Early and Temporary Use of Finger Prosthetics to Aid Rehabilitation

For many, losing a digit is traumatic, and adjusting to such a loss can be challenging. Not only do patients need to adjust from an occupational, social, and functional perspective, the subsequent pain that can follow after an amputation may also be an issue. The author describes an innovative and inexpensive splinting approach to assist these patients as they adjust after a digital amputation. The splint is designed to assist with the compensatory pain that people frequently feel as they learn to reuse their hand and to give people an understanding of what it feels like to have a prosthetic digit.—VICTORIA PRIGANC, PhD, OTR, CHT, CLT, Practice Forum Editor

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During 2001–2002, there were an estimated 27,886 non-work-related finger amputations with one or more digits in the United States.[1] Finger amputations can affect an individual physically and psychologically, which can impact one's activities of daily living (ADL).[2] The primary goal of hand surgery and hand therapy for these individuals is to restore function after traumatic amputations. Traditional prosthetic digits can take up to three months to be fitted and can be costly. These digital prostheses provide ascetics and some assistance with function. There is, however, a high non-use rate of these prosthetic devices despite the initial interest in obtaining a digital prosthesis.[3] Compliance varies on an individual basis, but some determining factors include the level of stump discomfort, gender, which digit is lost, and whether or not the person participates in manual or nonmanual employment.

Within a few days after a digital amputation, some patients need therapy to decrease compensatory pain, which is pain that develops as a patient learns to compensate for the loss of digit/digits. In our clinic, we have had success using splints to help decrease this compensatory or secondary pain.

The following case studies demonstrate how a simple splint design can be applied early in the rehabilitation process to increase function, while decreasing compensation pain that can develop when a patient begins to participate in ADLs. Initially, the splint is used to assist with pain management; however, as time progresses and the patient's activities increase, the patient is able to see how a permanent prosthetic feels and whether or not such a device would be beneficial. During the use of this temporary prosthetic splint, the patient may determine if a permanent prosthetic is warranted in the future.

CASE 1

Background

A 26-year-old male who cut his dominant index finger distal to the proximal interphalangeal (PIP) joint and middle finger at the proximal phalanx with an electric saw was considered. The hand surgeon at the emergency room presented the individual with three choices: 1) amputate the index finger proximal to the PIP joint; 2) fuse the index finger; or 3) complete a ray resection of the index finger. The patient chose the amputation. The middle finger had severed the digital nerve only. The subject works as an information technology technician, which involves writing, keyboarding, and using a mouse. His leisure pursuit is woodworking.

Treatment

Two weeks after surgery, the patient arrived in the clinic for splint fabrication, range of motion (ROM) execises, and desensitization. The patient was administered the Disability of the Arm, Shoulder, and Hand (DASH) survey and reported

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0894-1130/$ - see front matter

doi:10.1016/j.jht.2010.04.003

an outcome score of 31%. A hand-based dorsal blocking splint was fabricated to block full extension to protect the middle finger nerve repair (per protocol). Active ROM (AROM) and passive ROM (PROM) were performed within the limits of the splint. Desensitization of the index stump and sensory reeducation to the middle finger was performed. Two weeks after beginning occupational therapy (OT), the extension block splint was discharged, and the patient returned to unrestricted work duties. At this time, the patient developed pain between the index and middle metacarpals when writing and typing because of compensation. At the fourth visit (three weeks postsurgery), an index finger prosthetic was fabricated with 1/8-inch material to lengthen the stump to its original length and prevent further compensation pain. The following week, the patient noticed a decrease in pain at the MP with the use of the prosthetic during writing and typing (Figure 1). After only three weeks of using the prosthetic, the patient stopped using it, because the initial pain was gone, and he had learned to compensate for the loss of the index finger. At discharge, after 10 OT visits, the patient was not using the prosthetic, reported a DASH score of 8%, and was back woodworking seven weeks after surgery.

CASE 2

Background

A 76-year-old male who severed his dominant index, middle, and ring fingers below the PIP at different levels when trying to unclog a snow blower was considered. The patient is retired but is very active around the house. His biggest concerns were not being able to haul logs for the woodstove and type on the computer.

