

## Finger Prosthesis - An Attempt to Simulate Divine Creations : A Clinical Case

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### Abstract

*Finger amputations are one of the most frequently encountered forms of partial hand loss. Absence of finger causes marked psychological trauma, loss of grasp strength and social security. Prosthetic rehabilitation can be provided for such patients with individually sculpted custom restoration made of silicone elastomer. Retention is an important aspect in such prosthesis which can be achieved by finger rings, magnets or adhesive. This clinical case report presents a simple and easy way of retaining a silicone finger prosthesis with the fabrication of customized metal ring on the amputated stump and use of magnets giving adequate retention as well as minimising deviation of the prosthesis.*

**Keywords :** *finger, finger prosthesis, amputation, silicone, rehabilitation.*

### Introduction

Finger and partial finger amputations are some of the most frequently encountered forms of partial hand loss. The most common causes of these amputations are trauma, congenital absence and malformations or disease [1]. Such amputations cause life-long functional deficiency, immediate loss of grasp strength and security, pain, contractures, affect patient's socio-economic status but moreover causes psychological trauma of being handicapped [2].

Advances in surgical science in the form of micro vascular reimplantation have helped save many severely injured and traumatically amputated digits. However, in most of the patients, micro vascular reconstruction is contraindicated, unavailable or unsuccessful [3]. So the role of Prosthodontist comes for rehabilitation of such patients with the application of art and science to fabricate prosthesis that replaces and restores missing or amputated part [4].

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This paper presents the prosthetic rehabilitation of amputated fingers with a custom-made prosthesis fabricated using silicone elastomers and retained with the help of magnets.

### Case Report

A 51-year-old female patient reported to the department of Prosthodontics, Rural Dental College, Loni, India, with chief complaint of missing upper and lower teeth. Intra oral examination revealed edentulous maxillary and mandibular arches. General examination revealed that she had index and middle finger of right hand missing (Figure 1). On asking for the cause she gave history of accidental trauma in childhood.



**Figure 1: Missing index and middle finger**

Maxillary and mandibular complete dentures were fabricated according to the principles of complete dentures. The patient was unaware of possible rehabilitative technique for her missing fingers. So she was motivated for the finger prosthesis.

After obtaining informed consent from the patient, to ensure her willingness and cooperation, examination of right hand was done. The amputated fingers showed thickened ends. The surrounding area appeared to be normal with no signs of any infection over the digits. On radiological investigation it was found that proximal phalanx of the middle finger of her right hand was tilted distally (Figure 2).



**Figure 2: Radiograph of right hand**

The patient's right hand was lubricated with a thin layer of petroleum jelly, the area around the hand was boxed and irreversible hydrocolloid impression material was placed over the palmar side first and then the dorsal side to prevent tearing and distortion of the material. The impression was poured in type III dental stone and a positive replica of the hand was retrieved.

A putty index of patient's left hand index and middle finger was made and molten wax was poured into the putty index so as to get approximate finger replicas. These wax patterns were placed on the model and modifications in sculpting were carried out with the help of OHP transparent sheet (Figure 3). Patient's right and left hand were overlapped on this paper so as to guide the operator in sculpting the wax pattern. Try in of the wax pattern was done on the patient's hand and size, shape, fit, stability and seating of the pattern was thus evaluated.



**Figure 3: Transparent sheet showing tracings**

For fabrication of customized metal ring, light body addition silicon impression material was used to make impression of amputated stump with customized tray. It was poured in type IV die stone. This stone model was surveyed and block-out was done. It was duplicated and

poured in investment material. On this investment model of amputated stump, ring pattern was fabricated, invested and casted in Nichel-Chrome metal. It was finished, polished and tried on patient's stump for fit and smoothness of the casting (Figure 4). The ring was then incorporated in the wax pattern of the fingers.



**Figure 4: Customized metal ring on amputated stump**

Finger nails were fabricated from cold cure clear acrylic poured in putty index of the finger. Also surface characterization was done on the wax pattern to highlight skin folds, wrinkles, and print patterns so as to give natural look to the prosthesis. The pattern was finally tried on the patient's hand.

The whole assembly was flaked in custom-made box. Escape vents were provided to prevent air entrapment and for escape of excess material. Grooves were made to re-orient the mould. Acrylic stumps were made for retention of the finger nail. Separating medium was applied and a second pour was done to cover the entire wax pattern. Care was taken to avoid undercuts for the counter flask. Dewaxing was carried out and the flask was allowed to cool.

Factor II Brand medical grade silicone MDX-4210 RTV (Room Temperature Vulcanizer), better known as Dow Corning Brand silicone, was used. The base color was dispensed and intrinsic colors were mixed to achieve the required shade. The dorsal and palmar aspects were mixed separately and characterization was incorporated. The patient's presence was critical to gain her approval. The mould was packed separately for dorsal and palmar surfaces.

The prosthesis was initially tried on the patients hand in lieu of the missing finger. But due to the weight of the prosthesis, there was axial deviation of the prosthesis distally (Figure 5). So three cobalt-samarium magnets were incorporated in the proximal aspect of the prosthesis. These were retained with the metal ring present on the patient's middle finger thereby significantly reducing deviation (Figure 6).



Figure 5: Axial deviation of prosthesis



Figure6: Deviation of prosthesis reduced.



Figure 7: Final prosthesis

The patient was instructed and demonstrated about the use and maintenance of the prosthesis (Figure 7).

### Discussion

Retention is the primary determinant of prosthetic restoration of any part of the body. In case of finger prosthesis, as long as 1cm of the mobile phalanx remains at the amputated region, the restoration of active grasp finger is feasible.

Vacuum allows the prosthesis to remain on the finger. When suction is marginal because of a short or fleshy residual finger, medical adhesive may be used to hold the prosthesis [5]. Decorative rings are used for appearance, to mask the margin of prosthesis as well as for retention [6]. Implant-retained prosthesis has higher functionality[7]. In this case, due to the tilt of the proximal phalanx of middle finger, implant placement was not practical.

Since the residual amputated surface area was less, retention was a question in this patient. So it was planned to fabricate customized metal ring on the amputated stump. Due to the bulk of the prosthesis it was deviated distally.

So with the help of magnets the deviation was minimized. Magnets have been effectively used for the retention, maintenance, and stabilization of maxillofacial prostheses. Advantages of using magnets are ease of placement, automatic reseating, easy replacement, small size with strong attractive forces, can be placed within the prostheses, and ease of cleaning [8]. So the prosthesis had mechanical as well as magnetic retention.

### Conclusion

The custom-made finger prosthesis was aesthetically acceptable, partially restored some degree of functionality (Figure 8), comfortable for patient's use resulting in psychological improvement and her personality development.



Figure 8: Prosthesis in function

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