

Prosthodontic Approach for Rehabilitating an Amputated Toe: A Case Report

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ABSTRACT

Rehabilitation of an amputated toe using high temperature vulcanizing (HTV) silicone prosthesis aiming toward comfort and esthetics for a patient whose right toe was missing. Amputation is the removal of all or part of a limb. It can result from medical, surgical, congenital, or psychiatric reasons. Rehabilitating patients with amputated toe not only restores the function but also satisfies their esthetic needs, self-confidence and helping them to cope with the difficulties of amputation. The patient reported to the Department of Prosthodontics with the chief complaint of missing teeth and wants to get it replaced, and it was noticed that his right toe was amputated 2 years back due to diabetic foot ulcer. This case report describes the prosthodontic management of the patient with amputated right toe due to diabetic foot ulcer. Rehabilitating patients with amputated toe not only resulted in improved social interaction, function, and comfort of the patient, it also contributed to the physical and mental well-being of the individual in improving the quality of life of the patient.

Keywords: Amputated toe, HTV silicone, Toe prosthesis.

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BACKGROUND

Amputation is defined as the removal of all or part of a limb.¹ It can result from medical, surgical, psychiatric reasons. Medical causes of amputation include diabetes mellitus, osteomyelitis, peripheral embolization, peripheral vascular disease (PVD), thromboses, thrombocytosis, necrotizing soft tissue infection as well as malignancies such as malignant sarcomas. Surgical causes can be divided into accidental trauma and intentional or combat-related amputations. Psychiatric causes of amputation include self-neglect (e.g., from medical noncompliance). Self-neglect most often results from untreated depression.

Management of amputation during the immediate postoperative period includes pain management, psychological support, proper positioning of the residual limb, evaluation of limb dressing followed by commencement of prosthetic phase.² Fabricating a well-fitting prosthesis after the postoperative period not only restores the form and function but also plays a great role to combat post-amputation depression and increase social acceptance. This case report depicts the prosthodontic management of the patient with amputated right toe due to diabetic foot ulcer.

CASE REPORT

A 67-year-old male patient named Selvappa reported to the Department of Prosthodontics with the chief complaint of missing teeth in maxillary and mandibular arches and wanted to get them replaced.

Dental examination revealed completely edentulous maxillary and mandibular arches for which complete dentures were fabricated.

General examination revealed missing right toe. Upon eliciting history, patient revealed that he underwent amputation of the toe 6 months back due to diabetic foot ulcer. Since the patient had not undergone any rehabilitation for the same, the other phalanges of

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the affected foot were bent toward the defect side. After thorough examination, a toe prosthesis was planned for rehabilitating the amputated toe. Implant-retained toe prosthesis could not be given to the patient as he was a known case of diabetes mellitus since 12 years. Hence, a silicone toe prosthesis with mechanical retentive aid was suggested for the patient. Three different designs of the toe prosthesis were fabricated to compare and evaluate their retention, wear ability, wider rate of acceptance, comfort, and durability of customized silicone prostheses.

Impression Making

Before making impression of the feet, both the affected and the nonaffected foot (Fig. 1) were cleaned, and petroleum jelly was applied over the feet for the easy retrieval of the impressions. For making the impression, a plastic box was used to fit the patient's feet. Patient was instructed to keep his feet in a relaxed position in order to record the finer details of the defect. Preliminary impressions of the affected and the contralateral side of the feet were made with irreversible hydrocolloid material (Algitec, DPI, Mumbai, India) (Figs 2 to 4) which was reinforced with thin layer of type II dental plaster. Once the impression material was set, it was retrieved and poured with type III dental stone.