Treatment

Four weeks after surgery, the patient arrived in the clinic for pain management, desensitization, and functional retraining for ADLs. As the patient's pain decreased, there was a gradual increase in the use of the affected hand. This caused significant pain in the carpometacarpal (CMC) joint and the fifth digit because of compensation for the missing digits. A CMC brace was given to the patient, and modalities were used to decrease the pain. Four weeks after beginning OT, finger prosthetics were fabricated with 1/8-inch material for the index, middle, and ring fingers to restore the digits to the original length. The patient had a slow, steady decrease in pain while maintaining function with ADLs, such as grasping objects and typing on the computer (Figure 2). The patient was seen for 15 weeks and was still using the prosthetics on discharge. On follow-up one year later, the patient reported using the prosthetics for a few months but had stopped using them because of increased strength in his thenar and hypothenar eminences.

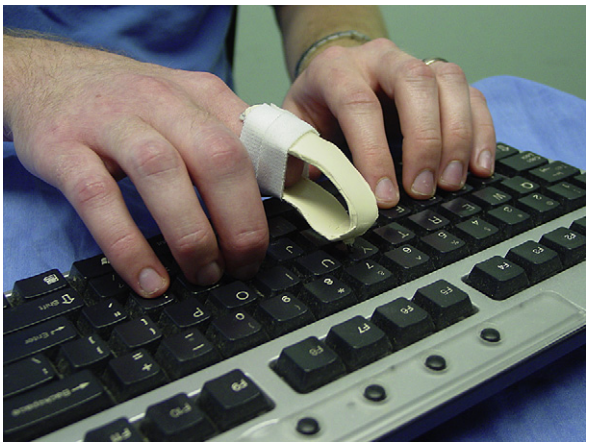

FIGURE 1. *Single amputation using prosthetic to type on a keyboard.*

FIGURE 2. *Multi-amputation using prosthetic to drink or lift items. The peg on the tip of the index finger is used for typing to get the exact keys.*

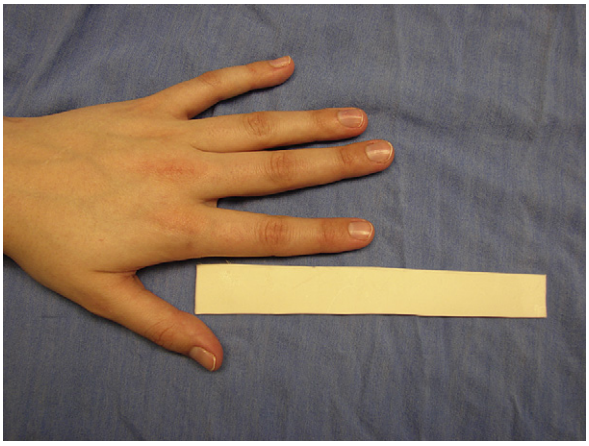

FIGURE 3. *Measurement of the material on the non-involved hand.*

SPLINT DESIGN

These splints were fabricated with 1/8-inch thermoplastic material with high rigidity. The exact material is not pertinent to the success of the splint as long as the material has enough strength to fulfill the ADL needs of the patient.

- Measure the length of the uninvolved digit and double it to determine the length of the splint (Figure 3).
- Cut a strip the width of the finger, fit along the top of the uninvolved digit, and wrap over the tip to the base of the finger (Figure 4).
- Fabricate with a slight bend of the PIP to allow for function with grip and typing.
- Place on the amputated digit and secure with a piece of velcro around the stump.

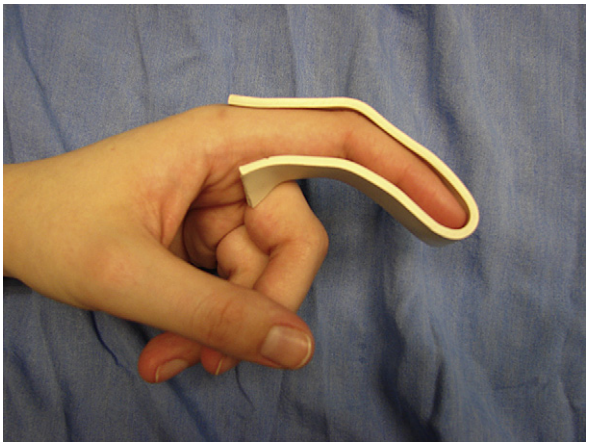

FIGURE 4. *Material wrapped around the non-involved digit to get the correct length. The PIP has a slight bend to allow for function.*

