

Prosthetic Rehabilitation of Single Amputated Finger - A Case Series

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Abstract

Hand is a body part which is of major importance for communication, body language and social contact along with its basic function of grasping and feeling. Amputation of the fingers in the upper limbs is a common occurrence and causes devastating physical, psychosocial and economic damage to an individual has significant implications on individuals overall function, coordination and quality of life. Rehabilitation of amputated 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 anatomy of the residual stump of the defect is of extreme importance and will dictate the mode of retention to be used, and the level of esthetics one can expect. This case series encompasses prosthetic

rehabilitation of 3 patients with amputated single finger with custom-made silicone prosthesis.

Keywords: Silicone, prosthesis, finger, amputated, rehabilitation

Introduction

Amputation of the fingers in the upper limbs is a common occurrence and has significant implications on individuals overall function, coordination and quality of life. Loss of these appendages can reduce functional ability, resulting in difficulties performing activities of daily living.^[1,2] Rehabilitation of amputated finger is of utmost importance as restoration of the natural appearance eliminates the trauma generated by the dysfunction and represents an efficient psychological therapy.^[3,4]

When surgical reconstruction is not feasible due to rehabilitative or financial constraints, fabrication of artificial prosthesis is considered.^[5] The restoration of the

finger amputations depends on the amount of tissue and bone involved along with the angles and levels of amputation.^[6] Silicone is the choice of material due to acceptable strength and durability.^[7]

This case series comprises of 3 cases with amputation at different levels and prostheses retained using various retentive aids.

Case Presentations

The following patients reported to the Department of Prosthodontics for prosthetic rehabilitation of amputated finger.

Case 1: A 44 years old male patient gave history of trauma from rock to his left index finger 6 years ago. On general examination amputation was just below the distal interphalangeal joint of the left index finger. The residual finger stump measured 62 mm in height and 12 mm in diameter. The area around the stump was compressible and showed no signs of inflammation (Figure- 1)

Case 2: A 22 years old male patient gave history of trauma from fan to his left middle finger 18 years ago. On general examination the amputation was at the mid-level of the middle phalanx of the left middle finger. The residual finger stump measured 45 mm in height and 20 mm in diameter. The distal end of the defect was bulbous due to scarring, area around the stump very slightly compressible and showed no signs of inflammation (Figure- 1)

Case 3: A 40 years old male patient reported with history of trauma to his right index finger while working on the farm 3 years ago. On general examination defect area had missing index finger of right hand with absolutely no residual stump. The defect was compressible in nature and no bony undercuts or subcutaneous nodules were present. (Figure- 1)



Figure 1: Pre-operative photograph

Treatment Plan

After thorough examination, the following treatment plan was decided:

- **CASE 1-** A thimble like silicone prosthesis extending upto the proximal inter-phalangeal joint and retained with an adhesive bandage.
- **CASE 2-** A silicone prosthesis with a custom-made ring- wire substructure to compensate for the broad base of the prosthesis.
- **CASE 3-** A silicone prosthesis retained with a customized ring stump assembly to offer better retention.

The treatment plan was discussed with each patient and informed consent was obtained.

Steps in Fabrication

Impression Making: The patient's hand with missing finger was lubricated with thin layer of petroleum jelly, the area around the hand is boxed and the impression was made with irreversible hydrocolloid impression material (Imprint, Dental products of India). The patient was instructed to keep the hand in normal resting position. (Figure- 2)

Model preparation: Impression was then poured in ADA type III dental stone (Gold stone, Asian Chemical, Rajkot, Gujarat, India) positive replica of hand was retrieved. (Figure- 3)

Wax pattern fabrication: Impression of the unaffected contralateral finger was made and molten modeling wax

(Hindustan Modelling Wax, India) was poured to get the wax pattern of the prosthesis. (Figure- 4)

