

## Silicone finger prosthesis using conventional method impression

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### Abstract

Prosthetic fingers are a part of a medical art science community. Which means the fabrication of the prosthetic fingers is more of an art based treatment than a science. The prosthetic fingers must match with the missing part of the fingers or digits of the patient and even better if it can be used functionally. There are multiple causes of complete or partial fingers loss such as a disease or congenital malformation. But the most common are due to traumatic injuries. Despite the etiology, the effect of a loss finger has such an impact on the individual both functional and psychological. Therefore, prosthetic finger are one of the most popular approach to alleviate the problems instead with surgery approach. This case report describes a method of obtaining the use of prosthetic fingers functionally from the impression process and most importantly still have the aesthetic appearance with an easy and cheaper method by using silicone prosthesis.

**Keywords:** Prosthetic Finger; Silicone Prosthesis; Partial Fingers; Aesthetic Prosthesis; Traumatic Injuries.

### 1. Introduction

A finger is a type of digit and an organ of manipulation and sensations that has an imperative role both functionally and aesthetically. The loss of a finger can cause devastating physical and psychosocial effect to an individuals(1). There are multiple causes of an absence of a finger such as congenital, acquired malformation (traumatic/ accidental), or surgical. The primary treatment for such cases is surgery, however not every cases can be done with surgery. Some tissue loss or defects can be reformed by prosthetic rehabilitation. Prosthetic rehabilitation is an artificial method to replace or reform a part of human body such as eye, fingers, ears, etc(2).

The most suitable treatment approach depends on the amount of tissue involved, the involvement of bone (distal phalanx), the angles and levels of amputation, and the involvement of other fingers. The common goal is to reduce pain and preserve sensations(3). Various factors for the success of finger prosthesis depend on how well the treatment planning of the case is done. From the clinical case presentation until the material choice for the fabrication of the prosthesis(2).

Before the treatment, the functional requirements of the individual and management options must be discussed with the patient. The management starts with the previous history of the injury, hand dominance, occupation, hobbies, and the patient systemic disease that may affect the wound healing and treatment options(3). In this case report, the use of retention for the silicone finger prosthesis was adopted by the undercut of defects and enhanced with the use of ring accessories.

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## 2. Case Report

A 44 years old male patient, came to the Prosthodontics Specialty Clinic at Universitas Airlangga Dental Hospital with a chief complaint of losing his right thumb due to a motorcycle accident. Upon clinical examination, keratinized epithelial tissue was observed after wound closure surgery on the thumb. The patient has not previously used a finger prosthesis. At the treatment stage, the impression is first carried out on the defect using alginate material and custom made trays. The impression material is allowed to thin slightly and flow in order to print any areas of the defect. Impression on the defects is carried out with 2 finger positions, specifically when the finger position bends and straightens. Then, the mold is filled with wax. After being filled with wax, patients are tried in using the wax model. When the try in is carried out, the calculation of the distance from the tip of the defect to 1/3 part of the thumb is also carried out, then a calculation is carried out on the antagonist's thumb.



