

## Prosthetic Rehabilitation of a patient with partially amputated index finger

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### Abstract

Hands are capable of a wide variety of functions like touching, grasping, feeling, holding, manipulating, caressing, and more. It is a vital and important part of a person's identity and well being. Loss of part of the hands can affect esthetics; functions are undermined depending upon the severity of loss and it causes a great psychological disturbance. The prosthetic rehabilitation of a partially amputated finger presents a challenge to the Prosthodontist. This case report illustrates the procedure of fabrication of finger prosthesis using room temperature vulcanizing (RTV) silicone and intrinsic staining with modern prosthetic design to improve the esthetics of a patient with partially amputated left index finger.

**Keywords: Finger Prosthesis, Silicone, Intrinsic Stains.**

### Introduction

Today is the age of esthetics where everyone wants to be appreciated for their beauty. With so much demand of esthetics, any loss of limb of young individuals not only affects them psychologically but also ruins their appearance. Apart from performing functions like touching, grasping, feeling; our hands play an important role in how we communicate. They are used as a means of communication regularly. Loss of a fingers can be complete or partial. It is one of the most frequently encountered forms of partial hand loss. The most common causes for finger amputation are trauma, disease such as diabetes, peripheral vascular disease (PVD) or sometimes congenitally<sup>1</sup>. The patient usually undergoes five stages of grieving after any limb loss which are denial and isolation, anger, bargaining, depression, acceptance and hope<sup>2,3</sup>. Usually they are advised to seek medical help, exercise and go back to work to come out of the psychological trauma resulting from the loss of the finger<sup>2,3</sup>. The microsurgical re-implantation helps to save many traumatically amputated finger. But when surgical reconstruction is contraindicated, rehabilitation of amputated finger with a high quality esthetic prosthesis with passive function is of utmost importance. The restoration of

the natural appearance eliminates the trauma generated by the dysfunction and represents an efficient psychological therapy. The prosthesis must duplicate the missing parts so accurately that the observer notices nothing that would draw attention to the prosthetic reconstruction. Rehabilitation efforts can only be successful when the patient can appear in public without the fear of attracting unwanted attention<sup>4</sup>. This article illustrates the procedure of fabrication of a highly esthetic finger prosthesis using room temperature vulcanizing (RTV) silicone with modern prosthetic design to improve function and esthetics of a patient with partial amputation of the left index finger.

### Case Report

A 32 year old male patient reported to the Department of Prosthodontics for rehabilitation of partial loss of left index finger. Patient gave history of trauma to his left hand while working on a mechanical lathe 9 months ago in which a part of the index finger was badly crushed. Since micro-vascular reconstruction of traumatized part of the finger was not possible, the affected part of the finger was amputated. Sutures along with pressure bandage were applied. (**Fig. 1**)



**Fig. 1: Partially amputated index finger**

On examination of the affected finger, it was noticed that the left index finger was amputated at the junction of middle and distal phalanx. There was no limitation in movement or function. No undercuts were present. The partially amputated finger showed

no signs of surgical scar or inflammation and a plain radiograph of the left hand confirmed the amputation of the junction of the middle and distal phalanx. **(Fig. 2)**



**Fig. 2: Radiographic image**

It was decided that a thimble type silicon finger prosthesis extending up to the junction of middle and proximal phalanx should be fabricated. Since the patient is young and highly concerned about his esthetics, a lot of attention was given to shade matching of the finger prosthesis and use of intrinsic stains was opted. It was planned that a small plastic strip bandage should be used for covering the

junction of silicone prosthesis to make the changing color of the finger less noticeable and to aid in retention. Another treatment option like acrylic finger prosthesis was ruled out due to rigidity of the acrylic material which is sometimes not tolerable by the patients. Use of extra oral implants for retention of finger prosthesis was excluded due to economic limitations. Intrinsic stains were used instead of

extrinsic stains due to more color stability of intrinsic stains. To give a more lifelike feel to the prosthesis, prefabricated nail was employed. It was painted using nail paints and intrinsic pigments from the inner side. Integral half moon, white margins were also incorporated in the nail design.

