

Rehabilitation of amputated single finger with customized silicone prosthesis along with acrylic resin custom made nail- A case report

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Abstract

Hands are capable of performing a huge range of activities from gentle and precise actions to industrial strength. Traumatic finger amputation results in dramatic impairment in hand function. It leads to loss of strength, grasp, and marked psychological trauma. When surgical reconstruction is not feasible due to rehabilitative or financial constraints, fabrication of artificial prosthesis is considered. This case report describes a simple technique for fabricating silicone finger prosthesis for a patient after an accident in childhood.

Keywords: Prosthetic finger, Silicone finger prosthesis.

Introduction

Maxillofacial prosthetics is a branch of dentistry that deals with congenital and acquired defects of the head and neck. This branch integrates parts of multiple disciplines including head and neck oncology, congenital malformations, plastic surgery, speech, and other related disciplines. Along with facial defects, it also deals with prosthetic rehabilitation of other body parts like fingers of

hand and foot.¹ Trauma, congenital abnormality or disease can lead to partial or complete loss of fingers.² Silicone is the material of choice in fabricating finger prosthesis due to acceptable strength and durability. To aid in retention of the prosthesis, adhesives, or mechanical methods can be incorporated. Certain ornaments such as ring and bracelet provide mechanical retention.³

Case Report

A 27-year-old male patient reported to Department of Prosthodontics with a chief complaint of missing left middle finger digit till second phalange History revealed that patient lost his finger 14 years back in a traumatic injury by mechanical lathe. On examination of the injured site there were no signs of inflammation or pathology. The wound was completely healed and was covered with healthy epithelium suitable for the fabrication of the prosthesis (figure 1) The patient had no history of using any artificial prosthesis of any kind. The advantages and limitations of the treatment was explained to the patient.

An informed consent was obtained from the patient for the fabrication of the prosthesis under ethical standards.



Figure 1: Pre-rehabilitation dorsal view and ventral view.

Clinical Procedure

A plastic container was chosen to confine the impression material and was tried on the patient's hand to provide adequate clearance of at least 5 mm around for the impression material. The patient was asked to thoroughly wash his hands under a plain antiseptic soap solution following which his hands were lubricated with a thin layer of petroleum jelly. An irreversible hydrocolloid impression material was used to make an impression of the amputated finger and was poured with American Dental Association (ADA) type IV dental stone. (figure 2 (a)). The positive replica was used for the fabrication of the prosthesis. (figure 3 (a)). Another impression of the undefected hand was made using irreversible hydrocolloid impression material were made in a completely resting phase (figure 2(b)) and was poured with type IV dental stone (figure 3(b)) and was for characterization of the prosthesis to provide a better life-like appearance.

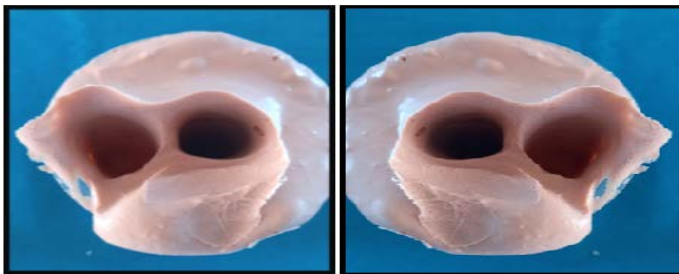


Figure 2: Alginate impression (a) amputated finger (b) contralateral fingers.

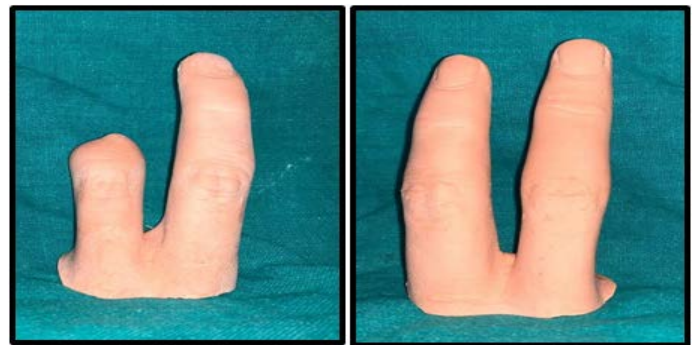


Figure 3: (a) Dental stone model (a) amputated finger. (b) Contralateral fingers.