Fig. 1: Preoperative view of the affected foot and the unaffected foot



Fig. 2: Primary impression of the affected foot reinforced with plaster

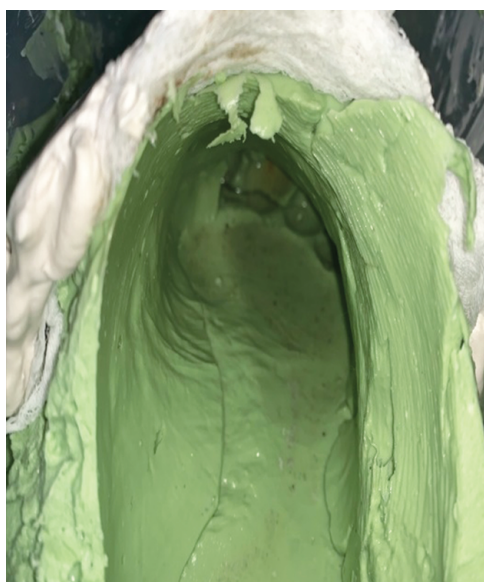


Fig. 3: Primary impression of the affected foot



Fig. 4: Primary impression of the unaffected foot

Fabrication of Wax Pattern

The wax pattern was made using the impression of the nonaffected toe and then carved according to the remaining phalanges of the affected foot to get the contour of the missing toe and was checked on the patient's affected foot for the same (Fig. 5).

Scoring and Filing the Casts

After the wax pattern was tried on the patient's foot, the next step was to prepare the cast for processing the prosthesis. For this purpose, the cast was scored and filed in such a manner that the phalanges were cut off and sufficient amount of space was created for the silicone material (Fig. 6).

Attachment of the Mandrel

On the basis of the scored cast, a hole was drilled at the center after measuring the anteroposterior and mediolateral distance. After the hole was drilled, a mandrel was attached into it for the orientation of the cast (Fig. 7).



Fig. 5: Wax pattern try-in done

Wax-up of the Scored Cast

The wax pattern of the toe which was tried on the patient's foot was attached to the scored cast. The wax pattern was then finished and polished (Fig. 8).

Processing of the Prosthesis

Once the prosthesis was ready for processing, the flasking and dewaxing was done in the conventional manner (Fig. 9). Once the dewaxing was done, the high temperature vulcanizing (HTV) silicone material was checked for the appropriate shade and packed; after which it was cured (Fig. 10). The three different designs of the final prosthesis were then finished and polished (Fig. 11).

Postoperative view of the different designs after Insertion of the prosthesis (Fig. 12).

DISCUSSION

Amputation is commonly encountered in primary care patients as it is often preceded not only by poor compliance with medical care but also by complications.² Amputees face exhausting

physical, emotional, and economic challenges all on a daily basis which is associated with a high level of distress and posttraumatic stress disorder (PTSD).³ The first amputation for patients with diabetic foot complications is usually a minor distal amputation (such as ray amputation) with a significantly low mortality rate as compared to a major amputation like below knee amputation. Izumi et al. reported a significant difference in mortality with the hazard rate being 1.6 times in major amputees compared to ray amputees.⁴ The goal of prosthetics is not only to overcome the challenges encountered in amputations but also to restore the function of the lost limb along with the best esthetic effect possible.^{2,5}

In this case report, an implant-retained toe prosthesis was not considered since the patient was a known case of diabetes mellitus and thus surgical intervention was not an option. Hence, HTV silicone (Technovent) toe prosthesis with mechanical retentive aid was suggested for the patient. Silicone prostheses are believed to offer greater patient satisfaction due to a wide range of advantages like skin protection,⁶ durability, flexibility, skin-like texture⁷ and biocompatibility (according to ISO 10993-1). Silicone is also non-abrasive compared to the other materials used for prosthesis fabrication and therefore causes less inflammation and



