



Awareness Regarding the Salvageability and Preservation of Amputated Body Parts Amongst the General Population: A Cross Sectional Study

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Introduction

An amputation of a body part is a devastating injury with great psychosocial impact. It adversely affects the victim's ability to earn a livelihood, support a family and carry out daily activities.

Salvaging the complex amputation injuries of extremities continues to be a great challenge for plastic surgeons and reconstructive surgeons even today. Replantation/reattachment of body parts has become a reality since the first arm transplant was carried out six decades ago.

The outcome and success of replantation significantly depends on the following few factors.

1. The mechanism of amputation.
2. At which level the body part was amputated.
3. Condition of the amputated part when it reaches the medical facility.
4. Time elapsed since the amputation injury occurred.
5. General health of the injured person.

Two of the above four factors – the condition of the amputated part and the time elapsed since the injury occurred are majorly governed by sociogeographical and economic factors, depending on the bystanders/primary responders at the time of the accident.

A large number of limbs cannot be salvaged simply due to the fact that they do not reach the appropriate medical facility in time or are not transported and preserved the right way, severely compromising their viability and in turn, their salvageability.

Hence, it is important to understand, analyze and create awareness regarding the preservation, storage, transport and salvageability of amputated body part/parts amongst the general population.

Aim and Objectives

Aim

To improve the salvageability and success rate of limb/digit replantation in order to restore form and function.

Objectives

1. To assess and analyze the level of knowledge and awareness regarding salvageability, preservation, storage and transport of amputated body parts to a medical facility.
2. To create awareness regarding the importance of the above factors amongst the general population.

Review of Literature

Replantation has been defined by the American Academy of Orthopedic Surgeons as 'the surgical reattachment of a body part (such as finger, hand or toe) that has been completely cut from the body[1]. Replantation of amputated body parts has been performed on fingers, hands, forearms, arms, toes, feet, legs, ears, skull, face, lips, penis, and tongue. It can be performed on almost any body part[2].

Replantation is performed in response to traumatic amputation. Sharp Guillotine type injuries

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with relatively uninjured surrounding tissue have the best post-replantation prognosis, with a success rate of 77%[3]. Severe crush injuries, multi-level injuries and avulsion injuries often mangle soft tissue to the point of precluding rejoining of essential blood vessels, making re-plantation extremely challenging[4].

Replantation requires microsurgery and must be performed within several hours of the part's amputation, at a center with specialized equipment, surgeons and supporting staff.

To improve the chances of a successful replantation, it is necessary to preserve the amputated body part as soon as possible in a cool (close to freezing but not at or below freezing) and sterile or clean environment[4]. Parts should be wrapped with moistened gauze and placed inside a clean or sterile bag floating in ice water. Dry ice should not be used as it can result in freezing of the tissues. There are so called sterile "Amputate - Bags" available which help to perform a dry, cool and sterile preservation.

Parts without major muscle groups, such as fingers, have been replanted up to 94 h later, although 12 h is typically the maximum ischemic time tolerated. Parts that contain major muscle groups, such as arms, need to be replanted within 6 h to 8 h to have a viable limb[5].

It is also important to collect and to preserve these amputates which do not appear to be good candidates for the replantation. A microsurgeon needs all available parts of human tissue to cover the wound at the stump and prevent further shortening. In cases of multiple amputation, nerves and vessels from a non-replantable part can be used as graft material for a replanted part[3].

Experiments on limb replantation were reported in the late 1800s, but it was not until the operating microscope allowed repair of small vessels in the 1960s that microvascular surgery began.

The first replantation to be performed in the world involved repair of the brachial artery and was done by a team of chief residents led by Ronald Malt at Massachusetts General Hospital in Boston, Massachusetts, United States in 1962. The arm of a 12-year-old child severed at the level of the proximal humerus was reattached.

The first report of a replantation using "modest magnification and keen vision" was reported by a team led by a Zhong-Wei Chen of the Sixth People's Hospital in Shanghai in 1963 writing in the Chinese Medical Journal. A machinist's hand was reattached at the level of the distal forearm. In this case, vascular couplers were used for the vessels as the Chinese did not have good micro-sutures available at that time.

First revascularization of a partially amputated finger was done by Kleinert in 1963. Later in 1965, first digital replantation was carried out by Komatsu and Tamai in Japan. In the Soviet Union, the first replantation of the arm after its traumatic amputation was performed by Professor Nicolai L.Volodoset al. on January 19th, 1977 in Kharkov, USSR. The case was described in the central press and became the catalyst for the beginning of microsurgery as a surgical specialty in Soviet medicine.

