World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(CASE REPORT)

A simplified silicone finger prosthesis: A clinical report

Gigih Gemiudeas and Agus Dahlan *

Department of Prosthodontics, Universitas Airlangga, Surabaya, Indonesia.

World Journal of Advanced Research and Reviews, 2022, 14(01), 353–358

Publication history: Received on 11 March 2022; revised on 14 April 2022; accepted on 16 April 2022

Article DOI: https://doi.org/10.30574/wjarr.2022.14.1.0339

Abstract

Psychological impact gives more affects to the patient's desire to make a finger prosthesis. Retention is an important factor in the fabrication of finger prostheses. a fairly simple way is to use the vacuum effect which can be obtained from modifying the stone model of the finger. The present article uses a technique to get retention from passive vacuum fit. This method can be used to fabricate finger prostheses with simple materials and will reduce costs.

Keywords: Finger Amputation; RTV Silicone; Finger Prosthesis; Medicine

1. Introduction

One of the most common types of hand loss is partial or complete finger amputation [1]. The loss of one finger has a significant impact on the body image, self-esteem, and psychological health of the amputee [2]. The fabrication of a finger prosthesis provides a profound psychological improvement for the patient. For most patients, aesthetic appearance has a more important role than function [3].

The prosthesis' success is dependent on precision in planning, printing, modeling, and materials. Finger prostheses are challenging because of the stability and retention required [4]. There are a variety of retention options available, including implants and adhesives. An alternative method that combined suction and vacuum was tried and proven to be highly effective [5].

This case report will explain the step of fabricating silicone finger prosthetics for a patient who has lost a fingertip due to a traffic accident. This treatment selection is the most cost-effective option. The basic material to be used is medical grade silicone and retention will be obtained from a passive vacuum by modifying the patient's finger stone model.

2. Case Report

A 61-year-old female patient reported to the Department of Prosthodontics, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia, with a chief complaint of a partially amputated thumb on her left hand. She wanted to make a prosthetic finger on her amputated thumb because her grandson always gets scared of the shape of her thumb. History revealed that the thumb has been amputated for 30 years previously because of a traffic accident. The amputation was partial, involving the end of the distal phalanx to the lunula. A radiographic image revealed an amputated 1st distal phalanx (Fig. 1a). The amputated stump was healed well, with no signs of inflammation and infection, but the shape of the thumb's tip little bit bigger (Fig. 1b). The patient had no history of a previous prosthesis.

* Corresponding author: Agus Dahlan
Department of Prosthodontics, Universitas Airlangga, Surabaya, Indonesia.

Figure 1 a) Radiographic image b) clinical examination

Figure 2 Impression

Figure 3 Stone Model

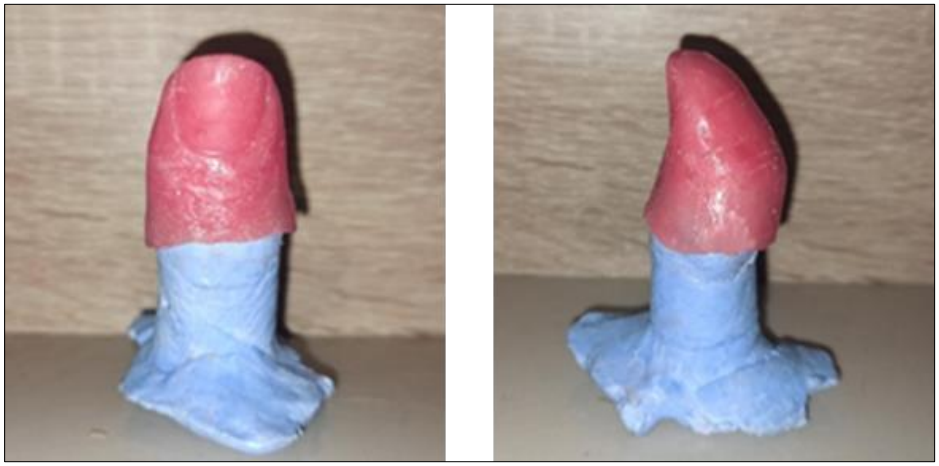

Figure 4 Wax pattern

Figure 5 Wax pattern try in

Figure 6 Stone mould of finger prosthesis

Figure 7 RTV Silicone

Figure 8 Intrinsic coloring

Fig 9 Packing of silicone in the mould

Figure 10 Final Prosthesis

3. Fabrication method

A Hydrocolloid impression of an amputated finger was made (Fig. 2). A small plastic container was prepared to facilitate the impression. Normal setting alginate was mixed and added to the container. The patient was instructed to dip her

amputated finger vertically into the container. The amputated finger must be cleaned before. The Impression was poured into a type III dental stone to make a positive replica of the amputated hand (Fig. 3).

The diameter of the amputated finger stone model was then reduced by around 1mm to 1.5mm with flame shape tungsten carbide bur. The reduction area starts from the tip of the amputated finger to the interphalangeal joint. the depth of reduction gradually decreases at the interphalangeal joint. The idea was to have a prosthetic barrier that fades in with the skin.

To replicate the amputated finger, an impression of the contralateral digit was taken with alginate impression material, then modeling wax was poured into the negative mold. On the stump cast, the wax pattern was adjusted and adapted. Finger characteristic sculpting to imitate soft tissue wrinkles, skin folds, etc. is done using a chisel and then adapted to an amputated finger stone model (Fig. 4).

Try in wax pattern to the patient is prepared. Retention, aesthetics, and stability are all factors to consider. The following process is carried out after the patient is satisfied with the wax pattern (Fig. 5).

