The journal of
PROSTHETIC AND IMPLANT DENTISTRY
Official Publication of Indian Prosthodontic Society
Kerala State Branch

PROSTHETIC REHABILITATION OF PARTIALLY AMPUTATED FINGER WITH CUSTOMIZED RING - A CASE REPORT

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Abstract:

AIM: The aim of the present case report is to make a life like prosthesis using the remnant portion of the remaining finger and also it should resemble the unaffected finger of the other hand.

INTRODUCTION: The individuals life quality depends on the state of being free from any illness or injury. Loss of body structure due to any form of illness or injury will affects the morale of the individual. Finger is a more vital organ to perform classic everyday function. Any defect in the finger leads to a psychological setback. Prosthetic rehabilitation with an artificial silicone prosthesis is the most viable treatment option. The present article discusses a prosthetic rehabilitation of the index finger of the right hand using a customized ring retained silicone prosthesis.

CASE REPORT: A 48 year old female patient reported with a principal complaint of partially lost right index finger. The patient had a history of traumatic injury 5 years ago with no evidence of pain on palpation. The treatment options suggested to the patient were implant supported endoprosthesis or a conventional silicone exoprosthesis. The patient opted for a conventional custom made silicone exoprosthesis due to financial concern.

CONCLUSION : Restoration of finger defects with an artificial substitute is no more a challenging procedure for a maxillofacial prosthodontist. So when silicon finger prosthesis is prepared with utmost care it can improve the life like appearance and psychological support of the patient.

Key words: Finger prosthesis, Ring retained silicone prosthesis, amputated finger.

Introduction

Prosthetics is the art and science that provides a natural aesthetic appearance by replacing the absent structures of the patient. Hands are the important organ which helps to perform wide range of precise and gentle activities. According to the National Centre for Health Statistics, physical injury accounts for >70% of upper limb amputations of which the most common are partial finger amputations[1]. The most common causes of finger amputation are trauma caused during road traffic accidents, occupational injuries, degloving injury, frostbite, gunshot injury. This can lead to reduced grasp, strength and also psychological

trauma[2]. Rehabilitation of the lost finger is usually done by fabrication of an endoprosthesis with implants or an exoprosthesis. Though an endoprosthesis is of better acceptance, it cannot be used in conditions with bare nerve endings in the amputation site[3]. Silicone could be a suggestive material in the fabrication of finger prosthesis[4]. This is a case report describing the partial finger defect rehabilitated using a silicone exoprosthesis retained by a customized ring.

Case Report

A 48 year old female patient reported to the department of prosthodontics, with a principal complaint of partially lost right index finger (fig .1). The patient gave a history of traumatic crush injury 5 years ago during a road traffic accident due to which amputation was performed. On examination there was complete amputation of distal phalanx of the right index finger (Allen IV classification) about 2.5cm with solitary healed wound. On physical examination there were no signs of inflammation or infection. The tissue on the middle phalanx was keratinised with brown to yellow crusting .The dorsal and ventral surface was smooth and rounded. The patient gave no evidence of pain on palpation so the possibility of remnant free nerve ending was negative. The patient do not have any previous history of prosthesis. The treatment options suggested to the patient was an implant supported endoprosthesis or a conventional silicone exoprosthesis. The patient was not willing for surgical procedure and opted for a conventional custom made silicone exoprosthesis.

