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# Life Like Silicone Thumb Prosthesis-Overcoming A Social Stigma: A Case Report

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**Abstract: The hand has basic functions like grasping and feeling. It is also a mean of communication and is of major importance for body language and social contact. Injuries to the fingers can occur in accidents at home, work, or play. Finger and partial finger amputations are some of the most frequently encountered forms of partial hand loss which causes devastating physical, psychosocial and economic damage to an individual. The purpose of this report is to present a case of prosthetic management of partially missing thumb by fabrication of silicone thumb prosthesis. The thumb prosthesis was retained by a ring. Silicone finger prosthesis with modern prosthetic designs, fabricated with immense care, can be life-like and can assist the amputee in returning to society socially as well as psychologically.**

**Key words: RTV silicone, thumb prosthesis, Maxillofacial prosthesis.**

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## INTRODUCTION

Prosthesis refers to artificial replacement of an absent part of the human body.[1] Maxillofacial prosthetics is a branch of dentistry that deals with congenital and acquired defects of the head and neck. Along with facial defects, it also deals with prosthetic rehabilitation of other body parts like fingers of hand and foot. [2]

Loss of a body part can be one of the most painful experiences in one's life. Apart from the face, the hand is a representation of one's self-image that others can easily notice. Hand is a body part which is of major importance for communication, body language and social contact.[3]

From the functional point of view, thumb constitutes at least 50% of hand. Thumb is essential for power grip and precision.Finger and partial finger loss are some of the most frequently encountered forms of partial hand loss. The most common causes are trauma, congenital absence and malformations. [4]

Rehabilitation of amputed finger is of utmost importance as restoration of the natural appearance eliminates the trauma generated by the dysfunction and represents an efficient psychological therapy. The amount of tissue lost, the current conditionof the bone, and involvement of the other fingers are some of the factors that have to be considered when choosing a suitable treatment option. [5]

Most of the prostheses are made from medical grade silicones.[6] These silicones can be rendered to match to the skin color of the patient and give a more life-like appearance. Most of the silicones used for this purpose are room temperature vulcanizing silicones (RTV silicones). The advantages of RTV silicones include chemical inertness, flexibility and elasticity.[7] They can also be easily molded and colored. The prostheses can be retained either by mechanical methods or by the use of adhesives. [8]

Use of magnets for retaining prostheses has also been tried.[9] Implant retained prostheses have proven to be satisfactory, provided they are economically feasible. [10]

Retaining finger and hand prosthesis by using rings, bracelets, etc. are some methods of mechanical retention. The purpose of this report is to describe a simple technique for fabrication of a silicone thumb prosthesis for a patient using mechanical mode of retention to provide motor skills recovery and diminished social discrimination.

## CASE REPORT

A 50 year old male patient reported to the Department of Prosthodontics and Implantology, Rama Dental College-Hospital & Research Centre, Kanpur for replacement of a missing teeth in the mandibular posterior region. During examination the patient was found to have partially missing thumb in his right hand. It was noticed that amputation was carried out through the middle portion of the thumb. A detailed history revealed that the patient lost his thumb 5-year-ago in a road accident. The remaining stump of the amputed thumb showed thickened ends with normal surrounding area & no signs of any infection or inflammation. (Fig. 1 )

Figure 1: Remaining stump of the right hand thumb.

## TREATMENT PLAN

The objective of the prosthetic rehabilitation was to eliminate the psychological consequences of the amputation and restore passive function by fabrication of a finger prostheses which had good retention, was comfortable to use and aesthetically acceptable to the patients. The treatment plan was decided depending upon the level of missing part of thumb and mode of retention. Since a part of the thumb was remaining, retaining the prosthesis by means of a ring was chosen. It was decided to fabricate silicone prosthesis extending nearby to metacarpo-phalangeal (MCP) joint using mechanical mode of retention by a new design of the ring.