Fabrication and trial of retentive aid

Case 1- The stump model of the finger was circumferentially reduced by 1.5mm to provide snug fit and aid in vacuum retention. (Figure-5)

Case 2- A metal framework was made from 0.9 mm orthodontic stainless steel wire that ran along the length of the finger from the ring to a point above the defect. Framework was then welded with the finger ring. (Figure- 6)

Case 3

A wax pattern resembling a hollow cylinder with holes and ring for middle finger made and casted. Both components were properly oriented, indexed in poly vinyl siloxane putty impression material (Flexceed, GC India Dental Pvt. Ltd, India) and then gas welded. (Figure- 7)

Wax pattern try in: Nail bed was prepared in the wax pattern (Figure- 10). In case 2, the metal frame ring assembly was inserted into the wax pattern (Figure-11).

In case 3 the stump portion of the customized ring-stump assembly was inserted into the wax pattern and tried. The finer details of the tissue surface of the defect area were recorded using light body elastomeric impression material. (Figure- 8) The wax pattern along with metal assembly was tried in patient's hand for length and fit verification.

Investment technique:The wax pattern with metal assembly was flaked using two-pour technique. The ring was embedded in putty material to ensure that there is no flow of dental stone into it for easier retrievability. (Figure- 9) Dewaxing was done and a layer of separating medium was applied between the two pours. (Figure- 10)

Shade matching and packing: The medical grade silicone (RTV Silicone, M.P Sai Enterprises, Mumbai) and pigments are mixed intrinsically to match dorsal and ventral skin of patient's finger in natural light. The

material was then packed in the mold and cured as per manufacturer's instruction. The prosthesis was retrieved carefully and finishing was done. (Figure-11, 12)

Nail fixation and final prosthesis: Slit was made along the crease on the nail bed and custom made nail fabricated using tooth coloured acrylic resin material (DPI, cold cure) was secured to the prosthesis using cyanoacrylate adhesive (Figure- 13). The final prosthesis was inserted and fit and color matching was evaluated (Figure- 14). In 1st case along with the suction fit, the adhesive bandage aids in retention. The patient was demonstrated and made to practice various movements. Instructions were given to the patient about maintenance of the prosthesis.



Figure 2: Impression making



Figure 3: Model preparation



Figure 4: Wax pattern fabrication



Figure 9: Investing of wax pattern



Figure 5: Case 1-Circumferential Reduction

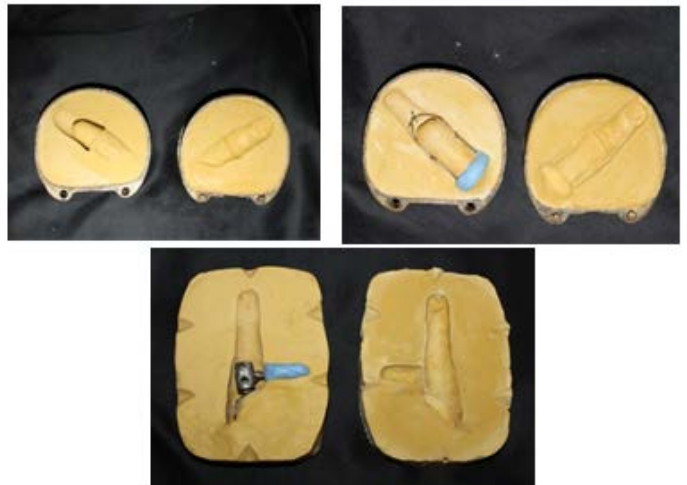


Figure 10: Dewaxing of mold



Figure 6: Case 2- Retentive aid trial



Figure 11: Shade Selection



Figure 7: Case 3- Fabrication of retentive aid and trial



Figure 12: Packing of Room Temperature Vulcanizing (RTV) Silicone



Figure 8: Wax pattern try in



Figure 13: Nail colour Matching



Figure 14: Final prosthesis

Discussion

Finger or partial finger amputations are some of the most frequent form of partial hand loss.^[1] Many amputations of finger can be rescued by microsurguries but in some cases it may not be advisable or not possible in some due to patient's unwillingness or due to factors such as cost.^[8] In such cases prosthesis can be provided and may offer great psychological aid.^[9] Retention of the prosthesis is important for esthetics, function, and comfort, thereby improving patient quality of life. For the patients who are contraindicated for surgery or feels that the implants are expensive, the choice remains between suction retention,^[10] medical grade adhesives^[11] and placement of finger ring.^[12]