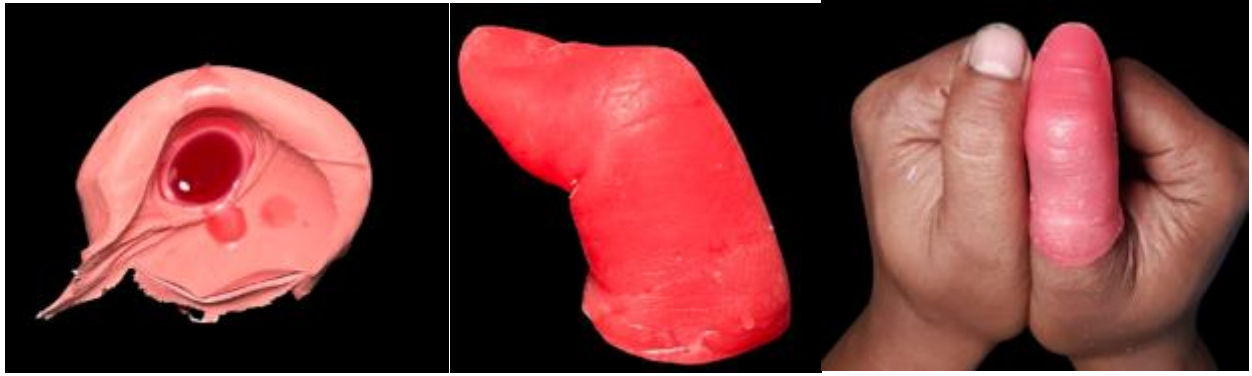
**Figure 1** Radiographic



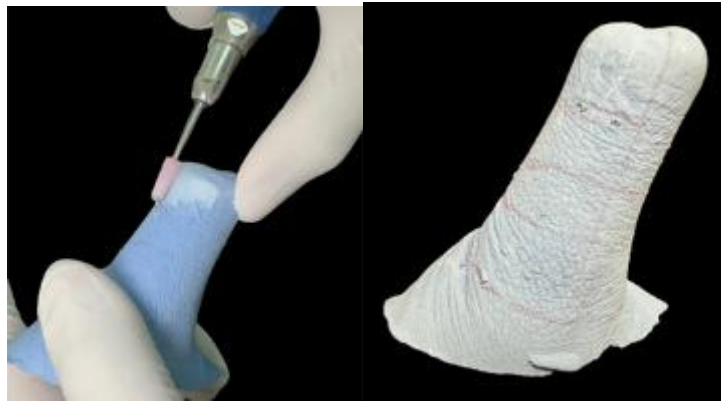
**Figure 2** Before



**Figure 3** Impressions taking



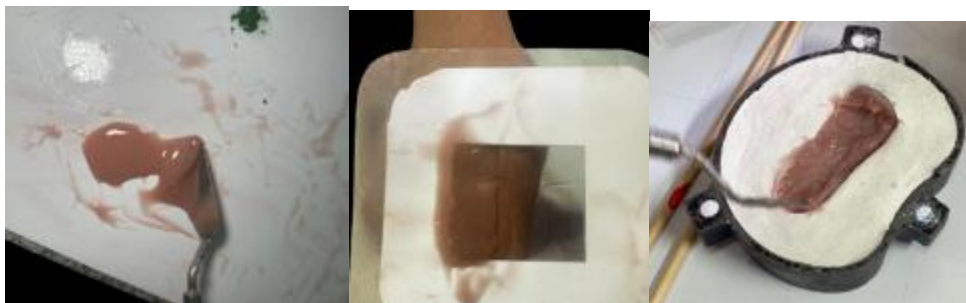
**Figure 4** Wax and Try In



**Figure 5** Trimming



**Figure 6** Trimming



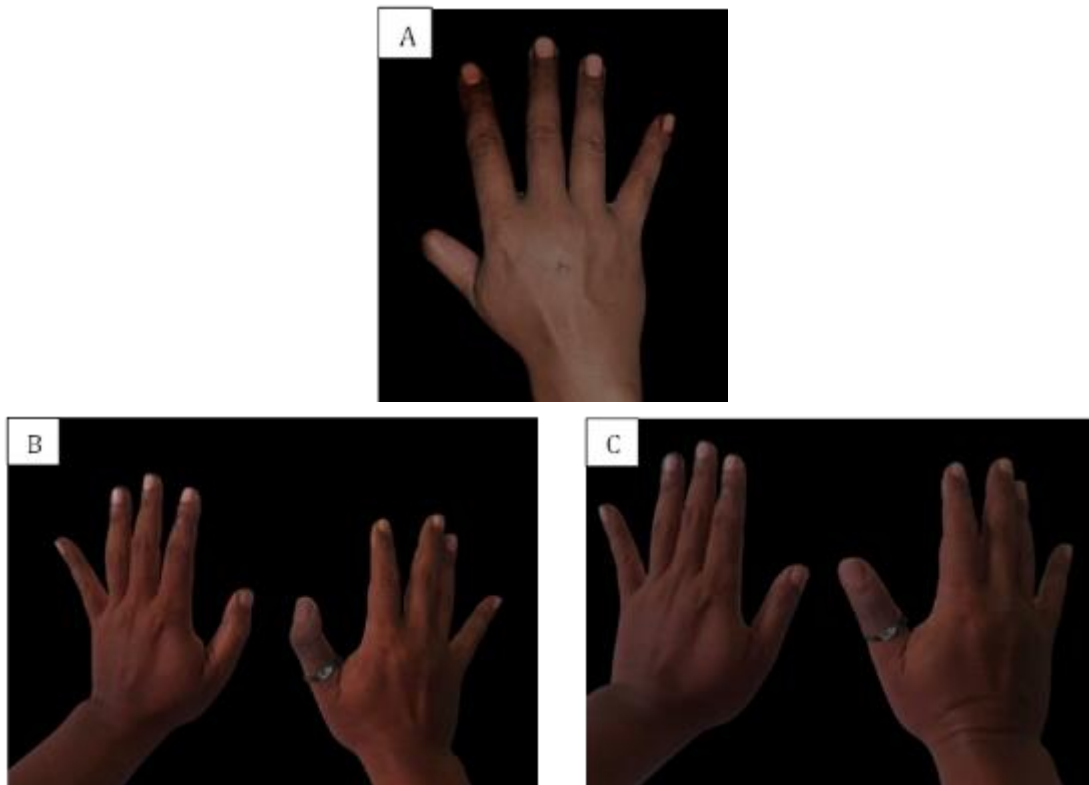
**Figure 7** Intrinsic Coloring and Try in with Patient



