

METHODOLOGIES



Finger prosthesis using silicone elastomer: A novel methodology

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Abstract

Maxillofacial prosthodontics is much an art as it is a science. The prosthesis provides a life-like appearance to duplicate the missing structures. The complete or partial loss of a finger not only results in functional deficiency, but also causes marked psychological trauma to the patient. This paper describes the fabrication of custom made finger prosthesis using silicone material. The retention for this patient was obtained by reducing the stump and using a ring of suitable size.

Keywords: Finger prosthesis, mechanical retention, silicone

Introduction

Finger and partial-finger amputations are some of the most frequently encountered forms of partial-hand losses.^[1] Although the most common causes of these amputations are traumatic injuries, congenital absences or malformations may present similar clinical challenges.^[2]

Prosthesis refers to artificial replacement of a missing part of the human body. These artificial substitutes support the patient emotionally as well as physically. They play an immense role in making the patient more socially acceptable.^[3] Surgical procedure cannot restore esthetics as much as prosthesis can and incurs major financial burden. The major role in rehabilitating the patient is thus played by the maxillofacial prosthodontist and the anaplastologist. The ideally constructed finger prosthesis must meet the following preconditions: The prosthesis must assist in grip and absorbing and transferring forces to the hand; the prosthesis should look natural, allowing expression of gestures.^[4,5]

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

Clinical Report

A 22-year-old female patient reported to the Department of Prosthodontics, with a chief complaint of a partially missing

index finger on her right hand [Figure 1]. A complete hand examination was carried out that revealed a residual stump on the index finger of the right hand measuring 1.5 cm in height. A solitary healed wound/scar was seen on the base of the residual stump. The surrounding area appeared to be normal with no signs of any infection or inflammation. Informed consent was obtained before beginning the treatment procedure.

Making impressions

The index finger of the patient's left and right hand were lubricated with a thin layer of petroleum jelly, to prevent the hydrocolloid impression material from adhering to it. Impressions of the stump and of the index finger of the contralateral hand, which correspond to the lost digit were taken using irreversible hydrocolloid. A plastic disposable cup was used for making impression. The cups were selected according to the size of patient's fingers to provide adequate space of at least 5 mm around for the impression material. Regular setting alginate was mixed using cold water to increase the working time and poured into the cups. The patient was asked to put her finger and stump vertically into the cups without touching the walls of the cups [Figure 2]. Both the impressions were made with the digits in the semiflexed and relaxed position. The material was allowed to set and the fingers were removed quickly in a jerking motion after the material was set.

The impression of the stump was poured in Type-III dental stone. The impression of the middle finger was poured with molten modeling wax. Upon cooling, the wax pattern was retrieved from alginate mold by partially incising the alginate mold with sharp instrument [Figure 3].

The wax pattern was then adjusted by sculpting and adapted on the working cast. Approximate length and angulations were determined on working a cast and later confirmed during the trial of the wax pattern. The wax pattern was tried on the patients affected right-hand little finger [Figure 4]. Necessary adjustments regarding the length, contour, and angulations of the finger were done at this stage of prosthetic fabrication.

Stump preparation

A reduction of 1-1.5 mm was done on the stone casts to produce prosthesis with a smaller diameter, which can be stretched over the stump to provide retention.



Figure 3: Incising the impression and retrieval of wax pattern from mold



Figure 1: Residual stump



Figure 4: Wax pattern trial



Figure 2: Stump placed in irreversible hydrocolloid impression material



Figure 5: Final prosthesis

The pattern and the cast were then invested in a large size Hanau flask. The mold was first poured only up to half of the pattern. Tin foil substitute was applied, and then the other half was poured, wax was eliminated in the conventional way.

Color matching and incorporation of nail

The most critical step was to match the color of the prostheses to the patient's skin color. The basic skin color was observed. The colors were mixed with the silicone to obtain the base color. Maximum efforts were made to achieve the appropriate characterization for the palmar and dorsal surfaces of the prostheses. The shade matching was done using natural daylight. The artificial nail was properly shaped and trimmed to the required size. Around 1 mm of nail bed was carved in the wax pattern, and the nail was incorporated in that space.

The mold created by the elimination of the wax was packed with silicone rubber. The material was allowed to bench cure overnight and for the final polymerization, it was placed in hot water, for 1 h, at 45°C.

Once the final prosthesis was retrieved, the flash was trimmed using a sharp blade and the final finishing was accomplished using fine sand paper.

The retention for this patient was by using a ring of suitable size [Figure 5].

Discussion

Individuals who desire finger replacement usually have high expectations for the appearance of the prosthesis.^[6] The polyvinyl chloride material generally used is easily and permanently stained by such common materials as ballpoint pen and newspaper ink and has not proven durable enough for active use. The acceptance rate is much higher with custom made silicone elastomer prosthesis due to the overall durability and stain resistance of silicone.^[7] Almost all stains can be removed easily

with water and soap.^[8] Placing a decorative ring over the margin of a finger prosthesis ending at the metacarpal-phalangeal joint will make the changing color of the hand less noticeable although the distal joint functions will be slightly restricted.

Conclusion

The custom-made finger prosthesis is esthetically acceptable and comfortable for use in patients with amputated fingers, resulting in psychological improvement and personality. An esthetic and retentive prosthesis are the primary determinant factors in the successful prosthetic restoration of a finger. The retention for this patient was obtained by reducing the stump and using a ring of suitable size.

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