## TECHNIQUE FOR FABRICATION OF SILICONE FINGER PROSTHESIS

Attachment of the ring to the prosthesis was done after the prosthesis was fabricated. The basic steps in fabrication of the prostheses are :

**Impression Making** :
The impression material chosen was alginate. A plastic container of sufficient length and diameter was chosen to confine the impression material. The container was tried on the patient's thumbs to provide adequate clearance 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 containers. The patient was asked to dip his thumb vertically into the container without touching the sides or the bottom of the container. The material was allowed to set and the hand was removed quickly in a jerking motion after the material was set. Impressions of both the affected and normal thumbs were made.

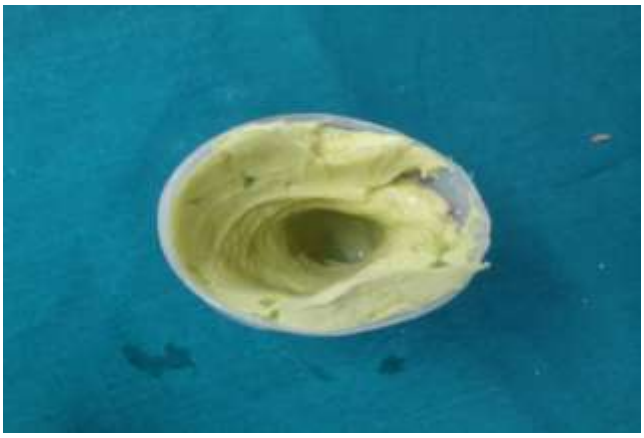


**Fig. 2,3 : Alginate impression of the affected and normal thumbs.**

The impressions were poured in stone and models were made. The normal thumb was used as a reference to duplicate the size, shape and orientation of the thumb.


**Fig. 4, 5: Models of the normal and affected thumb.**

**AX PATTERN FABRICATION:**

Impression of the normal thumb was made using addition silicone in putty consistency. (Fig. 6,7)


**Fig. 6, 7: Putty Impression of the normal thumb.**

Wax was molten and poured into the putty impression. After the wax cooled down, it was retrieved from the impression and tried on the model of affected thumb. (Fig. 8,9)


**Fig. 8,9 : Wax Patern Of The Prosthesis**

**TRY IN:**

Final carving and adjustments were made to adapt the wax pattern over the model of affected thumb. The completed wax pattern was tried in the patient's hand and the length and fit was verified. tried on the patient. (Fig. 10)

**Fig. 10: Wax pattern try-in.**

**INVESTMENT TECHNIQUE:**

The model of the affected thumb was duplicated and the duplicate model was used for investing. The pattern was sealed to the model at the junction, where the margins of the pattern overlapped the model. The pattern and the model were then invested in a large size flask. The wax pattern was invested in a dental plaster till the junction of dorsal and ventral surfaces .Tin foil substitute was applied and then the other half was poured. Second pour was done to stabilize stump to first pour and to cover the entire wax pattern. This mold facilitates an easy packing of silicone and separate color matching for dorsal and ventral surfaces. This mold was dewaxed by immersing in a boiling water bath. After the mold was carefully opened separating medium was applied between the two pours before silicone packing. ( fig. 10 )

**Fig. 10 : Investing Of Wax Pattern.**

**COLOR MATCHING AND PACKING:**

The most critical step was to match the color of the prosthesis to the patient's skin color. The basic skin color was observed. The acrylic fabric colors were mixed with the silicone to obtain the base color. Color matching of the dorsal and ventral surface was done separately in natural light. After getting the desired shade the silicone material was packed into the mold and light pressure was applied to remove excess material. Curing was done as per manufacturer's instructions. After polymerization, the prosthesis was carefully retrieved from the mold and finishing was done.

