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Fingertip Reconstruction in Hand Injuries

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ABSTRACT

Fingertip amputations are a significant issue in the United States, with approximately 45,000 performed annually, with a 7.5 per 100,000 incidence rate. The primary cause of finger injuries is metal objects and bladed hand instruments, which can lead to cuts, loss of limbs, or damage to nerves and blood vessels. Therapy aims to restore sensation, long-lastingness, and bone support for nail development. Inadequate management can result in cosmetic issues, cold sensitivity, skin soreness, and persistent impairment in functionality. Nail bed injuries, such as lacerations, avulsions, and crush injuries, can result in post-traumatic fingertip amputation. Physical examinations are necessary to evaluate the functional and sensory capabilities of the damaged finger. Surgical intervention is necessary for severe cases, with primary closure or revision amputation being the preferred procedure. Full-thickness skin grafting is also used for fingertip amputations, preserving the structure of the recipient's fingers and addressing areas with insufficient skin.

Flap repair is a method for managing fingertip amputations, using skin from another area or distant region. Local flaps are best for small covering areas, while regional flaps are used for extensive incisions. These flaps prevent prolonged immobilization and allow for a return of feeling in the fingertip. Post-amputation complications include delayed wound healing, nail abnormalities, heightened sensitivity, pain, intolerance to cold, scar retraction, limited finger movement, persistent ulcers, infection, and loss of tissue flaps. Inadequate management of fingertip amputations can lead to cosmetic flaws, reduced tolerance to cold, and increased skin sensitivity.

KEYWORDS: hand injuries, fingertip injuries, flaps

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INTRODUCTION

Each year, a significant number of individuals have severe hand injuries, often resulting in fingertip amputations. Approximately 45,000 finger amputations are performed annually in the United States, with an incidence rate of 7.5 per 100,000 individuals. An extensive epidemiological study on finger amputations in the United States revealed that the greatest occurrence rates were seen among children under the age of five and people aged 65 years and above. Among youngsters, fingertip injuries constitute 66% of all hand injuries. Moreover, a research on occupational hand injuries revealed that the primary cause of finger injuries is attributed to metal objects and bladed hand instruments. These kind of injuries may include cuts, loss of limbs, or damage to nerves and blood vessels.

The primary objectives of therapy are the reestablishment of feeling and long-lastingness in the tip, as well as ensuring enough bone support to facilitate nail development. The fingertip is crucial for feeling due to its dense population of sensory receptors; hence, the primary objective of the therapy is to restore sensation. Furthermore, the longevity of the fingertip is crucial for finger movement and hand function. Additionally, the distribution of nail development plays a significant role in preserving one's attractiveness. Inadequate management of fingertip amputations may result in cosmetic issues including hook nail deformity, as well as symptoms such as cold sensitivity and skin soreness. Deficiencies may also manifest as rigidity and persistent impairment in functionality over an extended period. This research offers a comprehensive examination of the structure of the fingertip, the manifestation of injuries to the fingertip, their treatment, and potential postoperative problems.

Assessment and identification

Nail bed injuries may manifest in several ways and may ultimately result in post-traumatic fingertip amputation. The primary types of injuries include lacerations, avulsions, and

crush injuries. Patients with nail bed lacerations and subungual hematomas will experience bleeding under their nail plate. This bleeding may cause the nail plate to separate from the nail bed, leading to considerable discomfort. Nail avulsion is the separation of the nail plate from the surrounding structures, resulting in the exposure of the nail bed to the external environment.

The compression of the nail bed and fingertip amputation might result from the presence of a sharp item in a crush accident. Various results of these injuries may be seen throughout the presentation. The range of injuries may span from a fracture of the distal phalanx to a partial or full amputation of the fingertip. During clinical examination, the most often seen injury mechanism in the pediatric age group is finger crushing of the right hand caused by door closing.

A physical examination is necessary to evaluate the functionality of the damaged finger. Typically, it is conducted without the use of anesthetic in order to correctly evaluate the sensory and motor capabilities of the fingertip. The primary focus of the motor examination is to assess the range of motion of the distal phalanx and determine the likelihood of distal tendon damage. The sensory function is assessed using a 2-point discrimination test conducted on both sides of the fingertip or a light touch sensation test. The assessment of vascularity involves evaluating capillary refill and the overall color of the finger. Thorough examination of the injuries may uncover an underlying deformity resulting from a potential fracture or dislocation.