Pillet et al^[10], suggested that, the length of the finger prosthesis is determined by the level of the amputation. 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 as done in one of the patient. The patient with a stump shorter than 1.5 cm requires surgical interdigital web recession. If the patient refuses further surgery, prosthetic fitting of the finger can sometimes be achieved by suspension with ornamental rings worn on the involved digit and adjacent digit; however, the result is complicated and fixation is tenuous.^[10] A customized ring-wire substructure^[13] or a hollow customized stump assembly^[14] used in two of the patients proved to be beneficial in terms of being lightweight, ensuring adequate fit, offering resistance to corrosion and adequate mechanical interlocking of the silicone. The prosthesis is easily cleanable with soap and water and is made with material that is pleasant to wear and prevents pressure sores.

Conclusion

A well fabricated, esthetically pleasing prosthesis helps in re-establishing the lost self-confidence of the patient. It is primary responsibility of the prosthodontist to restore the function, comfort, and esthetics with a well fabricated prosthesis.

References

1. Young K J, Pierce JE, Zuniga JM. Assessment of body-powered 3D printed partial finger prostheses: a case study. 3D Printing in medicine.2019;5:7.
2. Kuret Z, Burger H, Vidmar G, Maver T. Adjustment to finger amputation and silicone finger prosthesis use. Disabil Rehabil. 2018;0(0):1-6.
3. Kamble VB, et al. Silicone finger prostheses for single finger partial amputations: Two case reports. Indian Journal of Dentistry IJD. 2012;03(10):1-7.
4. Kaira LS, Dabral E. Glove silicone finger prosthesis. SRM J Res Dent Sci. 2015;6:275-8.
5. Beumer J, Curtis TA, Firtell DN. Maxillofacial rehabilitation. St. Louis: The CV Mosby Co., 1979.

6. Kamble VB, Desai RG, Arabbi KC, Mahajan K, Patil S. Finger prostheses for multiple finger amputations: Two case reports. *NJMDR*. 2013;1(2):38–42.
7. Yadav N, Chand P, Jurel SK. Rehabilitation of single finger amputation with customized silicone prosthesis. *Natl J Maxillofac Surg* 2016;7:89-91.
8. Shanmuganathan N, et al. Aesthetic Finger Prosthesis. *J Indian Prosthodont Soc*.2011;11(4):232-237.
9. Pilley MJ, Quinton DN. Digital prostheses for single finger amputations. *J Hand Surg Br* 1999;24:539-41.
10. Jean Pillet, Evelyn J. Mackin. O and P Library aesthetic restoration. *Atlas of Limb prosthetics: Chapter 7C surgical, prosthetic, and rehabilitation Principles: partial-hand amputations*.
11. Pillet J. Esthetic hand prostheses. *J Hand Surg Am*. 1983;8:778-781.
12. Livingstone DP. The D-Z stump protector. *Am J OccupTher*. 1988;42:185-87.
13. Mehta S, Leela B, Karanjkar A, Halani AJ. Prosthetic rehabilitation of a partially amputated finger using a customized ring-wire substructure. *J Indian Prosthodont Soc* 2018;18:82-85.
14. Mehta S, Agrawal R, Chitikeshi S, Nandeeshwar DB. Rehabilitation of missing digit using customized attachment supported prosthesis. *J Indian Prosthodont Soc* 2019;19:276-80.