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RESEARCH ARTICLE

AFFORDABLE FOOT PROSTHESIS MADE USING FIXIT SILICONE GIVING AMPUTEES A SECOND CHANCE USING PROSTHODONTICS LABORATORY TECHNIQUE

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Abstract

Affordable foot prosthesis is a major aid for financially unsound amputees. A female patient with partial foot amputation at midtarsal joint with a history of road accident came for prosthetic rehabilitation of the limb. Fixit silicone was used for foot prosthesis fabrication. Despite not being medical graded silicone, patient is satisfied with its limited function, biocompatibility and esthetics. Patient is reviewed after one month.

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Introduction:-

Case Report:

A 60 year old female patient came to our Department of Prosthodontics with amputated right forefoot at midtarsal joint. Amputation was done following an accident which occurred 8 years ago. Chopart's amputation is the separation of forefoot at the midtarsal joint. It offers an advantage of retaining ankle motion in comparison with other higher level amputations. On examination a healing ulcer was found on the mid part of the sole area. It was planned to fabricate a silicone prosthesis at an affordable price using fixit silicone to restore esthetics and function. Patient's primary concern was to be able to stand independently for her daily routine activities. We explained the treatment plans and she gave her consent for silicone prosthesis though not medically graded.

Step By Step Fabrication Of The Silicone Prosthesis:

Impression Making: Both the right and left affected and unaffected leg were cleaned using betadine. Impression of the amputated leg was made using irreversible hydrocolloid as per the instructions given by the manufacturer (Zhermack, Tropicalgin Alginate Normal). Cotton gauze was placed all over the alginate impression so as to provide a mechanical interlocking between the alginate and plaster. Once the alginate was set, thick plaster mix was poured over it to reinforce the whole unit. Following setting it was removed from the leg and Plaster of Paris was poured into the impression of the amputated leg to get master cast free of voids and defects (Fig 2). Measurement of the left foot of the patient was found to be 10mm length and 13mm width. Impression of a similar right leg with same measurement was taken from another person in order to make a wax pattern trial (Fig 3).

Wax Pattern Trial: After making a wax pattern, it was inserted into the patient's amputated leg to check whether it resembled the other leg in size, shape and form (Fig 4). Shade matching was done and the foot was shaped according to the patient's left leg. After the wax trial, wax was well adapted to the master cast and a plaster mould was made over the wax pattern adapted over the master cast (Fig 5). Sectional plaster mould was made so that the opening and retrieval of the silicone prosthesis would be easier. Dewaxing was done in order to obtain a hollow space to fill the silicone material (Fig 6).

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Fabrication of silicone prosthesis: After dewaxing, separating medium was applied throughout the mould cavity. Oil colour (Burnt sienna, white and pinch of black) was used to give a similar skin shade for the prosthesis. 3 tubes of Fixit silicone sealant were used simultaneously and the colour was added into it to get a uniform shade and consistency. Mould space was filled with silicone material and the assembly was tightly packed and wrapped. The setting time of fixit silicone is 15min as per the manufacturer (Fig 7). After opening the mould sectionally, the prosthesis was retrieved and the excess material was removed (Fig 8). Toes were separated and nail colours were applied. Foot wear was custom made to accommodate the amputated foot and the silicone prosthesis (Fig 9).

The retention of the prosthesis is mainly by attachment of the foot prosthesis with the foot wears so that the sandals will not slip away from the prosthesis thereby improving the retention by the close approximation of the silicone prosthesis with the amputated foot.

Discussion:-

Infection with tissue necrosis in diabetic patients, gangrene, ischemia due to peripheral disease, trauma are causes of concern which leads to amputation of the affected leg. Partial foot amputation provides an advantage of retention of plantar load bearing tissues which allow the patient to ambulate with or without prosthesis. Silicone material we used is Fixit Silicone sealant which is normally used for household purpose and we checked if patient has any allergic issues with this silicone sealant before prosthesis fabrication. The main goal of prosthetic management of patient with limb loss is to restore function, form and restore self reliance for the patient. Different types of amputations include toe amputation, ray amputation, Transmetatarsal amputations, Lisfranc's amputations, Syme's amputations, Chopart's amputations. Several options are available for Chopart's amputee but most of the prosthesis take support at or above the ankle. This disarticulation occurs through the talonavicular and calcaneocuboid joints. The main aim of prosthetic rehabilitation in Chopart's amputation is to prevent deformity, provide anterior support and cosmetic restoration. Management of Chopart's amputation includes AFO with filler, modified SMO, Carbon fibre foot plates, Chopart plate by Endolite, Chopart plate by Ottobock, High definition silicone foot (HDSF), custom made silicone foot etc. The major flaw of the below ankle design is that it lacks an effective lever arm that would help to lift the partial foot. In this case, we used Fixit silicone sealant which is less flexible than the medical grade silicone and the custom made foot wear is used so that the length of the leg can be adjusted. The silicone we used in this study has not been used earlier for similar situations.

Hydrophobic nature of well adapted silicone not only protects the wound but also improves the psychological well being of the patient. Even if the silicone material is flexible, lightweight, the attachment of the foot wear with the prosthesis increased its weight. However limited it is in function, the patient seems to be patient compliant.



Fig 1:- Amputated Leg.



Fig 2:- Impression Making.



Fig 3:- Master Cast With Wax Pattern.



Fig 4:- Wax pattern Adapted to the Cast.



Fig 5:- Plaster mould made over the Wax Pattern Trial.



Fig 6:- Plaster mould After Dewaxing.



Fig 7:- Plaster Mould Filled With Silicone.



Fig 8:- Silicone Prosthesis.



Fig 9:- Silicone Prosthesis Attached With a Foot Wear.



Fig 10:- Silicone Prosthesis Insertion.

Conclusion:-

Amputation is the final resort done by the medical professionals as a surgical measure to control disease progression. As we see a large number of people facing difficulties to stand independently to carry out their personal needs, we can provide them with an affordable prosthesis so that it may improve their self confidence and give them a second chance.

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