

Silicone Finger Prosthesis. A Clinical Report

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Restoration of both form and function are essential requirements for the fabrication of a finger prosthesis.¹ The ideally constructed finger prosthesis must meet the following preconditions: the prosthesis must assist in grip and absorbing and transferring forces to the hand;² the prosthesis should look natural, allowing expression of gestures.³ The missing partial or complete finger has tremendous physical and emotional influence, and it may affect the social well being of an individual.

Loss of fingers can occur because of trauma, congenital disorders such as amniotic band syndrome, and excision for neoplastic disorders.⁴ Although microsurgical reconstruction by reimplantation or transplantation can be attempted to restore function of many finger defects, it may not be possible in crush and severe injuries. Prosthetic rehabilitation as an alternative could be considered in these situations.⁵ Restoring the digit with a functional prosthesis with matching form, color, and texture will enhance patients' acceptance and confidence. The most common methods of retaining a digital prosthesis are by vacuum effect on the stump, use of a ring at the junction of prosthesis and stump,⁵ and the use of osseointegrated implants with customized attachments.^{6,7}

Painful hypersensitivity has been reported, especially at the end of finger remnants after amputation. It has been documented that the same can be alleviated with the use of gentle pressure exerted by silicone prosthesis.⁸

This report presents a case of rehabilitation of a finger defect with a silicone prosthesis and describes a method of retention for the same.

Abstract

The loss of all or part of a finger following traumatic amputation may have a negative impact on physical and psychological well being. An esthetic prosthesis can offer psychological, functional, and rehabilitative advantages. The success of a prosthetic restoration primarily depends on its retention. This clinical report describes an alternative method of retention by scoring the master cast of a partially amputated finger, thus enhancing the vacuum effect for the retention of the prosthesis. The methodology of treatment is also explained. Silicone material was used to provide function and esthetics.

Clinical report

A 22-year-old female patient reported to the Department of Prosthodontics, Krishnadevaraya College of Dental Sciences, Bengaluru, India, with a chief complaint of a partially missing index finger on her right hand. She wanted to get it replaced because she was getting married. History revealed that the patient lost a part of her index finger 1 year previously because of a traumatic injury. The amputation was partial, involving the mid-part of the middle phalanx of the right index finger. The wound completely healed, and the surrounding skin showed no signs of inflammation and infection. The patient had no history of a previous prosthesis. Informed consent was obtained before beginning the treatment procedure.

A thin layer of petroleum jelly was applied to the patient's hand prior to making the impression with irreversible hydrocolloid impression material (Jeltrate; Dentsply). Impressions were then poured with ADA type IV dental stone (Kal Rock, Kala Bhai Karson Pvt.) to create positive replica of the amputated finger (Fig 1).

The overall diameter of the middle phalanx (about 1 cm) was reduced by 0.5 mm with a flame-shaped tungsten carbide bur. A ring-shaped depression of about 1-mm depth and 1.5-mm width was made with round tungsten carbide burs at the junction of the middle and mesial phalanx⁹ (Fig 1) and measured with a digital vernier caliper.

An impression was made of the contralateral digit using alginate impression material, and modeling wax (Y-Dent, MDM corporation, New Delhi, India) was poured into the negative mold to duplicate the lost finger (Fig 2). The wax pattern





Figure 1 Positive replica and scored replica of amputed finger.



Figure 2 Wax pattern.

was modified and adapted on the stump cast. Surface characterization (skin folds and wrinkles) was incorporated using appropriate tools. This pattern was assessed and adjusted keeping in mind the size, shape, and contours of the contralateral finger.

The wax pattern was then flasked using ADA type 2 Plaster of Paris (Kal Dent). Undercuts were avoided to facilitate easy opening of the flasks and subsequent removal of the set silicone prosthesis.

The mold was created by the lost-wax technique. The silicone base material (Silicone A-2186 Platinum Silicone Elastomers, Factor II, Lakeside, AZ) was mixed with catalyst in a ratio of 10:1 by weight, and thixo (Factor II) was added to thicken the



Figure 3 Shade evaluation of finger skin.



Figure 4 Extrinsic coloration.



Figure 5 Fingernail matching with natural fingers.

material and to reduce the problem of air entrapment. The base color of the prosthesis was matched with the ventral and dorsal surface of the hand (Fig 3). Colored silicone was then layered

into the mold, and the flask was closed applying light pressure. Excess material was removed.

The mold was then transferred to a clamp, and roomtemperature vulcanizing (RTV) silicone was then processed at 100°C for 30 minutes as recommended by the manufacturers. The silicone prosthesis was then retrieved from the mold, and excess silicone trimmed using sharp curved scissors. Burs provided by the company were used to finish the prosthesis. The fit and shade of the finger prosthesis was evaluated on the patient. For better color/shade matching, extrinsic coloration was applied on the dorsal and ventral areas of the finger prosthesis under daylight (Fig 4). A fingernail was molded from base silicone material and pigmented to match the patient's natural nails (Fig 5). The prosthesis was inserted, and the patient expressed satisfaction with the end result and the retention of the prosthesis. The patient was given a demonstration on the use of medical grade adhesive (Daro Hydrobond, Factor II) if additional retention was required.

Homecare instructions involving the use of a soft brush, soap, and warm water irrigation were given, and the patient was instructed to come back after 2 months for a recall check-up. Recall examination revealed healthy skin at the amputation site and good retention of the prosthesis.

Discussion

Loss of any finger affects esthetics and functionality, greatly impacting dexterous individuals. Most cases involving distal phalangeal amputations can be restored to near normal functionality using appropriate prostheses.^{10,11} Customized silicone prostheses have a wider rate of acceptance, owing to their comfort, durability, and stain resistance, which are far superior than any other available extraoral maxillofacial materials.¹² Coloration carried out while the patient is wearing the prosthesis (preferably under natural light) is critical for patient acceptance. Additional functional benefits of silicone prostheses include desensitization and protection of the painful hypersensitive tissue at the amputation site by constant gentle pressure exerted over the affected area. It has also been speculated that silicone gel improves the hydration of the stratum, making the scar tissue more pliable and comfortable.

Various methods of retention are available (i.e., using rings over the margins of the finger prosthesis, using medical grade adhesive, or by implant-retained prosthesis). In the patient here, the positive model was rectified to create suction for retention. It is possible to ensure enhanced retention by creating multiple grooves in the positive model, thus creating multiple vacuum chambers.

The most challenging cases are those where suction is not feasible or is compromised, as is seen in cases of a short or fleshy residual finger.¹³ This problem can be overcome with the use

of medical grade adhesives to hold the prosthesis in position. In case of multiple missing fingers, extensive skin coverage can be considered. Contrary to this, many patients with similar amputations still prefer a single-finger prosthesis, even at the expense of a compromised grasp, making use of medical grade adhesives necessary. Therefore, this must be discussed with the patient before designing the prosthesis.

Conclusion

The loss of all or part of a finger following traumatic amputation may have a negative impact on the physical and psychological well being of an individual. An esthetic and retentive prosthesis are the primary determinant factors in the successful prosthetic restoration of a finger. There are many methods of retention such as implant and adhesives. An alternate method using both suction and vacuum was attempted and found to be quite successful.

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