**Figure 8** Silicon Processing



**Figure 9** Extrinsic Coloring



**Figure 10** (A)Before Insertion, (B) After Insertion With Slightly Bent Position, (C) After Insertion With Straight Position

The impression of the patient's defects that have been casted with type 3 casts, trimming on all sides is about 1– 2mm. The wax that have been try in on patients, filled with white casts followed by planting on cuvettes. After obtaining the results of planting the model on the cuvette, silicon staining manipulation is then carried out. There are 2 stages in

silicon staining, first is intrinsic coloring (the basic color of the prosthesis) followed with extrinsic coloring. In intrinsic coloring, it is done using Platinum Silicon Part A which is then mixed with color paint. Silicon color mixing is done gradually until it produces a basic color similar to the patient's skin. The finished silicon material is stained, placed in a container and given a mixture of Factor II which is then continued with a vacuum process so that no air is trapped. Silicon that has been vacuumed is then placed in a white cast mold that is on the cuvette for packing. In the base of the cast, a slight red color is given to give the impression of nerves and blood vessels in the prosthesis.

Then the mold from the defect is put on the cuvette and pressed. Left until setting for approximately 24 hours. The resulting silicon is then finished at the edge of the prosthesis and given anatomical detail and color from the silicon using extrinsic staining. After extrinsic staining was complete, then continued with try in the patient. If the patient feels comfortable and have no complaints, then proceed with putting an artificial nail fitting on the prosthesis. Then the installation of the prosthesis is carried out. To add aesthetics and cover the edges of the prostheses and real fingers, rings are attached to the prostheses. Instructions were given about the use and maintenance of the prosthesis.

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### 3. Results and discussion

Finger injuries are one of the most common injuries of the hand. Various techniques are available for the repair of finger amputation with the ultimate goal to reduce pain and preserve sensation. The right treatment selected depends on the amount of tissue and bone involved, the angle and level of amputation and the involvement of other fingers(1).

The most common materials used for rehabilitation prostheses are acrylic resin and silicones. In spite of its advantages, resins has a hard texture material that will make the patient uncomfortable during function. While silicones, has a skin-like texture and flexibility therefore can provides a more comfortable prosthesis. However, without a proper care, it has a lack of sensibility and short durability(5). Silicon itself is divided into several grades, namely I (implant grade), II (medical grade), III (clean grade), and IV (industrial grade). Of all the types, medical grade is the most common material used for maxillofacial prostheses. On top of that, the use of silicone material was chosen because silicone has good aesthetics, flexibility, and elasticity as well as a look that resembles the original. In addition, silicone also has adequate tear strength. As for the disadvantages of silicone materials, the possibility of degradation from the prostheses when exposed to high temperatures and the risk of allergies, especially if using adhesives as a retention component (4). Based on the crosslinking process of polymers, silicone is divided into two types, namely Room Temperature Vulcanized (RTV) and Hot Temperature Vulcanized (HTV). RTV silicone material has several advantages including easy to manipulate and coloring whilst gives color stability. So that in this case, RTV material was chosen(3)

Treatment options with the installation of thumb prostheses can be given in conditions where there is residual tissue or undercut in the defect that can still provide retention to the prostheses. The method of impression using alginate made with flow consistency in order to mold any areas of the defect and can create the grooves of the defect thus give better retention. Retention is the most important factor for the success of finger prosthesis. Retention of finger prostheses can be obtained from the suction between the patient's defect and the prosthesis. However, if suction is considered inefficient, retention in the form of grooves can be added to the prosthesis. The use of adhesives can also be recommended as a retention enhancer in finger prostheses, but the use of adhesives can cause allergic reactions and is relatively difficult to clean. Another way that can be used to increase retention is by giving rings to finger prostheses, using magnets, or implants. In this case, retention is obtained from the vacuum between the patient's thumb and the finger prosthesis. Patients are given 2 types of the finger positions which is straight and slightly bent position in order for the patients to adapt easily during daily activities. In addition, the patients are also given accessories in the form of rings to increase retention and camouflage the boundary between the thumb and the prosthesis (4).In addition, the selection of treatment using finger prostheses is also carried out if the patient is contraindicated for replantation or reconstruction. In the following cases, replantation cannot be done because the remaining tissue on the patient's thumb is out of shape after the accident.

The prognosis for the successful use of prostheses depends on a variety of factors ranging from retention, stabilization, support, aesthetics and comfort of the patient. These factors are formed from treatment planning, impression making, wax carving, and the material used.

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### 4. Conclusion

The following case report provides a good economic and aesthetic management side of finger defects with a rehabilitative prosthesis treatment plan. In the following cases, there is retention of the undercut in the defect and

additional ring accessories are given to add to the aesthetic side of the prosthesis. The process of making prostheses is carried out entirely using silicon. In the following method, it provides prostheses that are lightweight, low cost, easy to use, and comfortable for long-term patient use.

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### **Compliance with ethical standards**

#### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

#### *Statement of informed consent*

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

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