Today, with the medical technology and scientific advancements, improved instruments, surgical techniques and suture materials, patient selection, preoperative and post-operative management, the rate of successful replantation's has significantly improved.

The success also depends upon several factors which contribute to the ischemia time and in turn the viability of the limb, even before the patient and the part has reached the hospital – the quickness of first

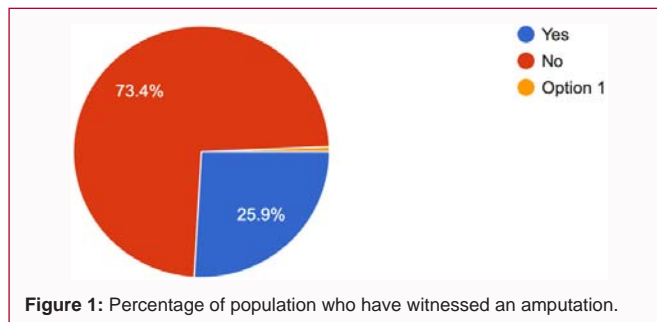


Figure 1: Percentage of population who have witnessed an amputation.

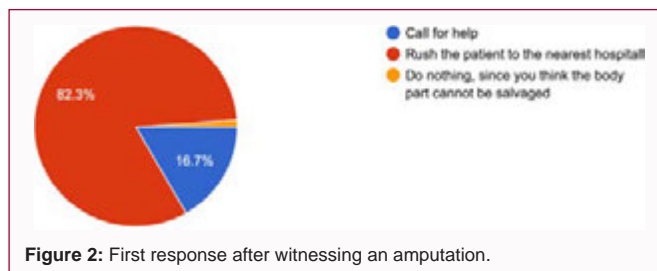


Figure 2: First response after witnessing an amputation.

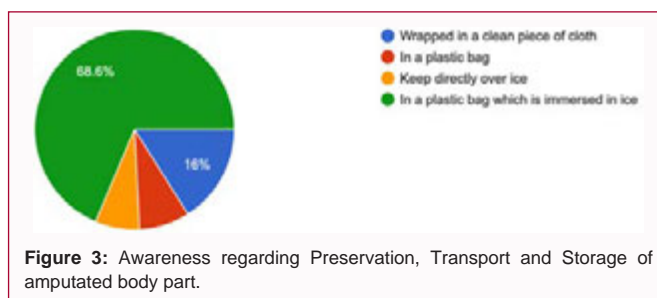


Figure 3: Awareness regarding Preservation, Transport and Storage of amputated body part.

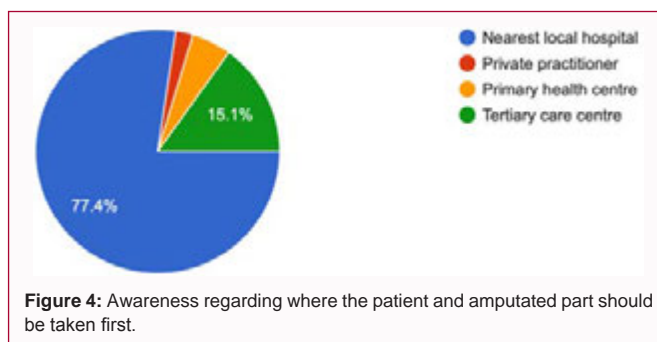


Figure 4: Awareness regarding where the patient and amputated part should be taken first.

aid or response, the preservation and storage of the part, the transport and handling and the condition in which the amputated part reaches the hospital.

Hence, it is of utmost importance to create awareness regarding the above factors amongst the general population who are the primary responders at the scene of trauma to improve the salvageability of the amputated part and possibly achieve the final goal i.e., to restore a functional limb.

Materials and Methods

- Study design – Cross sectional survey-based study
- Study population – General Indian population
- Study duration – 6 months
- sample size -2000

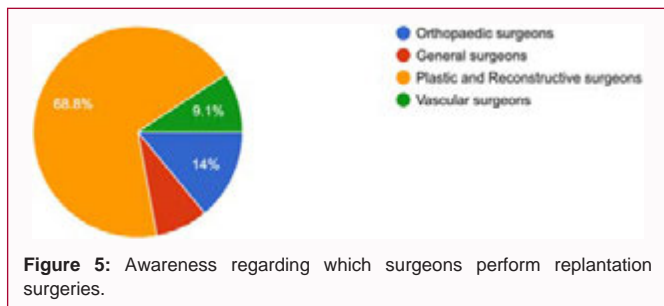


Figure 5: Awareness regarding which surgeons perform replantation surgeries.