In addition, the doctor should examine the laceration thoroughly to determine its size and position, as well as check for the presence of any foreign objects such as wood, glass, or metal. Fortunately, a digital nerve block may be necessary when assessing young children or when trying to detect wounded structures such as a torn nail plate, since it may improve the accuracy of motor and sensory evaluation. When examining injured fingers, especially those that have been amputated, it is important to use radiographic evaluation techniques such as anterior-posterior, lateral, and oblique views. This is done to determine whether there is any dislocation, fracture, or foreign object in the distal region of the finger, in order to confirm the diagnosis.

ADMINISTRATION

Initial termination

Surgical intervention is necessary for severe instances of fingertip amputation, since it helps promote the healing of the lesion. Primary closure involves the closure of a wound by reducing the protruding bones in order to facilitate the closure of the lesion. According to Wang et al., fingertip revision amputation is the preferred procedure for treating fingertip amputations due to its high effectiveness in producing excellent treatment results. The procedure may include the partial loss of skin, reduction in digit length, fingernail damage, and potential functional impairments after therapy. The objective of managing fingertip amputation by primary closure or revision amputation is to facilitate the wounded individual's prompt return to work while preserving the finger's usefulness. Revision amputation yields favorable therapeutic results, particularly in terms of sensitivity. Nevertheless, a drawback of the operational technique is that individuals undergoing this procedure may have cold sensitivity as a side effect. Although patients get prompt treatment and have normal functioning, their functionality might be affected by frigid temperatures. While cold intolerance might result from nerve injury rather than the therapy itself, it is crucial for clinicians to comprehend the efficacy of revision amputation in order to utilize it for managing instances of fingertip amputation.

Full thickness skin grafting is performed using tissue from the hypothenar region.

Full-thickness skin grafting involves taking skin from the hypothenar area and transferring it to the recipient as a treatment for fingertip amputations. According to Simman and Hermans, the use of Esterified Hyaluronic Acid Matrix (eHAM) therapy and grafting resulted in full bone covering and ultimate finger healing. Skin grafting of the hypothenar area is a viable option when there is insufficient tissue to cover an amputated finger. Ramsey et al. state that full-thickness skin grafts are used when secondary healing, flap repair, and primary closure are not feasible. The method employs the epidermis and dermis layers of the skin to be applied to the severed fingers and flaps. The technique is simple for both the surgeon and the patient and preserves the structure of the recipient's fingers. Skin grafts are used to address locations with insufficient skin by treating the fingers and flaps. While often used as a last option, this procedure frequently leads to effective treatment of fingertip amputations and finger flaps.

Reconstructive surgery for repairing a flap

Flap repair is an alternative method for managing fingertip amputations. Due to the absence of blood flow in the skin, full-thickness skin transplantation may not be suitable for treating significant tissue damage. In this scenario, the wound is treated by using the whole depth of the skin retrieved from another area of the damaged hand or a distant region of the body [30]. Flap repair is often necessary for injuries that include exposed bone and a lack of soft tissue, unless the patient prefers a total amputation. Preserving finger length is crucial, but reconstructing and replanting flaps often need an extended period of immobility and recuperation. Local flaps are the best option when a tiny covering area is needed since they cause the least amount of harm at the donor site. Local flaps are harvested from a donor location that consists of healthy tissue next to the incision to repair the wounded finger. Some examples of local flaps include the Kutler lateral V-Y flap, the Atasoy-Kleinert V-Y flap, and the Moberg flap (also known as the thenar advance).

Regional flaps include the use of tissue that is not directly next to the area that has to be repaired. These flaps are beneficial when the incision is too extensive to be covered by

a local flap. Regional flaps often used for the treatment of fingertip amputations include the thenar flap, cross-finger flap, and the thenar-H flap. Additionally, island flaps including a neurovascular pedicle may be used to provide coverage for the fingers. These flaps have two benefits: they may prevent the need for a lengthy period of immobilization required for a cross-finger or thenar flap, and they enable the return of feeling in the fingertip.