Type II gypsum was mixed and poured into the bottom part of the dental flask. Model and wax patterns were placed on the surface on the initial pour and immersed slowly and stop until the area dorsal and ventral sides met. After the initial pour set, all the surfaces of the dental stone and finger model were lubricated with a layer of petroleum jelly as a separating agent. The second pour used two different types of dental stone. On the surface of the wax was poured using Type III gypsum and the rest is poured using Type II gypsum. After setting of gypsum, wax elimination procedures were done. The flask was put in boiling water for 30 minutes. Then the flask was separated. All the wax was removed completely using boiled water. The clean flask was placed in the open air to make the mold cool (Fig. 6).

The silicone used was medical-grade RTV (Platinum RTV-45 silicone elastomer, factor-II incorporated) (Fig. 7) Which was mixed according to the manufacturer's instructions. It was colored with intrinsic stains chosen based on the patient's skin color (Fig. 8). The red, yellow, and blue primary colors of the intrinsic coloring system were used to create the base shade.

Coloured silicone was layered into the mold and the flask was then closed and placed on the clamp with minimal pressure (Fig. 9). The excess material was eliminated. The silicone was allowed to cure overnight for the final polymerization. The prosthesis was taken out. Then, the fabricated fingernail was installed on the nail bed.

Finally, the prosthesis was inserted, and the patient was pleased with the outcome. For better color and shade matching, the prosthesis was eccentrically colored in the presence of the patient in daylight. The patient was given maintenance instructions to follow at home. The patient was scheduled for a follow-up appointment. The patient came back after a week. There were no issues during a follow-up visit, and the patient was very happy (Fig. 10).

4. Discussion

Losing a part of the thumb may have a small effect on how the hand functions. It has the smallest impact on hand function than if the other finger is lost [6]. However, the traumatic amputation will not only have a functional effect but also have a psychological effect on the patient [7]. Moreover, the visual appearance of an amputated finger is more important to most patients than its function [8].

Silicone finger prostheses are a potential option for replacing amputated fingers because they provide comfort, improved function, psychological benefits, and a pleasing aesthetic result [9]. Based on the process of cross-linking of polymers, silicone is divided into two classes, RTV (Room temperature vulcanized) and HTV (Heat temperature vulcanized) [10]. We used RTV (Room temperature vulcanized) silicone because of its advantages. The utilization of stone molds, simplicity of manipulation, and ease of coloring, color stability, and biological inertness were among the benefits of using the RTV silicone material [11].

The success of a prosthetic restoration is primarily determined by its retention [12]. Various methods of obtaining retention of finger prostheses have been demonstrated by clinicians, from the simplest, using adhesive, to the latest treatment, which is using implant retention [13]. In this report, reducing the diameter of amputated finger stone model by around 1mm to 1.5mm with flame shape tungsten carbide bur aims to obtain retention of the resulting vacuum effect.

5. Conclusion

The loss of a body part is a tragic event. Although only a few portions are missing and may have little effect on organ function or our activities, it could have a significant psychological impact. Even though we can only employ very basic materials and techniques, fabrication of finger prosthetics must be performed. Retention from passive vacuum fit can be used to fabricate finger prostheses with simple materials and will reduce costs.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Kumari N, Kumar Jain J, Prabhu AC. A Simplified Silicone Finger Prosthesis-A Boon to Handicapped: Case Report. International Journal of Oral Health and Medical Research. 2015; 2(1): 45-47.

[2] Kamble VB, Desai RG, Panigrahi D, Kumar M. Silicone finger prostheses for single finger partial amputations: Two case reports. Indian Journal of Dentistry. 2014; 5: 128–34.

[3] Goyal A, Goel H. Prosthetic rehabilitation of a patient with finger amputation using silicone material. Prosthet Orthot Int. 2015; 39: 333–7.

[4] Raghu KM, Gururaju CR, Sundaresh KJ, Mallikarjuna R. Aesthetic finger prosthesis with silicone biomaterial. BMJ Case Rep. 2013; 2013: bcr2013010385

[5] Jacob P, Shetty KH, Garg A, Pal B. Silicone finger prosthesis. A clinical report. J Prosthodont. 2012; 21: 631–3.

[6] Kuret Z, Burger H, Vidmar G. Influence of finger amputation on grip strength and objectively measured hand function: a descriptive cross-sectional study. International Journal of Rehabilitation Research Internationale Zeitschrift Fur Rehabilitationsforschung Revue Internationale de Recherches de Readaptation. 2015; 38: 181–8.

[7] Silander NC. Life-Changing Injuries: Psychological Intervention throughout the Recovery Process Following Traumatic Amputations. J Health Serv Psychol. 2018; 44: 74–8.

[8] Shanmuganathan N, Uma Maheswari M, Anandkumar V, Padmanabhan T v., Swarup S, Jibran AH. Aesthetic Finger Prosthesis. The Journal of the Indian Prosthodontic Society. 2011; 11: 232.

[9] Asnani P, Shivalingappa CG, Mishra SK, Somkuwar K, Khan F. Rehabilitation of amputed thumb with a silicone prosthesis. J Nat Sci Biol Med. 2015; 6: 275–7.

[10] Prakash V, Gupta R. Concise Prosthodontics. 2nd ed. Elsevier India; 2017.

[11] Mitra A, Choudhary S, Garg H, Jagadeesh HG. Maxillofacial Prosthetic Materials- An Inclination towards Silicones. Journal of Clinical and Diagnostic Research : JCDR. 2014; 8: ZE08.

[12] Goiato MC, Mancuso DN, Ferreira PPM, dos Santos DM. Finger prosthesis: the art of reconstruction. J Coll Physicians Surg Pak. 2009; 19: 670–1.

[13] Aydin C, Nemli SK, Yilmaz H. Esthetic, functional, and prosthetic outcomes with implant-retained finger prostheses. Prosthet Orthot Int. 2013; 37: 168–74.