Fig. 6: Scoring and filing of the cast



Fig. 7: Scored cast attached to the mandrel



Fig. 8: Wax-up of the desired final prosthesis done on the scored cast

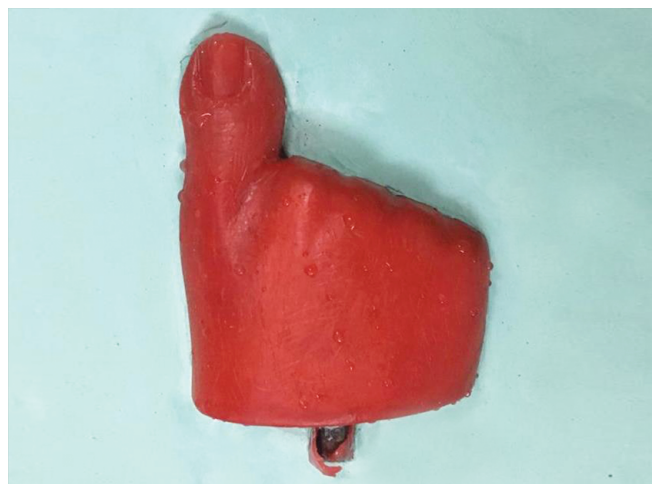
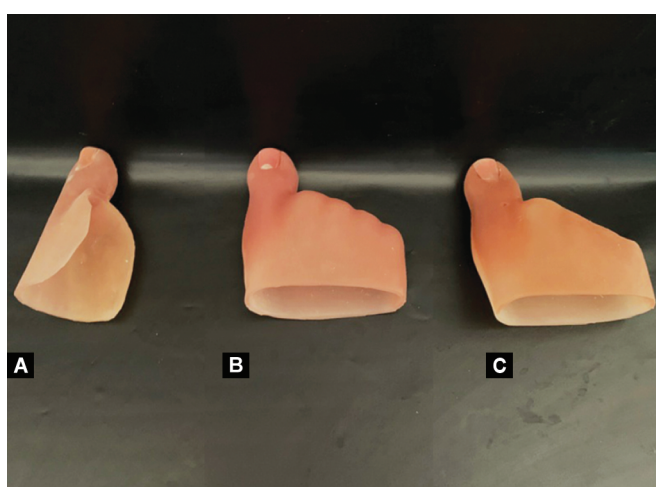


Fig. 9: Flasking of the waxed up scored cast



Fig. 10: Packing of the mold with HTV silicone



Figs 11A to C: Final prosthesis with different designs: (A) toe prosthesis with adhesive; (B) Toe prosthesis with finger separator, (C) Toe prosthesis with flap pattern

tissue breakdown.⁸ Silicone prostheses are not subjected to ordinary thermal damages and stains which in turn increases the longevity of the prosthesis.⁹

In this case report, three different designs of the toe prosthesis were fabricated to check and assess their retention, function, wider rate of acceptance, comfort, esthetics, and durability of the prostheses. The patient was satisfied to an extent with all the three types of silicone prostheses; however he was more comfortable with the flap type prosthesis. As the toe was not restored for a long time the adjacent phalanges were deviated towards the amputated toe. As a result, the prosthesis differed minimally when compared with the contralateral normal foot which was a limitation of the prosthesis. Another limitation in terms of custom-made prostheses fabrication is that they are time-consuming and require manual skill.¹⁰ Prosthesis with mechanical retention rehabilitate the defect physically but the implant retained prosthesis allows a partial recovery of the osseoperception. This results in the transfer of tactile stimuli to inter-osseous nerves, which allows the patient to do functional activities too.¹¹ Recent advancement in both, the materials and methods of fabrication like use of 3D printing exhibits



Fig. 12: Postoperative view of the different designs after insertion of the prosthesis

greater potential for the fabrication of functional prostheses that improve function in amputees.¹²

CONCLUSION

Replacement of a lost limb is always accompanied by a psychosocial impact on the patient. This aspect must always be taken into account by the prosthetists while rehabilitating an amputee. With advances in the field of prosthetics, in terms of better technique and material enhancement, the esthetic and functional challenges of the prostheses can be easily met, thereby assisting the patient to deal with the difficulties of amputation.

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