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Prosthetic Rehabilitation of Amputated Partial Foot with Silicone- A Case Report

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ABSTRACT

The Prosthesis is an artificial substitute that replaces missing body parts, which may be lost due to trauma, disease, or congenital disorder. The prosthesis should not be concerned only to replace the missing part but also to restore the function of the lost parts. Replacing a partially amputated foot is found challenging due to different levels of amputation. A male patient reported with a partially amputated foot was successfully rehabilitated using room temperature vulcanization silicone. In this clinical report, step by step fabrications of prosthesis has been described. This clinical report proves that techniques used in the clinic and laboratory for fabricating the maxillofacial prosthesis is effective in body prosthesis fabrication and highlights the role of prosthodontists.

Keywords: Amputated foot, prosthesis, Room temperature vulcanization silicone

INTRODUCTION

Partial foot amputation is the removal of an extremity or appendage from the body. The main objective of rehabilitation is to improve or restore the function like standing and walking. Inability to function normally or unesthetic may result in psychological problems in these patients. To overcome these consequences, the prosthesis should be fabricated in such a way as to restore function and have a realistic appearance. The rehabilitation must consider an individual need of the patient, changes in his/her gait and the subsequent alteration in weight-bearing surfaces, the functional level of the affected leg [7]. The prosthetist should have knowledge on available prosthetic materials, coloration, and a way to achieve retention to fabricate a better foot prosthesis.

In this case report, step by step fabrication of foot prosthesis using RTV silicone retained with footwear is presented.

A CASE REPORT:

A 55- year old male patient reported to the department of prosthodontics, Adhiparasakthi dental college and hospital, Melmaruvathur with the chief complaint of partially amputated left foot [FIGURE 1]. History revealed a patient had undergone surgical resection following wet gangrene 10 months back. On examination, the amputated site is completely healed; the surrounding area appeared to be normal with no signs of inflammation. Treatment planning, advantages, and limitations were explained to the patient. The treatment is commenced after obtaining informed consent from the patient.

STEPS IN FABRICATION OF THE PROSTHESIS:

Impression making:

Affected and the unaffected feet were cleaned before making an impression. Three layers of polyethylene separating sheets dipped in water were adapted over

the surface of the foot to act as a spacer for alginate impression material. Polyethylene sheets were covered with layers of plaster of paris with surgical gauze in between to reinforce the whole assembly. After the dental plaster is completely set, it was retrieved and this acts as a tray for making an alginate impression (Algitex, DPI, Mumbai). Polyethylene spacers were removed from the tray. Escape holes were drilled for the flow of an excess impression material [FIGURE 2a]. The irreversible hydrocolloid impression was mixed as per the manufactures instructions, loaded onto the custom tray and the impression was made [FIGURE 2b]. After the alginate is set, the impression was removed using slow rocking movements. The impression of the unaffected foot was made to serve as a mold to depict the morphology [FIGURE 2c]. Dental stone was poured into the impressions and the master cast was obtained [FIGURE 2d].

Fabrication of acrylic sleeve and wax pattern:

Acrylic sleeve (DPI-TM^{RR} Cold Cure, DPI, India) of even thickness was fabricated over the master cast covering at least three-fourth to serve as a base for the fabrication of wax pattern. A try-in of the acrylic sleeve was done to check for the fit [FIGURE 3a]. Toes were carved separately using modeling wax (Modeling Wax, Hindustan Dental Products, Hyderabad India Ltd.). Each toe was then attached to the sleeve and a wax pattern was fabricated. During the trial procedure, the patient was instructed to stand erect and necessary adjustments were made to match with the unaffected foot [FIGURE 3b]. The nail bed is scooped in the wax pattern, and the margins are undermined for the natural appearance of the nails. Shade matching was done prior to the fabrication of the silicone prosthesis. Final wax-up was done [FIGURE 3c].

Fabrication of silicone prosthesis:

Custom made flask was fabricated from a thick stainless steel container. Parts of the flask contain a base, body 1, body 2, and lid. Dental stone was manipulated and poured into the base of the custom flask. The base of the model cast was placed vertically over the dental stone in a custom made base of the flask and a separating medium was applied. To duplicate the wax pattern exactly, a layer of die stone was applied over it. Body-1 of the flask was placed over the base and poured with dental stone [FIGURE 3d]. After the complete setting of the dental stone, the separating medium was applied, body-2 was placed and tightened using nut and bolt to body-1, poured with dental stone. The lid was placed over body-2. The pattern was dewaxed and the mold was cleaned in running tap water [FIGURE 3e]. Nut and bolt were removed, only body-1 and body-2 of the flask were separated for dewaxing. Separating media was applied on both halves of the mold. An equal proportion of room temperature vulcanizing silicone (RTV) is mixed with intrinsic stains added to it and packed into the molds. The packed flask was kept under compression for 24 hours [FIGURE 3f]. After 24 hours the bodies of the flask were separated, and the prosthesis was retrieved. The prosthesis is trimmed and polished with silicone trimmers. The prosthesis is tried in the patient for retention. Extrinsic stains were added to match the skin shade. The wax pattern of the nails was fabricated over the silicone prosthesis to fit over the nail bed. The wax pattern was removed from the silicone prosthesis, and the index was made using polyvinyl siloxane putty. Cold cure clear acrylic resin was mixed and stained to match the nails of the unaffected leg. The mixed resin is loaded into the index. After polymerization, the nails made of acrylic resin were trimmed and polished. Nails were attached to the nail bed of the silicon prosthesis using denture adhesives. The prosthesis is reinforced with footwear [FIGURE 4]. Post insertion instructions were given to the patient. The patient was advised to follow-up after 1 week and 1 month.