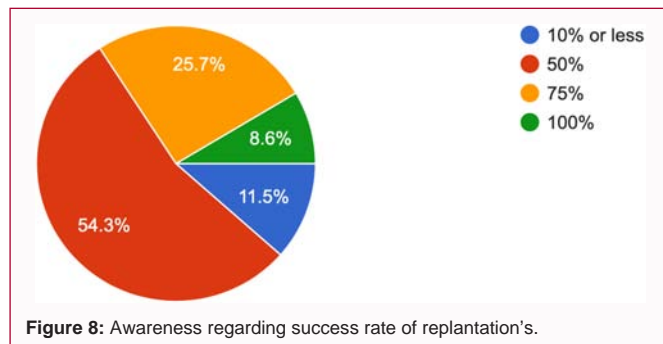


Figure 8: Awareness regarding success rate of replantation's.

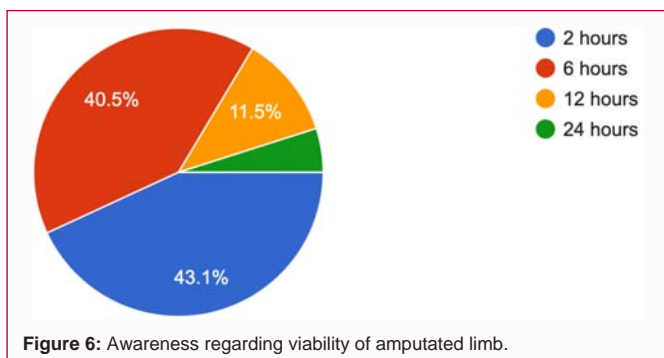


Figure 6: Awareness regarding viability of amputated limb.

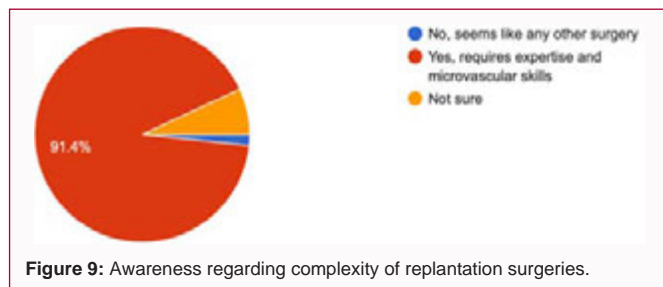


Figure 9: Awareness regarding complexity of replantation surgeries.

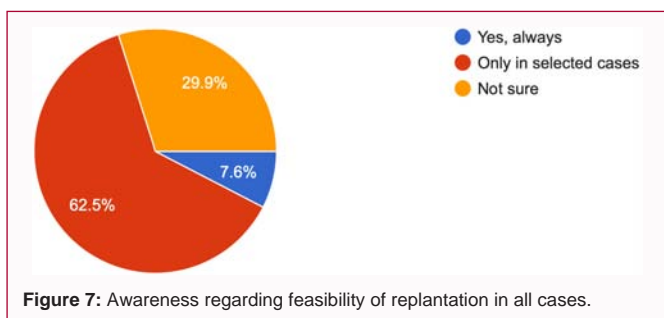


Figure 7: Awareness regarding feasibility of replantation in all cases.

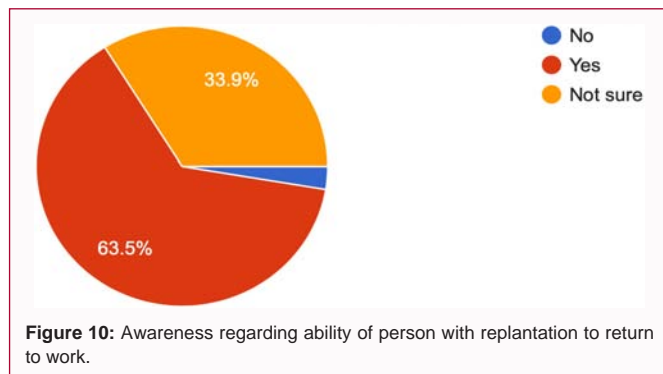


Figure 10: Awareness regarding ability of person with replantation to return to work.

Inclusion criteria

- Age >18 years
- Willing to participate in the study
- Literate enough to understand and fill the questionnaire form

Exclusion criteria

- Age less than 18 years
- Medical fraternity
- Paramedical fraternity

Methodology

A pre-structured questionnaire in 3 languages was designed, comprising of demographic data and questions regarding the preservation, transport and basic knowledge of management amputation injuries.

After taking written informed consent for participation in the study, all the participants who met the inclusion criteria were given the questionnaires in a language which they understand.