**ACRYLIC NAIL FABRICATION :**

Custom-made acrylic nail was fabricated using cold cure clear acrylic resin and pink acrylic. Color and shade matching was done with the nail of adjacent fingers. The size and position of the acrylic nail was established and the nail bed was prepared, where the custom-made acrylic nail was adapted into place. A cyanoacrylate adhesive was applied on the undersurface of the nail for bonding with the silicone surface. ( Fig. 11)

**Fig. 11: acrylic nail bonded with the final silicone surface.**

**FINAL PROSTHESIS:**

To disguise the junction line of silicone thumb prosthesis and to make the changing colour of the thumb less noticeable, a metal ring was placed over the margin of the prosthesis. This also aided in retention of the finger prosthesis.( Fig. 12,13)

**Fig. 12: metal ring.**

**Fig. 13: Final prosthesis with ring attached.**

The final prosthesis was inserted on the residual stump. (Fig. 14)

**Figure 14: Insertion Of The Finger Prosthesis On The Patient.**

The fit and colour matching was evaluated.( Fig. 15,16)

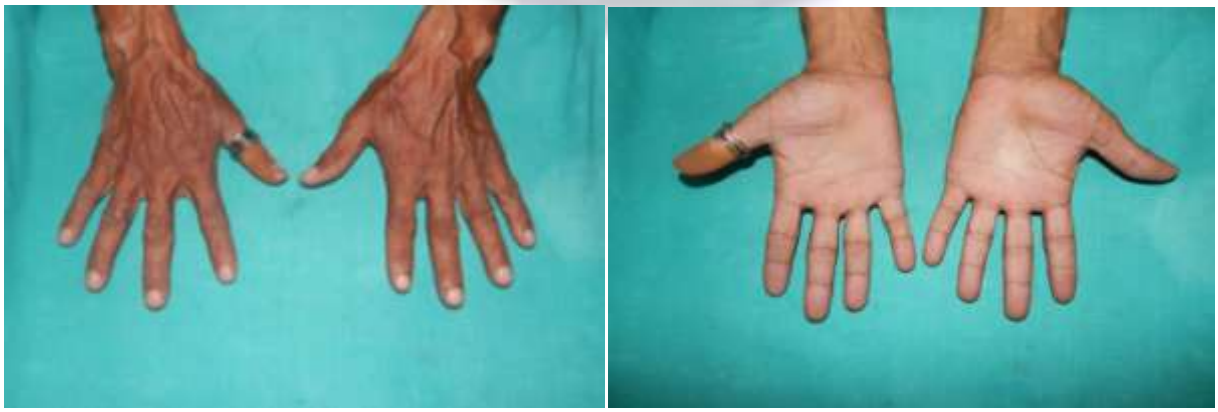

**Fig.15,16 : Final Prosthesis – Palmer And Dorsal Aspect.**

**INSTRUCTIONS AND MAINTENANCE OF THE PROSTHESIS:**

1. The prosthesis should be washed every day with water and soap, cleaning inside and out.
2. The prosthesis should not be worn overnight. Continuous use irritates skin.
3. Avoid exposure of prosthesis to high temperatures.
4. Care should be taken while using sharp cutting tools.

**FOLLOW-UP:**

For prosthesis evaluation, the patient was asked to return on day 1 and 7 for follow-ups. There after a 6 months follow-up was done, and it was noted that the patient had no complaints and was satisfied about writing efficiency, esthetics, comfort and retention of the thumb prosthesis.

**DISCUSSION:**

When surgical reconstruction of lost finger is contraindicated, unsuccessful or unavailable, a removable prosthesis can provide and offer great psychological help. [11]

The acrylic resin and silicone are the most common materials used for rehabilitation. Although resin can be easily characterized and presents 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 pigment and degrades due to color instability when exposed to ultraviolet rays.[12] In this particular case, silicone prosthesis was fabricated and a wide ring was placed over the margin of the prosthesis to aid in retention and to make the changing colour of the hand less noticeable.

## CONCLUSION

Loss of thumb may have a negative impact on functional and psychological well-being of the individual. In this case, the prosthetic rehabilitation of thumb with high quality silicone prosthesis restored functional, esthetic and psychological well-being of the patient. Such types of prosthesis are widely accepted and also boost the morale of the patient.

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