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Case Report

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PROSTHETIC REHABILITATION OF PARTIALLY AMPUTED FINGER- A CASE REPORT

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ABSTRACT

Finger defect severely jeopardizes the day-to-day life activities of an individual by affecting the aesthetics and function of his/her hand. The ideal prosthesis should replace the missing part of the finger so precisely that it would not draw the attention of the observer. Fabrication of such a prosthesis will require great technical and artistic expertise. Planning the prosthesis, making the impression, sculpting the model and choosing the material - all contribute to a successful prosthesis. This case report describes a cost-effective and simple approach of rehabilitation of a partially amputated finger using a silicone finger prosthesis.

KEYWORDS: Amputated finger, Silicone finger prosthesis, Aesthetics.

INTRODUCTION

Finger, also known as digit contributes to several functions as well as aesthetics. Upper limbs are the second most common exposed part of the body; the face being the commonest. It is needless to mention that amputation of finger of upper limb is common and also aesthetically quite unpleasant. The common causes for finger amputations are trauma, congenital absence, and malformations.[1] Loss of part or whole of a finger will emotionally disturb the patient and may result in serious functional deficiencies. Rehabilitation of such defects depends on the quantity of tissue lost, the extent of amputation, and also the bone involvement if any. Although advancements in the field of microsurgical procedures have helped patients, prosthetic rehabilitation remains as one of the most important treatment options available due to reduced expense.[2,3] Prosthetic rehabilitation are often satisfactory in patients who have a minimum of 1.5 cm of residual stump.[4]

Silicone is the material of choice in fabricating finger prosthesis because of acceptable strength and durability. To aid in retention of the prosthesis, adhesives, or mechanical methods can be incorporated. Certain ornaments like ring and bracelet provide mechanical retention. This article presents a case of a patient, rehabilitated with finger prosthesis for amputated ring finger of the right hand.[5]

CASE REPORT

A 23-year-old female patient was reported to the Department of Prosthodontics and Crown & Bridge, Haldia Institute Of Dental Sciences And Research, Haldia, with the chief complaint of amputed ring finger of her right hand (Fig. 1). History revealed that she had lost her ring finger due to an accident when she was only 5 years old. It was also noted that the patient was eager to get the amputed finger rehabilitated to improve aesthetics.

On examination it was found that the amputation was partial, involving the distal phalanges and some part of intermediate phalanges of the ring finger of her right hand. The wound was completely healed and the surrounding stem showed no signs of inflammation and infection. The treatment plan was then discussed with the patient after clinical evaluation was done. An informed consent was taken from the patient before starting the treatment to ensure her willingness and co-operation.

Fig. 1: Preoperative photograph.

Steps involved in fabrication

1. An impression of the defective finger was made by inserting the fingers in a relaxed state into a plastic container filled with irreversible hydrocolloid impression material (Algitex Alginate Impression Material, The Bombay Burmah Trading Corporation, Mumbai, India) (Fig. 2) and poured with type III dental stone (Kalabhai Kal Green Stone) (Fig. 3).

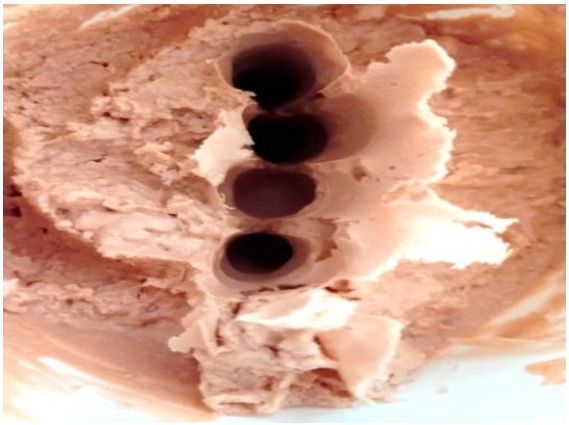

Fig. 2: Impression of the defective finger.

Fig. 3: Stone cast obtained from the impression.

2. An impression of the contralateral normal finger was made with a rubber base putty impression material (Densply Aquasil Addition Silicone) (Fig. 4).

Fig. 4: Impression of donor contralateral finger.

3. In order to give a snug fit to the final silicone prosthesis, the finger on model was reduced by 0.5mm in circumference. In addition, the stump was scored to form a ring-shaped depression of 0.5 mm width using round tungsten carbide burs close to joint as possible.
4. Molten wax was poured into the elastomer impression from the donor finger to obtain a working wax pattern. The wax pattern was sculpted to fit the finger stump replica of the mutilated finger on the stone cast. Modifications in sculpting were carried out to resemble the digits of the donor hand accurately. The margins of finger prosthesis were thinned in order for the silicone to blend with natural tissues (Fig. 5).
5. Wax try-in of the prosthesis was done and necessary corrections were made (Fig. 6).

Fig. 5: Sculpted wax pattern on stone cast.

Fig. 6: Try-in of the wax pattern.