Wax Fabrication

Impression of the unaffected side thumb was made in putty (figure 4) into which molten modeling wax was poured to get the wax pattern of the prosthesis. (Figure 5). The wax pattern was then hollowed from inside by sculpting.



Figure 4: Putty index of the donor contralateral finger.



Figure 5: wax-up prosthesis

Wax- Trial

During try-in, the length and fit of the wax pattern was verified and checked for harmony with the adjacent fingers.(figure 6) Approval from the patient was taken.



Figure 6: wax trail of the prosthesis.

Investment Technique

The wax patterns were invested separately in Type II gypsum product using two pour techniques to facilitate 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 and separating medium was applied. (figure 7). Reduction of 1-1.5 mm was done on the stump all around and was reoriented on the obtained mold. This produced a prosthesis, which was smaller in diameter by 1-1.5 mm and it stretched over the amputated stump to provide retention.



Figure 7: Dewaxed mold.

Color matching and packing

The silicone (RTV Silicone, Silastic-MDX 44210 MP Sai Enterprises, Mumbai, India) (figure 8) and pigments were mixed intrinsically to match patient's skin. Color matching of the dorsal and ventral surface was done separately in natural light.(figure 9)



Figure 8: RTV Silicone and intrinsic stains.



Figure 9: Shade matching

After getting the desired shade, the silicone material was packed into the mold, and light pressure was applied to remove excess material. After polymerization, the prosthesis was carefully retrieved from the mold and finishing was done.

Acrylic Nail Fixation

An artificial nail was fabricated with cold cure clear acrylic resin which was characterized using intrinsic stains. Color and shade matching was done with the nail of adjacent fingers. The acrylic nail was finished, polished and stained extrinsically to obtain white margins and other details. The size and position of the acrylic nail were

established, cyanoacrylate adhesive was then applied on the under surface of the nail for bonding with a silicone surface. (Figure 10)



Figure 10: customized acrylic nail

Final Prosthesis

Once the final prosthesis was retrieved, the excess material was trimmed with scissors. The fit and appearance of the prosthesis were checked in the patient and the patient was instructed about the maintenance of the prosthesis. Ring was used to hide the margins of the prosthesis



(a) (b)

Figure 11: Post-rehabilitation (a) dorsal view (b) ventral view

For prosthesis evaluation, the patient was asked to return on day 1 and 7 for follow-ups.

Discussion

The loss of any finger of hand affects esthetics and functionality. Currently many traumatically amputated digits can be saved by microsurgical replantation or osseointegrated digital prosthesis. In some cases, where reconstruction is contraindicated or patient economic conditions preclude, in such cases conventional prosthesis

can be used. Prosthetic rehabilitation is a quick, reversible procedure, medically uncompromised and it allows the surgical site to be closely monitored.⁴

Allen's classification is commonly used to describe the level of amputation for fingertip. Type 1 injuries are those involving the pulp only. Type 2 injuries consist of injury to the pulp and nail bed. Type 3 injuries include distal phalangeal fracture with associated pulp and nail loss. Type 4 injuries involve the lunula, distal phalanx, pulp and nail loss.⁵

Over time, various materials have been used and have been developed further. Wood, leather, polyurethane and polyvinyl chloride (PVC) have been used to produce esthetic prosthesis, but silicone rubber has proved to achieve the desired life like effects.⁶ Customized silicone prostheses have a wider rate of acceptance, owing to their comfort, durability, and stain resistance, which are far superior to any other extraoral maxillofacial materials. Additional functional benefits of silicone prostheses are desensitization and protection of the painful hypersensitive tissue at the amputation site by exerting constant gentle pressure over the affected area. Silicone gel also improves the hydration of the stratum, making the scar tissue more pliable and comfortable.⁷

Conclusion

In this case, the prosthetic rehabilitation of finger 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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