DISCUSSION:

In India, it has been estimated that there are roughly 0.62 amputees per thousand population [8]. Amputation is the removal of a limb, whole, or part of the body. Generally, amputation of a lower limb is more common than the upper limb. Amputation may be due to trauma, malignant tumors, nerve injuries, burn, gangrene, peripheral vascular insufficiency, congenital absence, or severe infection. Levels of lower limb amputation can be classified as transtibial (below the knee) and transfemoral (above the knee). On partial foot amputation, the patient loses his balance [6] and confidence to walk [3]. The goal of a prosthesis is to overcome the challenges.

Prosthetic design and principle depend on the levels of amputation. The design for the prosthesis that does

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not extend below the level of ankle is divided into rigid, semi rigid, semi flexible and flexible. During movements, rigid and semi rigid materials may cause tissue irritation and discomfort to the patient. Flexible materials like silicone not only replace the esthetics but also biomechanically superior to other prosthetic solutions especially for walking [2]. Therefore, in this case medical grade silicone is used for the fabrication of the prosthesis [1]. There are 2 types of silicones- heat temperature vulcanization (HTV) silicone and room temperature vulcanization (RTV) silicone. RTV silicone is used [5].

Various treatment plans were explained to the patient. The patient was not willing for implant due to financial reasons. During try-in stage base was fabricated using cold cure acrylic. So the exact movements were not possible due to usage of rigid material. It is better to fabricate the base using silicone after trimming the model for 2mm equally [4]. Another problem faced during fabrication is an air entrapment of silicone materials. This can be avoided by using metal stirring instruments. The final prosthesis was self-retentive. For better retention patient is advised to wear the prosthesis along with footwear. Instructions to maintain the prosthesis were given. The patient was recalled after a week and 1 month. Patient was satisfied, comfortable and adapted to the prosthesis. The limitations of the prosthesis were explained to the patient.

CONCLUSION:

Among the various prosthetic materials available recently, flexible silicone meets the needs for better prosthetic rehabilitation. Prosthetic rehabilitation of the amputated foot should not only replace the missing part; it should also replace the function which gains confidence for the patient. In this clinical report, the role of a prosthodontist towards the rehabilitation of partial foot amputation has been briefed. Solutions to challenges faced due to amputations will improve the mental and physical well-being of the patient.

FIGURE 1: Pre-operative

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Figure 2: Impression and Master cast

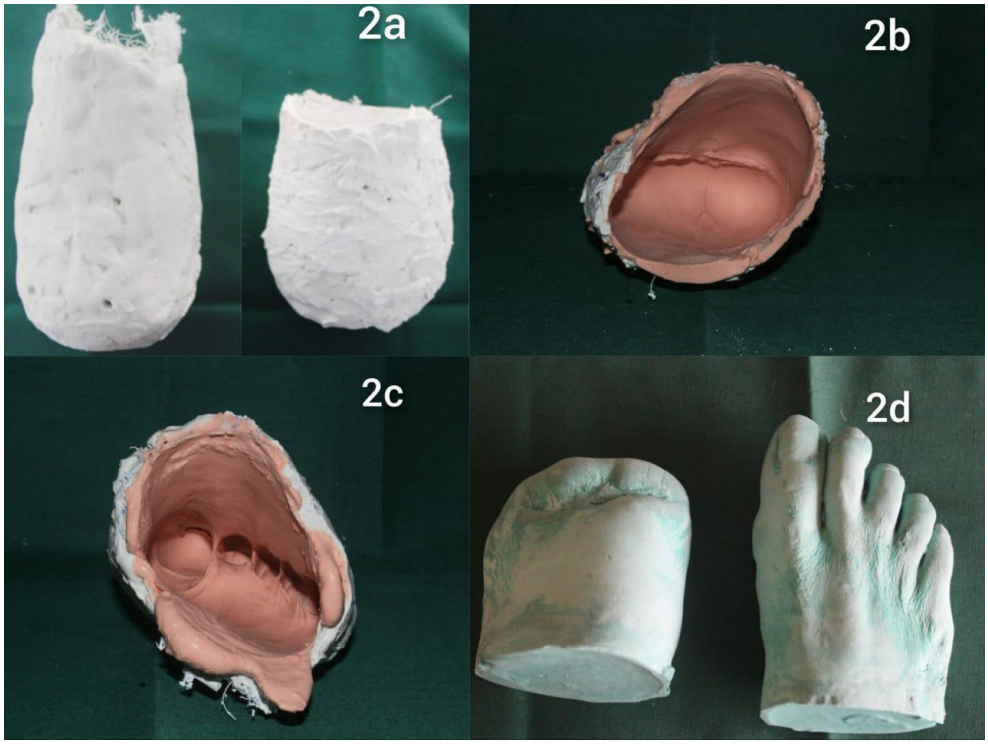

FIGURE 3: 3a to 3c- Acrylic sleeve and wax pattern; 3d to 3f- Flasking and curing

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Figure 4: Post-operative

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