6. Following successful try-in, nail bed was reduced to allow for insertion of acrylic nail.
7. The pattern was then flasked in the lower half of the flask. Flasking was done in such a way that the

donating finger stump was removeable to create a three-dimensional mould space. The advantage of this technique is that it eliminates the unsightly voids in the prosthesis commonly seen while using silicone, as it is more viscous and does not flow easily into inaccessible areas.

8. Dewaxing procedure was done and the wax residue was completely eliminated. The mould was allowed to cool thoroughly prior to the shade matching and silicone packing procedure. (Fig. 7).

Fig. 7: Dewaxing of the wax pattern with removable stump.

9. The shade matching was done using natural daylight. Intrinsic colours were mixed to achieve the appropriate characterization for the palmer and dorsal surfaces. It is critical to carry out this procedure in the presence of the patient so as to gain his approval.
10. Colour corrected RTV silicone (Multisil RTV, MP Sai Enterprises, Mumbai, India) was packed (Fig. 8). The packed mould was allowed to polymerize at room temperature for 24 hours before retrieving the final finger prosthesis. After polymerisation, the flask was opened and flash removed with a sharp scalpel and finished with an abrasive stone. The prosthesis was tried in the patient.
11. Finally, an acrylic nail was fabricated using auto polymerizing acrylic resin material (DPI, cold cure) (Fig. 9). The nail shell was trimmed to conform to the nail bed that had been created on the silicone finger prosthesis. The finished nail shell was positioned and secured in place with cyanoacrylate (Fig. 10).
12. After that silicone finger prosthesis was inserted. A ring was used to provide additional mechanical retention (Fig. 11).[6]

Fig. 8: Silicone used for finger prosthesis.

Fig. 9: Fabricated acrylic nail.

Fig. 10: Final slicone finger prosthesis.

Fig. 11: Silicone finger prosthesis inserted and retained using ring.

13. Instructions regarding the use and maintenance of prosthesis were given to the patient:

- She was asked to use a soft brush with antibacterial soap and warm water irrigation to clean the prosthesis and to avoid exposure of it to direct sunlight.
- She was also advised not to wear the prosthesis during sleep.[7]

DISCUSSION

Success of prosthesis depends on the precision in planning, making the impression, carving the model and choosing the material that best suits the circumstances.

Very commonly used materials include medical grade silicones, polymethyl acrylics, etc. Former being commonly used and preferred material for the mimicking the tissue structures and the consistency for a life-like appearance and the perception. Silicones are synthetic polymeric chains where silicone atoms bonded to organic groups typically methyl groups.

Silicones, also known as polydimethyl siloxane is the most successful maxillofacial prosthetic material till now. Various silicones available for maxillofacial prosthesis such as HTV Silicones, RTV Silicones, MDX 4-4210, etc.[8-10]

We used RTV (Room Temperature Vulcanising) Silicones for fabrication of prosthesis.

Room-temperature-curing silicones are supplied as single-component materials that cure by evaporation of acetic acid. They are capable of producing natural flesh-like appearance because of components like dyed rayon fibers, dry earth pigments, and/or oil paints. Prostheses are polymerized by bulk multiple packing.

Recently, some advanced silicone materials have become available for prosthesis such as silicone block copolymers, foaming silicones, etc which overcome the drawbacks of HTV silicones.

Silicone finger prosthesis should be used in conditions of amputation or congenital malformations of one or more phalanges with a sufficient residual phalange length where direct fixations are possible. Silicone prosthesis are not indicated where the residual limb wounds are not completely healed, finger joint/wrist and residual limb end that are unable to bear weight, transcarpal residual

limbs, unstable residual limb volume with fluctuations of more than 5%.

Silicone finger restorations may have additional functional benefits. Many traumatic amputees experience painful hypersensitivity at the termination of finger remnants. The gentle, constant pressure of an elastomer prosthesis can help desensitize and protect the injured tip. Over time, scar tissue contained within a silicone prosthesis seems to become more pliant and comfortable. Recent literature speculates that silicone gel improves the hydration of the stratum corneum of immature hypertrophic scars.[11]

A user's acceptance depends heavily on the ability to effectively represent the appearance and retention of the missing limb as well. During function active grasp is well-recognised as an important consideration when choosing prosthesis. There are various methods to increase the retention of the prosthesis such as the use of retentive finger rings, medical grade adhesives, implants, etc along with the basic positive contact of the prosthesis with the tissues. Leow *et al*[12] studied optimal circumference reduction of finger models for a good prosthetic fit of a thimble-type prosthesis for distal finger amputations and found out that 5–7% circumference reduction in the finger was shown to provide best results.

In our article we scored the stump mould to create a positive pressure and suction mechanism. Uniform reduction of 0.5mm was done. The retention was added also by a retentive finger ring which solved the purpose of retention and aesthetics.

CONCLUSION

Loss of a digit has profound effect on the self-esteem and psychological status of the patient. For most patients, the aesthetic appearance of an amputated finger plays a more important role than function. When surgical reconstruction is contraindicated or unaffordable, a prosthetic finger will assist in the rehabilitation of the patient. Fabrication of highly aesthetic finger prosthesis will require great technical and artistic expertise. When fabricated with immense care, a well-fabricated finger prosthesis can help in providing the patients with aesthetics as well as immense psychological support.

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