#### Technique

1. Firstly, the impression of the hand with partial missing finger was made using a thin mix of

irreversible hydrocolloid impression material. The hand was lubricated with petroleum jelly and then inserted into a box made up of cardboard and filled with thin mix of irreversible hydrocolloid. The hand was kept in the normal resting position without stretching while making the impression.

2. The impression was then poured in Dental stone type III and after setting, a positive replica of the hand was retrieved. **(Fig. 3)**



**Fig. 3: Positive replica of hand in Dental stone type III**

3. Impression of the unaffected index finger was made using putty by hand manipulation around the index finger. Molten modelling wax thereafter poured into the putty impression to get the wax pattern of the prosthesis. The wax pattern was

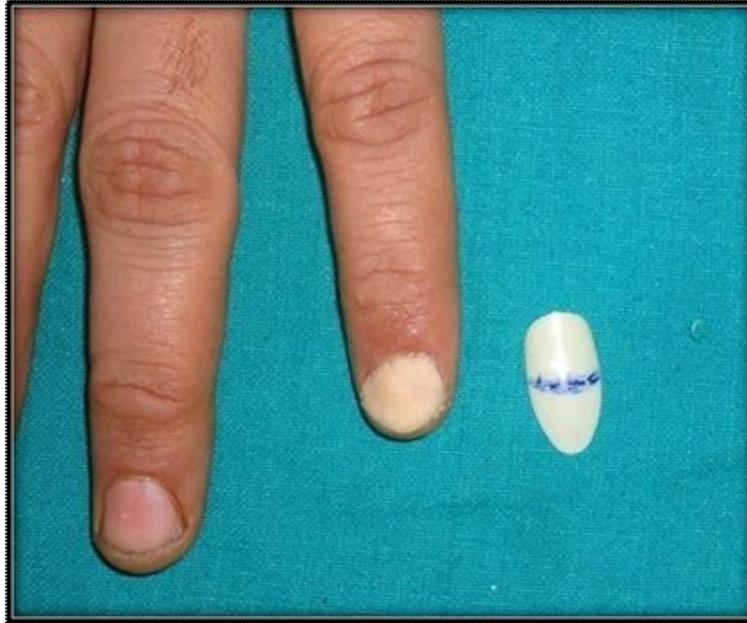
then hollowed from inside by sculpting. It was placed in warm water and then placed on the cast alternatively and in this way modifications in sculpting were carried out to resemble the finger of the other hand. **(Fig. 4)**



**Fig. 4: Wax pattern of the prosthesis**

4. Transparent prefabricated nail was used to fabricate artificial nail for the prosthesis. Colour and shade matching was done with the nail of adjacent fingers using nail polish and intrinsic colour pigments. Integral half moons, white

margins and other details were also incorporated. The size of prefabricated nail was established using nail cutter and the nail bed was prepared by removing 2 mm of the modelling wax from the nail bed region. **(Fig. 5)**



**Fig. 5: Prefabricated nail**

5. The wax pattern was tried on the patient's left index finger and the length and fit was verified. The shade matching of artificial nail was also

verified. The patient's approval was taken and necessary corrections were made. **(Fig. 6)**



**Fig. 6: Wax pattern trial**

6. To improve the retention of the silicone prosthesis, the internal circumference of the finger stumps was reduced accurately by 2 mm and 4 vertical grooves were made to create vacuum chambers in order to provide a snug fit of the prosthesis and aid in vacuum retention<sup>4,5</sup>.
7. The wax pattern was flaked in a conventional manner as done in case of complete dentures in Hanau flask. Two pour technique was used to flask the wax pattern, the two halves were poured from dental plaster (type II) and dental stone (type III) respectively to indicate the ventral and dorsal surfaces of the finger. **(Fig. 7)**



