving progress in both recovery and functionality of the replanted limb. For example, certain exercises aid in preventing joint stiffness, facilitating muscle movement, and reducing scarring [9]. The duration of a patient’s physical therapy and rehabilitation depends on the nature of the injury [9]. Furthermore, the patient can play their own role in facilitating recovery. For instance, smoking and caffeinated beverages should be avoided to prevent a reduction in blood flow to the replanted limb. It is also crucial that the replanted limb be protected before the patient leaves the hospital [11]. For example, the surgical site should be wrapped in a bandage to prevent infection and decrease swelling [6]. The psychological aspect of recovery is also important, and care must be taken after the surgery to ensure the patient’s mental well-being. For instance, the patient may suffer emotional trauma when seeing the replanted limb for the first time after the removal of bandages. Also, the patient may feel shocked or disappointed in the probable event that the replanted limb does not appear as it did before the incident [12].

Staff at King Khalid University Hospital reviewed 70 patients who recovered from traumatic limb and digit amputation after thorough follow-up care that lasted from April 1984 until April 1988 [7]. Unfortunately, reattachment was not a viable option for 34 of the 70 patients. The other 36 patients underwent reattachment or revascularization of 46 discrete body parts. The net rate of survival was 67.4%. The net rate of survival increased from 62.8% to 81.8% during the subsequent 2 years, and an indication of functional recovery was reported in 18 cases. This remarkable increase in the net rate of survival and the reported functional recovery mainly resulted from two factors: a change in the specificity of the criteria used when selecting cases where reattachment is possible and improvement of the technical skills of the surgical team [7].

Conclusion

Amputation of a limb may result in severe psychological harm, significant loss of physical functionality, as well as severe financial losses, both directly and indirectly. However, these serious consequences may be avoided or mitigated by successful reattachment surgery. The primary factors that determine the functionality of the replanted limb can be classified into preoperative, procedural, and postoperative factors. Preoperative factors include the type of injury, maintaining the amputated limb at a high level of hygiene, and preserving the amputated body part until the time it can be reattached. Procedural factors revolve around surgical skills, the experience of the surgical team, as well as quick and accurate performance of the surgery. Postoperative factors include the patient’s psychological condition after surgery, as well as physical therapy, rehabilitation, healthy lifestyle practices on the part of the patient, and constant follow-up care. Each factor can have a significant influence on the functionality level of the replanted limb. A local interventional study conducted at King Khalid University Hospital demonstrated that a significant increase in the net rate of survival for reattachment operations was associated with the technical skills of the surgical team and improvements in the selectivity of the criteria used when evaluating the possibility of performing reattachment.

Conflict of interest

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