After the complete filling of the questionnaire, the data was reviewed and analyzed to assess the level of awareness regarding the salvageability, preservation, storage and transport of amputated body

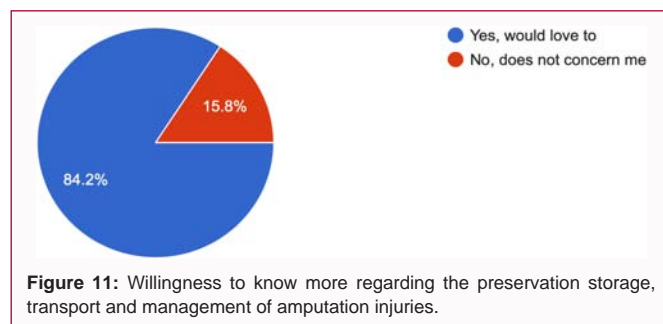


Figure 11: Willingness to know more regarding the preservation storage, transport and management of amputation injuries.

parts amongst the general population.

Collected data was entered in the Microsoft excel 2016, for further statistical analysis, categorical variables were expressed in terms of frequency and percentage, while quantitative data was expressed as mean and standard deviation. Statistical analysis was done with the help of statistical software SPSS version 25.

Observations and Results

Following are the observations after analyzing the data obtained in the survey (Figures 1-11).

Discussion

Traumatic amputation injuries are fairly common at construction

sites, carpenter workstations, sugarcane factories or even during road traffic/railway accidents. The first responders are usually the bystanders at the site of injury.

The goal of pre-hospital management of both, the amputation victims and the amputated part should be to get the patient and part to the hospital in time and in the appropriate manner. There are significant lacunae in the general population regarding the initial management - preservation, storage and transport of the amputated body part before reaching the medical facility. The primary aim of initial management is to limit the warm ischemia time of the limb to improve salvageability, stabilize the patient and reach the appropriate, well equipped medical facility as fast as possible since replantation must be performed within 6 h. These measures will significantly improve the success rate of replantation's. In our study, we conducted a survey amongst 2,000 people, in which we observed that 25.9% of the population had witnessed an amputation, which is a fairly sizeable number. 77.4% of the population stated that they would rush the patient to the nearest hospital instead of going to a private practitioner or a primary/tertiary care hospital. This is important for stabilizing the patient and appropriately preserving the amputated part. Also, referral to a tertiary care center where microsurgical facilities and surgical team is available can be done by the local hospital. 68.6% knew that should keep the amputated part wrapped in gauze and then in a plastic bag, placed over ice. This is an important aspect to increase the chances of limb salvageability [6].

68.8% people were aware that plastic and reconstructive surgeons perform replantation surgeries. This awareness is important to that patients can avail the right treatment in time to avoid delay and complications. Only 40.5% people were aware that an amputated limb remains viable for only 6 h. This is the most important factors the general public should understand, so that time is not wasted, medical help is sought immediately and the replantation can be performed as soon as possible. 91.4% people were aware the replantation surgeries require microsurgical skill and expertise and are not performed in all hospitals. Only 63.5% people thought that patients with replanted limbs could perform daily activities and resume their work. 84.2% people were keen to know more about the preservation, storage, transport and management of amputation injuries.

In a study conducted by Massand et al. [7], a total of 91 patients met inclusion criteria. Thirty-one of these patients (34.1%) had amputated parts which were properly preserved in saline-soaked gauze in a bag on ice. Transfer patients from referring hospitals were more likely to

present with properly preserved parts (45.0%) than those presenting from home (25.5%), though this did not meet significance ($P=0.051$). In total, 74 patients arrived via emergency medical services with 26 (35.1%) of those patients having properly preserved parts. Of the 31 patients who had properly preserved parts, 58.1% underwent attempted replant; of the 60 patients who had improperly preserved parts, 23.3% underwent attempted replantation ($P=0.001$) [7].

If the general population are educated regarding the correct pre-hospital management of amputated body parts, the chances of limb salvageability will significantly improve, thereby improving the patient's quality of life and reducing the burden on health care.

Conclusion

From overall observations, we conclude that majority of the study population had decent knowledge regarding the preservation, storage and transport of amputated body parts. However, it is vital that every single individual have basic information about the importance of prehospital management of amputation victims and the amputated limbs in order to improve the success rates of replantation surgeries. This can be done through information pamphlets, booklets, brochures or by conducting seminars, street-plays and skits. Educating and increasing the awareness of the general population regarding amputation injuries will gradually help to decrease the morbid and uncertain prognosis of these kind of injuries.

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