Figure 1. Comet flap desing

Figure 2. Comet flap

Figure 3. 4th week follow-up

Figure 4. Cross flap

Figure 5. Cross flap liberation

COMPLEXITIES

Various issues may occur after fingertip amputation, such as delayed wound healing, nail abnormalities resulting in poor appearance, heightened sensitivity, lingering pain, intolerance to cold, scar retraction, limited finger movement, persistent ulcers, infection, and loss of tissue flaps.

Delayed wound healing occurs due to inadequate removal of dead tissues and, more often, the use of excessive force during closure. This issue might arise around the edges of the incision after tissue death. Secondary intention healing is a process that happens naturally over time when a wound contracts and new epithelial cells grow to cover the wound. Wound contraction causes a scar that is much smaller than the initial injury, and when the scar forms with imperfect reepithelialization, it nonetheless provides virtually complete covering of the skin.

Hypersensitive fingers might result from a constricted scar or atrophic alteration on the tactile pulp. To mitigate this issue, it is advisable to use flap covering using a sensate flap that has an appropriate thickness for the pulp. The primary reason for the unsatisfactory appearance and distortion of the nail is a small nail bed with inadequate structural support from the distal phalangeal bone and insufficient soft tissue. Following the amputation of the fingertip, there is a reduction in bone and soft tissue in the distal phalanx. A superfluous nail bed that extends beyond the tip of the terminal phalanx results in

a hook nail malformation. This malformation results in fingertip discomfort or agony, perhaps preventing the finger from participating in normal tasks. This malformation is a matter of both practical and cosmetic concern, particularly in young women and children. Several surgical methods are recommended to address this deformity, such as the conventional antenna surgery, composite toe pulp grafting, homodigital advancement flap, free toe tissue transfer, and oblique, triangular neurovascular osteocutaneous flap.

CONCLUSION

The distal part of the finger contains almost all the tissue components found in other parts of the body. The primary cause of finger injuries is often attributed to metallic objects and bladed hand tools. These kind of injuries may include cuts, loss of limbs, or damage to nerves and blood vessels. Inadequate management of fingertip amputations may result in problems such as cosmetic flaws including hook nail deformity, reduced tolerance to cold, and increased sensitivity of the skin. This research presents a comprehensive examination of the structure of the fingertip, the occurrence of injuries to the fingertip and their treatment, as well as potential problems that may occur after surgery.

REFERENCES

I. Hong, M. K., Park, J. H., Koh, S. H., Lee, D. C., Roh, S. Y., Lee, K. J., & Kim, J. S. (2020). Microsurgical Free Tissue Options for Fingertip Reconstruction. Treatment of fingertip injuries and nail deformities, An Issue of Hand Clinics, E-Book, 37(1), 97-106.

II. Kawaiah, A., Thakur, M., Garg, S., Kawasmi, S. H., & Hassan, A. (2020). Fingertip injuries and amputations: a review of the literature. Cureus, 12(5).

III. Jerome, J. T. J., & Malshikare, V. A. (2022). Fingertip injuries outcome score. Plastic and Reconstructive Surgery–Global Open, 10(6), e4386.

IV. Karakas, A. O., & Yuce, E. (2020). Evaluation of pediatric fingertip injuries using etiology, demographics and therapy. The Medical Bulletin of Sisli Etfal Hospital, 54(3), 306.

V. Abu-Ghname, A., Lazo, D., Chade, S., Fioravanti, A., Colicchio, O., Alvarez, D., ... & Maricevich, M. (2022). The first dorsal metacarpal artery perforator free flap: The Comet Flap. Plastic and Reconstructive Surgery, 150(3), 671e-674e.

VI. Bravo, E., & Rodríguez-Merchán, E. C. (2022). Controversies in the Treatment of Fingertip Amputations in Adults: Conservative Versus Surgical Reconstruction. In Controversies in Orthopedic Surgery of The Upper Limb (pp. 247-263). Cham: Springer International Publishing.

VII. Chakraborty, S. S., Acharya, S., Goel, A. D., Sahu, R. K., Midya, M., & Kotu, S. (2022). A systematic review of the sensory outcomes of a standard cross-finger flap reconstruction for fingertip defects. The Journal of Hand Surgery (Asian-Pacific Volume), 27(05), 782-791.