Sculpting lifelike finger prosthesis

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Abstract

Partly or completely missing finger is documented as the most common consequence of a trauma. The physical loss may have a psychological impact if the victim is young. Hence it's important to restore the loss as soon as possible. A case report is presented where a hollow custom-made finger prosthesis was fabricated using silicone elastomer which has adequate retention, good in esthetics and can show movements. For sculpting skin creases elastomeric impression of the contralateral little finger was used. Thus lifelike finger prosthesis could be made using methodical approach of fabrication.

Keywords: Finger prosthesis, hollow wax pattern, silicone prosthesis.

Introduction

A loss as small as part of a finger may have deep psychological implications upon the victim. It can be congenitally missing or occur as a result of some trauma. Mostly the prosthetic replacement of a missing digit depends upon a number of factors like the materials required for the replacement, colour matching, obtaining correct texturing of grooves and age-lines, mode of retention and most important is the skill of doctor and communication between the patient and the clinician.

Advances in microvascular reconstruction and using implant as the mode of retention are restricted by the consideration of economic factor. However, the method of retention notwithstanding, a life-like reproduction of the prosthesis will be as unrecognizable as a perfectly fabricated missing tooth.

Case Report

A 50-year-old man reported to the Department of Prosthodontics , Crown Bridge and Implantology for rehabilitation of missing little finger of right hand[Figure 1,2].

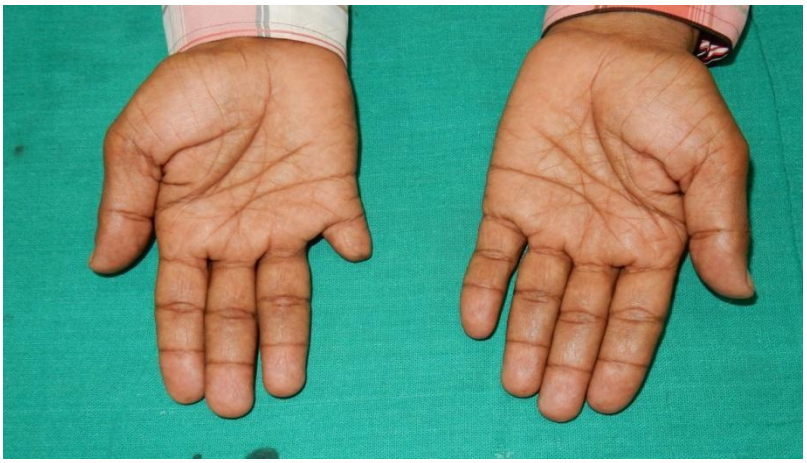

Fig. 1 Palmer aspect of hand - pretreatment

Fig. 2 Dorsal aspect of hand

The patient revealed a history of having lost the digit in a traumatic injury. On examination, it was found that the amputation occurred at mid shaft level of proximal phalanx of the little finger. The remaining stump appeared healthy with no active swelling and discharge. After clinical evaluation, it was decided that the amputated finger can be restored with the fabrication of silicone prosthesis. The patient's hand was lubricated with a thin layer of petroleum jelly. Alginate impression material was mixed and poured into a box with the simultaneous application on the dorsal and palmar surface. Patient hand was inserted into the center of box maintaining equal space superoinferiorly and mediolaterally. The patient was instructed to keep the hand in normal resting position. The impression was poured with ADA type 4 dental stone(Kal Rock, Kala Bhai Karson Pvt.) and the cast was retrieved[Figure 3].

Fig. 3 Working model of hand

An elastomeric impression of the little finger of the left hand was made. The impression was then poured with molten modeling wax and dipped in chilled water. The outer layer of wax that is in contact

with impression surface hardens instantly while inner layer remains flowable which was poured out [Figure 4].

Fig. 4 Making hollow wax pattern

By this procedure, we made our desired hollow wax pattern. The wax pattern was then moulded so that it resembled the form of lost finger. During moulding, fine details were lost and to resume the lost final details following procedure was adopted.

