

# Prosthetic Rehabilitation of Congenitally Missing Digits

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## ABSTRACT

Complete or partial fingers are the most commonly encountered forms of partial hand losses. Though finger amputations are commonly due to traumatic injuries, digit loss may also be attributed to congenital malformations and diseases. Irrespective of the etiology, digit loss has a considerable functional, psychological and social impact on an individual. This clinical report describes the fabrication of silicone glove type finger prosthesis for a 36 years old male patient with congenitally missing index and middle finger in the left hand. The prosthesis offered psychological, functional and rehabilitative advantages for the patient.

**Keywords:** Glove type finger prosthesis, Silicone, HTV, RTV.

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## INTRODUCTION

Any kind of deformity, facial or elsewhere may cause psychological and emotional disturbance to the patient as well as social annihilation. Finger and partial finger amputations are some of the most frequently encountered forms of partial hand losses. It may be due to congenital abnormalities, trauma or diseases.<sup>1</sup> Congenital hand anomalies affect 1 in 700 live births. Both function and form are important attributes of the hand. The active function of the hand is represented by its prehensile activities in grip, grasp, transferring and absorbing forces. Hands also have an esthetic impact; they can emphasize the beauty of a gesture or the grace of a movement.<sup>2</sup> Whatever, the reason of amputation was, digit loss causes significant functional deficiencies and esthetic problems. In addition to immediate loss of grasp, strength and security, the absence of a finger may lead marked psychological trauma.<sup>3</sup>

Prosthesis refers to an artificial replacement of an absent part of the human body.<sup>4</sup> The chief objective of fabricating finger prosthesis is to partly or wholly restore function, improve aesthetics, thereby benefiting the morale of patients.<sup>5</sup> Prosthesis form, coloration and texture must be as indiscernible as possible from the surrounding natural tissues. The ideally constructed prosthesis must duplicate the missing parts so precisely, that the casual observer notices nothing that would draw attention to the prosthetic reconstruction.<sup>6</sup>

This report presents a case of rehabilitation of partial adactyly with silicone prosthesis and describes a method of retention for the same.

## CASE REPORT

A 36 years old male patient reported to the Department of Prosthodontics, Bapuji Dental College and Hospital, Davangere with a chief complaint of missing index and middle fingers in left hand since birth and wanted replacement for the same (Figs 1A and B).

On physical examination, reduced tissue compressibility was observed when palpated at the terminal end. There was also presence of undercut at the junction of the second and the third phalange of approximately 2 mm all around the middle finger. The surrounding area of the digit appeared to be normal. After receiving informed consent from the patient, fabrication of glove type finger prosthesis using medical grade silicone was planned.

## PROCEDURE

### Making of Impression

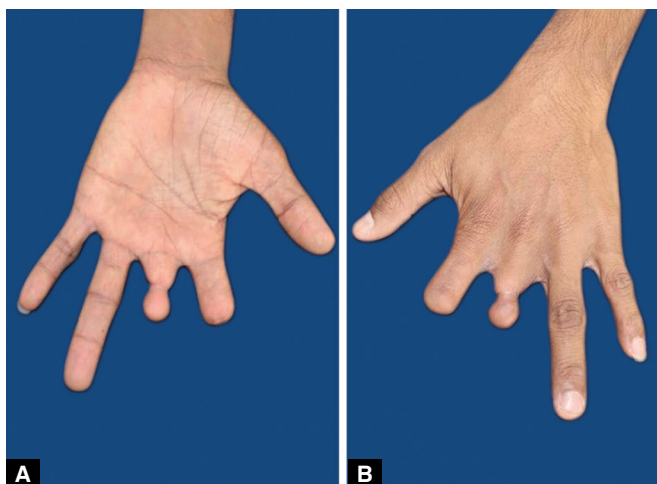
The patient hand was lubricated with petroleum jelly to prevent the impression material from adhering to the amputated site. A baseplate wax box was used for making the impression of left hand using irreversible hydrocolloid impression material (Zelgan-Plus, Dentsply, India) and the patient was instructed to keep his hand in normal resting position along with fingers and thumb slightly apart.

### Preparation of Models

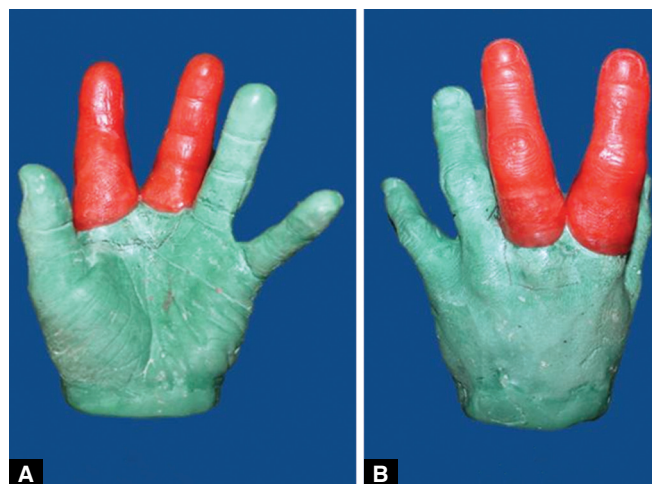
The impression was then poured in dental stone (Kalabhai Dental Pvt Ltd) using vibrator carefully to avoid voids and the positive replica of hand was retrieved after complete setting. The middle and index finger was trimmed using a 2 mm rose head steel bur considering the tissue compressibility in the area, so that the undersize sleeve when placed in position on the tissue of the residual stump will create a passive vacuum fit.