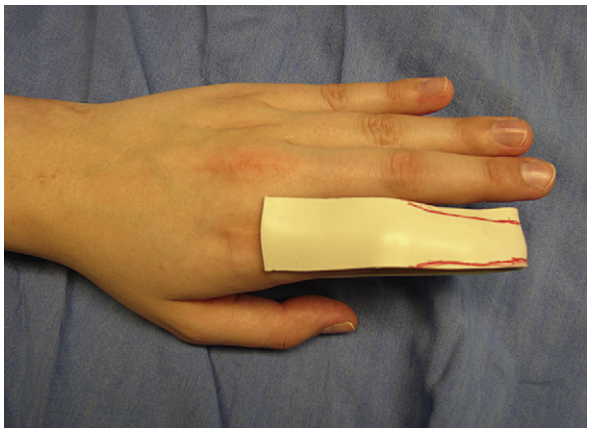

FIGURE 5. *Mark and taper the width of the material from the PIP to the tip to decrease rubbing the adjacent digit.*

- Trim the width to be smaller from the PIP to tip, so that the adjacent finger does not rub (Figures 5 and 6).

Coban (3M, St. Paul, MN) or edema wrap around the stump can be used to prevent slipping when gripping. Depending on the tissue coverage of the stump, foam or gel padding can be used to prevent breakdown over the dorsal proximal phalanx. A peg or rivet can be added for function to the tip at the correct angle when typing (Figure 7).

UNIQUENESS

This splint design offers a unique, cost-effective way of decreasing compensatory pain during the

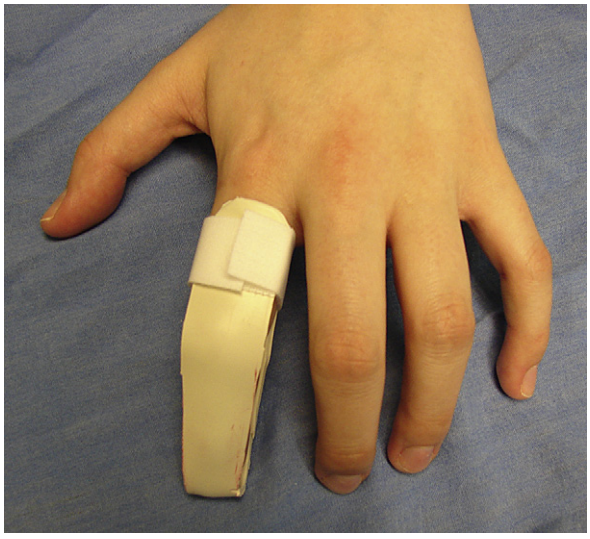

FIGURE 6. *Final prosthetic splint with velcro attached at the proximal phalanx/stump.*

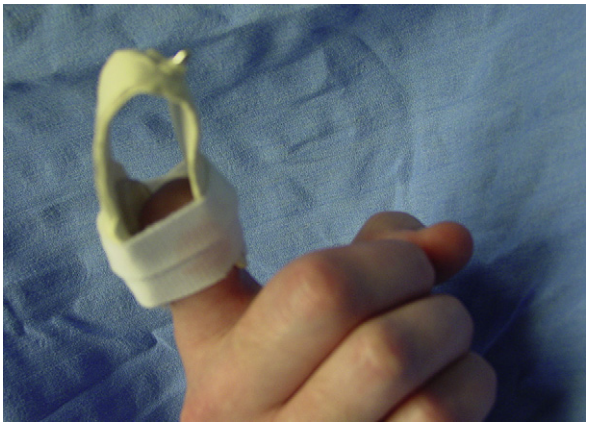

FIGURE 7. *A rivet is added to the tip to be more point-specific, especially with typing.*

healing process. It can be applied early in the rehabilitation process, as early as a few days depending on the sutures and wound care. With the use of the splint, the two patients experienced increased function with ADLs during the healing process. Traditional prosthetics can be expensive and take weeks to be fitted. This design can be fabricated to the patient in one session and for a minimal cost of materials. It also allows the patient to determine if a cosmetic prosthetic digit is desired or warranted in the future.

CONCLUSION

This treatment technique is a relatively simple way to treat compensation or secondary pain during the healing process of an amputation. It can be fabricated and used early, when the stump is healing. The use of the prosthetic improves function, which in turn, can have improved psychological benefits. It also helps to determine if the patient will want or use a permanent prosthetic before investing in a costly item.

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