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Fingertip Reconstruction Techniques: An Update

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ABSTRACT

The hand portion that sustains injuries most frequently is the fingertip. For a practical and aesthetically acceptable result, flap repair can be required if replantation of a fingertip amputation is not feasible. This work examines frequently used reconstruction methods, emphasizing technical nuances and potential issues and how to prevent them.

KEYWORDS: Complication, fingertip, injury, reconstruction, surgical tip

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INTRODUCTION

The most often damaged area of the hand is the fingertip, which is the section of the finger distal to the insertion of the flexor and extensor tendons. The fingertip's distinct architecture and specific structure make it essential for tasks including feeling, grasping, and delicate handling. In order to provide patients a satisfactory functional and cosmetic outcome, it is crucial to be aware of the treatment choices available for such injuries. Replanting a severed fingertip is not always an option, even though it can be the best technique to achieve both functional and cosmetic repair. The ability to undertake a distal replantation can be greatly impacted, if not completely prevented, by a number of factors, including as the cause of damage, the preservation and condition of the severed portion, the length of the ischemia period, the presence of a qualified team within the institution, and the availability of sufficient resources. Reconstruction of the fingertip flap then becomes crucial. For fingertip reconstruction, a number of methods with acceptable functional and aesthetic results have been documented. A variety of criteria need to be taken into account while selecting a surgical procedure. Above all, the nature of the damage will determine the kind of reconstruction that may be used. The remaining factors that are assessed fall into three categories: surgeon factors (prior experience, training, microsurgical skills), operating room availability, equipment, and team availability, and patient factors (hand dominance, occupation, age, expectations, prior injuries, smoking status, comorbidities). This study aims to discuss certain reconstructive techniques while concentrating on surgical pearls, potential problems, and preventative measures [1-4].

Figure 1. Fingertip amputation

Figure 2.Cross-flap digitis tip reconstruction

TECHNIQUES

Thenar flap

The thenar flap, first proposed by Gatewood and then updated by Flatt, is more frequently recommended for volar oblique injuries. Because there is a chance of flexion contracture in adults, it is best advised for the index and middle fingers and should be used sparingly. The flap can be raised in a number of ways, such as a "H" pattern or distally based. Using a "H" shape to elevate the donor region might make it easier for the flap to close after division. In order to reduce the possibility of flexion contracture hypersensitivity on the scar and possible unsightly color mismatch, it is crucial to avoid using a skin transplant at the donor site. A better donor site is produced by elevating the flap closer to the thumb metacarpophalangeal joint crease because there is more skin mobility there, allowing for direct wound closure at the donor site and requiring less flexion of the recipient finger than at the more proximal donor site that was initially described. But caution is needed to prevent damage to the superficial digital neurovascular bundles there. Usually, the flap is separated two or three weeks following the flap elevation [5-7].

Cross-finger flap

Similar to the thenar flap, the cross-finger flap is recommended for volar oblique injuries. The fact that it may be applied to any digit or several digits by stacking the digits next to one another for numerous wounded fingertips makes it theoretically easier to execute. It is also a fairly dependable method for major flaws. Gurdin and Pangman first described it, and Cronin made modifications. Designed to extend from the proximal interphalangeal (PIP) to the DIP creases, the flap is positioned dorsally at the level of the middle phalanx. The extensor mechanism's paratenon is superficially divided in a very obvious plane; retaining the paratenon over the extensor mechanism for skin grafting while also preserving all of the subcutaneous tissue affixed to the flap's skin. This will aid with the functional result in addition to initially allowing the flap to be perfused since it will act as good cushioning for the freshly repaired pulp. The PIP and DIP creases dorsally should be the site of the transverse incisions. This guarantees that the flap contains the supplying artery, which is the dorsal branch of the appropriate digital artery. If the flap is too tight or built too narrowly, the vascular supply to it may be compromised. The supplying artery on the donor finger is similarly vulnerable to unintentional suture damage during skin transplant implantation. To make a bigger flap and avoid kinking when the flap is translated and inset, extend these transverse limbs all the way to the junction between the volar and the dorsal glabrous skin (both radially and ulnarly). Lastly, we frequently loosen the Cleland ligament, which further mobilizes the flap and widens the space between the two fingers for more comfort. This flap is often separated two to three weeks following first elevation, same as the thenar flap [8-10].

Retrograde flow neurovascular island flap

This distally based digital artery flap was described by Lai et al. and Kojima et al. This homodigital flap covers a defect on the same digit by using the neurovascular pedicle of the skin and soft tissue, much like the previously reported neurovascular island flap. This flap, in contrast to the antegrade island flap, employs the anastomosing transverse arch as its artery intake; to reach the distal defect, it is transposed on this axis as a retrograde flow pedicle. In this way, larger deformities, such as whole amputations of the finger pulp, can be covered by this flap. It doesn't matter if the flap covers a dorsal or volar defect in the wound; it can cover either. The indications are comparable to those of a cross-finger flap, but the treatment is one-step, and there is less color variation than with a cross-finger flap. Technically speaking, this flap is more difficult, and there is a possibility of venous congestion during the recovery phase. After the neurovascular bundle has been identified, the nerve should be volarly severed, leaving behind some adipose tissue where the digital artery and the venae commitantes are joined. After being removed, the digital nerve is not split. A metal clip may protrude at the tip of the finger after the pulp has healed, thus suture should be used instead while ligating the digital artery proximally. The distal connections between the radial and ulnar digital arteries at the level of the DIP joint should be preserved by careful dissection. The ulnar side of the little finger and the radial side of the index finger should be protected against this flap, much like with the antegrade island flap. Avoiding tight skin closure during flap insetting is especially critical since there is a risk of venous congestion with this flap. To lower the likelihood of flexion contracture, we advise beginning with early active and mild passive range of motion of the finger [11-13].

COMPLICATIONS

Following fingertip repair, the most frequent side effects are flexion contractures, hypersensitive scar with continuous discomfort, nail deformities (hook, ridges, broken nails), decreased feeling, cold intolerance, scar retraction, chronic ulceration, infection, and flap loss. As previously mentioned, there are precautions to reduce the risks of problems unique to the flap that may arise. Reconstructions that are more intricate could be more prone to issues. Having the right

signs is the most crucial component in preventing failure. To improve patient satisfaction, a thorough conversation about problems, postoperative therapy and care, and reasonable expectations should be had with the patient.

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