**Fig. 7: Two pour technique used to flask the wax pattern**

8. The Silicone (RTV Silicone, MP Sai Enterprises, Mumbai.) and pigments were mixed intrinsically to match patient's skin. Colour matching of the dorsal and ventral surface was done separately in natural light. After getting the desired shade, silicone material was packed into the mold and light pressure was applied to remove excess material. The prosthesis was cured by keeping it at room temperature for 24 hours according to manufacturer's instructions. Thereafter, it was carefully retrieved from the mold and finishing was done using silicone tip burs.
9. The final prosthesis was inserted and the fit and colour matching were evaluated. To disguise the junction line of silicone finger prosthesis and to make the changing color of the finger less noticeable, a small skin-color plastic strip bandage was placed at the junction of finger prosthesis and residual stump. The patient was taught about the use of the prosthesis and instructions were given about its maintenance. **(Fig. 8).**
10. The patient was asked to return on day 1 and 7 after fitting for evaluation of the finger prosthesis. Thereafter, a 3month follow-up was done and it was noted that the patients had no complaints and was highly satisfied about esthetics and comfort of the finger prosthesis.



**Fig. 8: Silicone prosthesis inserted**

## Discussion

The prosthesis should be comfortable and lifelike in all aspects which would allow the patient to wear the prosthesis in public without being noticed. A study by Buckner<sup>6</sup> stated that the acceptance rate of individually sculpted custom made silicone prosthesis has been much higher. Another study by Pilley and Quinton<sup>7</sup> illustrated that when surgical reconstruction of lost finger is contraindicated, unsuccessful or unavailable, prosthesis can provide and offer great psychological help. In the case presented above, the portion of the finger was badly crushed so surgical reconstruction was not possible. Pillet<sup>8</sup> suggested that, partial or total amputation of the distal phalanx requires a thimble-like prosthesis extending to the middle phalanx, with the proximal interphalangeal joint left free. According to Gary et al<sup>9</sup>, although resin can be easily characterized and has great durability, it is a very hard material and uncomfortable for the patient. On the other hand, silicone has texture and flexibility similar to the skin, provides a more comfortable prosthesis and presents better capacity for skin-prosthesis linkage. However, this material is more difficult to stain and degrades due to colour instability when exposed to ultraviolet rays.

According to Matussek and Neff<sup>10</sup> for making of wax pattern for finger prosthesis, the person's unaffected hand can be used to eliminate the error in respect to size and shape. Also, Michael and Robert<sup>11</sup> suggested in their study that, a 5-7% circumference reduction in the finger model showed good fit of a thimble-type prosthesis for distal finger amputation. Apart from this, shade matching is done using intrinsic colouration as it is longer lasting and it also gives a sense of depth to the prosthesis. Moreover, fumes from extrinsic spray colouring may be toxic<sup>12,13</sup>.

Lundborg et al<sup>14</sup> suggested that osseo integrated implant retained digital prosthesis can provide some tactile sensation apart from good esthetics, retention and function by transfer of tactile stimuli from the digit to intraosseous nerves via the osseo integrated implant. However, in the present case due to economic limitations implant was not considered.

Considering the age and esthetic demands of the patient, a lot of attention was paid to the shade matching aspect of the prosthesis along with the nail. In this quest to reproduce a very lifelike finger prosthesis, silicone was chosen and intrinsic pigments were used with great precision for shade matching procedure. The wax pattern was hand crafted and utmost details were incorporated. The esthetic outcome was very pleasing and patient was

highly satisfied with his new finger prosthesis.

## Conclusion

The use of silicone finger prosthesis to replace the missing finger seems to be a viable method for restoring amputated fingers as it provides comfort, stability of function and excellent esthetics. Moreover, it gives self-confidence to the patient to overcome this social stigma. The present article illustrates a simple way of fabricating finger prosthesis and incorporation of intrinsic stains to achieve excellent esthetic results.

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