An initial elastomeric impression was cut into three pieces such that we got distal, intermediate and proximal phalanx sections. These sections were then divided into dorsal and ventral halves. So we had six sections that were slightly heated and pressed over the wax pattern to get fine grooves or lines for more lifelike appearance [Figure 5].

Fig. 5 Sculpting skin creases with elastomeric impression

Finally sculpted and carved wax pattern was fitted on the master cast of affected hand[Figure 6,7] and then tried on patient finger stump and checked for fit, stability, shape, size contour and surface pattern[Figure 8,9].


Fig6: Hand model with wax pattern carved – dorsal aspect


Fig7: Hand model with wax pattern carved – palmer aspect


Fig8: Wax pattern tried on hand - dorsal aspect


Fig9: Wax pattern tried on hand - ventral aspect

The pattern was then flasked using two stage flasking technique such that dorsal and the ventral aspects of the finger were separable to allow appropriate shade matching for both the surfaces [Figure 10]


. Fig 10. Flasking

After dewaxing the mould was allowed to cool. Intrinsic colors were mixed to achieve the appropriate characterisation of the palmar and dorsal surfaces. Shade matching was done using natural daylight and in presence of patient to gain his approval. The mould created by the elimination of the wax was packed with platinum silicone elastomer , factor II inc. VST 50. The material was cured as per manufacturer's instruction. Once the final prosthesis was retrieved, the flash was trimmed using a sharp B.P. blade and the final finishing was accomplished using fine sandpaper strips. An appropriate sized artificial nail was adapted into place and to achieve an enhanced realistic appearance, the nail was shaped and colored according to the nail of natural fingers. To retain the prosthesis metal ring was used[Figure 11,12].


Fig 11. Final prosthesis – dorsal aspect


Fig 12. Final prosthesis - palmer aspect

The patient could reproduce the movements of the stump with success without displacement of the prosthesis[Figure 13].


Fig. 13 Final prosthesis – in function

The prosthesis was inserted and the patient was instructed in homecare and prosthesis maintenance. Silicone is considered the major retainer of microorganisms on its surface. Therefore, for cleaning prosthesis, the use of water and neutral soap, as well as chlorhexidine, is recommended. As regards care of the adjacent tissues, it is recommended to remove the prosthesis before going to sleep, in addition to washing the prosthesis receptor tissues with water and neutral soap or with a mixture of hydrogen peroxide and water[1].

Discussion

Individuals who desire finger replacement usually have high expectation for the appearance of a prosthesis[2]. The various material used for such prosthesis are acrylic resin, Polyvinyl chloride copolymer, polyurethane elastomer, silicone elastomer etc. In the presented case, we have used silicone elastomer as it gives the more natural appearance, is durable as well and stain resistant as compared to other materials mentioned above[3]. Silicone finger prosthesis may have additional functional benefits. Many traumatic amputees experience painful hypersensitivity at the termination of finger remnants. The gentle constant pressure of elastomer prosthesis can help desensitize and protect the injured tip[4]. For retaining the finger prosthesis and to mask the junction between the prosthesis and natural finger metal ring was used. As our prosthesis was hollow in design so light weight, a metal ring was sufficient to retain it. Prosthesis being hollow patient could reproduce movement with comfort and without displacement of the prosthesis. An elastomeric impression of contralateral finger was used to sculpt finer details on wax pattern in the presented case. Osseointegrated implant was another option for

retention but patient was unwilling due to an invasive procedure. The colour of a prosthesis plays very important role, being one of the main factors contributing to the success of a prosthesis. Esthetic value of artificial part of the body comes from its ability to fit well and merge into the surroundings of the skin and other anatomical structures making it unnoticeable to the onlooker[5]. Careful colouration is essential for maximal patient acceptance. Red, yellow, blue and white were mixed in appropriate consistencies to achieve dorsal surface characterisation and for ventral surface, burnt sienna colour was additionally used. Thus a satisfying rehabilitation , relieves the patient of his deformity and brings out a positive attitude to personality.

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