### Wax Pattern Fabrication and Try-in

Matching fingers from a suitable donor was selected and putty impression of the middle and index finger of left hand was made. The impression was then poured in molten base plate wax to create a partially hollow wax pattern of the finger and after cooling, the wax pattern was retrieved and tried on patient's hand. The necessary modifications were made at chair side; the fit, stability and orientation of the wax pattern were evaluated along with the shape and size of the pattern (Figs 2A and B).



**Figs 1A and B:** Pretreatment photograph of patient's left hand. (A) palmer view, (B) dorsal view



**Figs 2A and B:** Wax pattern fabrication on working model: (A) palmer view, (B) dorsal view



**Fig. 3:** Investment of wax pattern using dental stone and die stone

### Flasking and Dewaxing of Wax Pattern

The investment (Fig. 3) was done using a big customized flask by transferring the pattern with the model to enhance the accuracy at the stage of shade matching such that the dorsal and the palmar aspects of the finger were separable, separating medium was applied between the two pours. After thorough dewaxing and cleaning, the mould was allowed to cool. The mold thus obtained facilitates easy packing of silicone material (Fig. 4).

### Color Matching, Packing and Curing

The medical grade silicone (Cosmesil) was used for this prosthesis. 80 grams of Part A (M511 and Z004) was weighed and uniformly mixed with 8 grams of Part B (M511) according to manufacturer's instructions (10:1 by weight). Shade matching was done in natural daylight. The base color (P401-P420) was dispensed and intrinsic

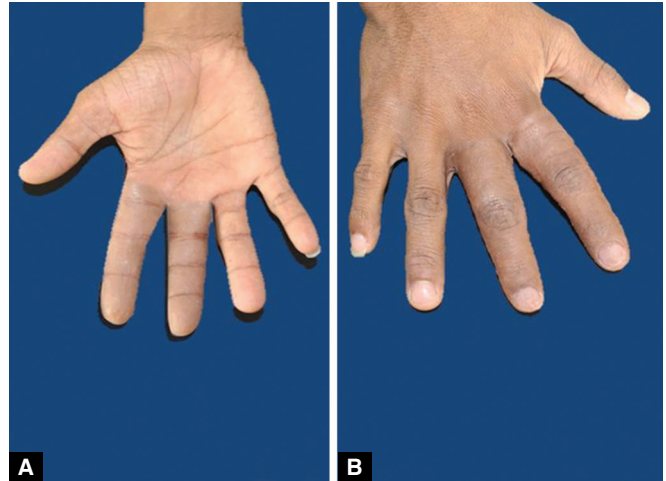
colors (P101-P129) were mixed separately to achieve the appropriate characterization for the palmer and the dorsal surfaces. It is critical to carry out this procedure in the presence of the patient so as to get his approval. The dorsal and palmar surfaces were packed separately and characterized individually (Fig. 5). The separating medium used was soap solution that was provided with the silicone kit. The material was then kept for curing for 1 hour at 100°C (steam).

### Finishing of the Prosthesis

Once the final prosthesis was retrieved, the flash was trimmed using a sharp blade and final finishing was accomplished using alpine stones and silicone burs. A slight extrinsic staining using dry pigment (P201-P227) was done for exact matching of the shade. To complete the prosthesis the nail bed area was also extrinsically stained according to the nail of the natural fingers. Sealant (P799) was applied



Fig. 4: Mold after thorough dewaxing and cleaning



Figs 6A and B: Glove type finger prosthesis. (A) palmer view, (B) dorsal view



Fig. 5: Procedure of color matching and packing of silicone



Fig. 7: Patient holding a glass of water with the help of glove type finger prosthesis

according to manufacturer's instructions and kept for curing for 30 minutes at room temperature.

The final and the most gratifying step was to place the prosthesis on the patient's hand in lieu of the missing finger. Good retention and esthetics were achieved at the time of final prosthesis. Patients was instructed and demonstrated about the use and the maintenance of the prosthesis (Figs 6A and B and Fig. 7).

### DISCUSSION

Loss is defined by Pertz as 'a state of being deprived of or being without something one has had and valued'.<sup>7</sup> When surgical restoration is unsuccessful, contraindicated or unavailable, prosthesis definitely provides great psychological help. Jean Pillet enumerated the essential characteristics of a prosthesis as the prosthesis should be of high quality both technically and esthetically, resemble the digit of contralateral hand,

skin must correspond to the natural skin in all details and match the color as appropriately as possible, should not be affected by climatic variations, heat resistant and must not be stained by ordinary materials. Prosthesis must be cleaned easily and should not irritate the skin.<sup>8</sup>

Maxillofacial silicones are preferred over other materials because of their improved texture, light weight and life like appearance. These silicone elastomers are available in two forms: heat to effect vulcanization (HTV) and vulcanize at room temperature (RTV). They contain both organic and inorganic compounds to which additives and fillers are added to provide additional strength and color. Antioxidants and vulcanizing agents transform the raw mass from a plastic to a rubbery resin during processing.<sup>9</sup> HTV silicone was used for the fabrication of finger prosthesis in this case.

Retention is of prime concern and is important for esthetics, function, and comfort thus enhancing quality. In the present case finger prosthesis was retained by vacuum

effect on the stump. Other means of retention includes medical grade adhesive and mechanical means such as a finger ring.<sup>10</sup>

## SUMMARY

The loss of all or part of a finger has a negative impact on the physical and psychological well-being of an individual. An esthetic and retentive prosthesis are the primary determinant factors in the successful prosthetic restoration of a finger.

A convenient and affordable method of prosthetic rehabilitation of congenitally missing fingers with heat temperature vulcanizing silicone material has been presented. It used both suction and vacuum for retention and found to be quite successful. Patient was highly satisfied with the prosthesis in terms of retention, function and esthetics. The morale of the patient was also boosted to a great extent.

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