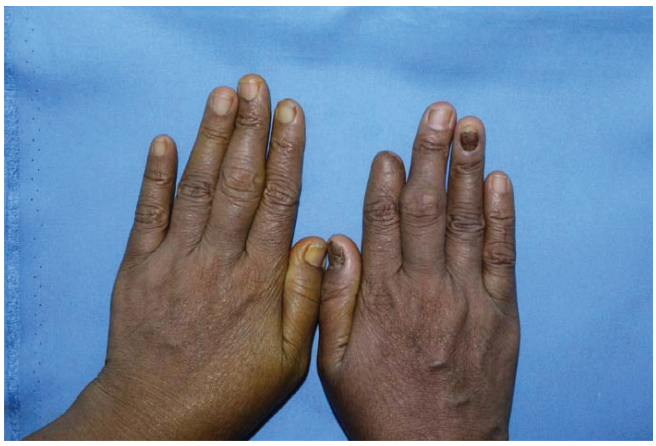

Fig 1- Preoperative view of amputated finger

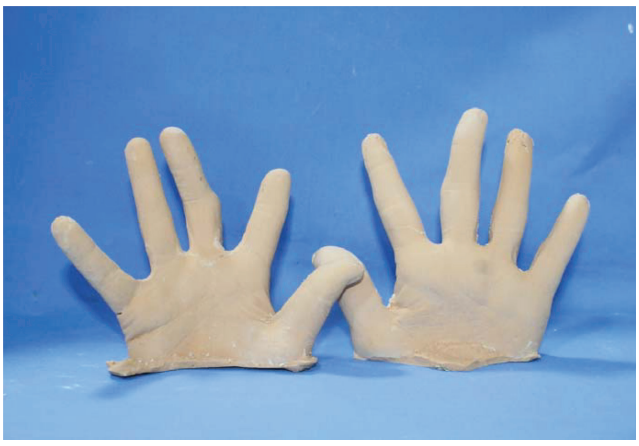

Fig 2- Positive replica of the hand and amputated finger

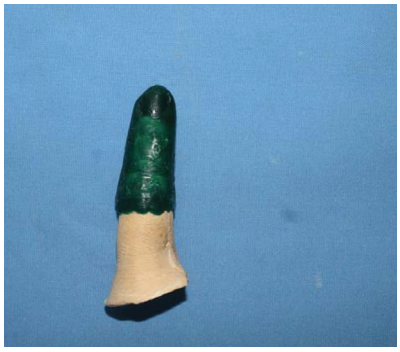

Fig 3- Wax pattern

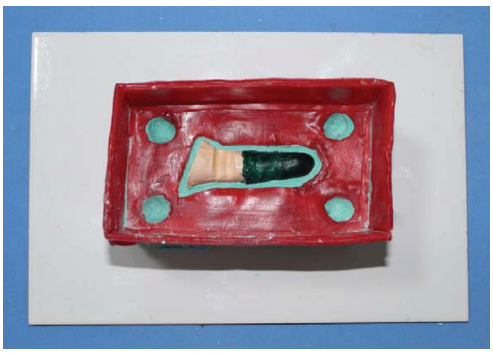

Fig 4- investment of wax pattern

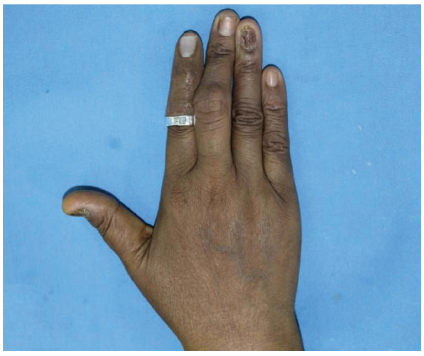

Fig 5- Ring retained Final Prosthesis with customized nail

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Before making the impression a thin layer of separating medium, petroleum jelly was applied to the patient's hand. The impressions of both the hands were made using irreversible hydrocolloid (Zelgan plus, Densply, USA) using a broad plastic container, which was selected based on the patient's palm size. Care was taken to place the hand in relaxed position and without contacting the bottom portion of the container while making impression. The impression was poured with die stone(Ultrarock, Kalabhai, India) to produce positive model of hand with amputated finger (fig.2). Separate impression of the finger stump was made using Putty elastomeric impression material (Aquasil, Densply Pvt Ltd, Germany) and light body elastomeric impression material (Reposil, Densply Pvt Ltd, Germany)and a model was obtained by using die stone (Ultrarock, Kalabhai, India).

With the dimensions of the opposing finger as reference a wax pattern was fabricated using inlay wax (GC Asia Dental Pte Ltd, Singapore) (fig. 3)and tried on the patient. After trial the wax pattern was placed in refrigerator to prevent wax distortion. Once the trial was satisfactory the finger stump was reduced by 2mm with a rose head steel bur (Morris dental company ltd, Dublin) in order to attain a passive vacuum fit of the prosthesis. Then the silicone was manipulated on a white tile and a trial silicone sleeve was made on the reduced finger stump to verify the fit. The trial sleeve had sufficient vacuum. The trial sleeve was removed from the finger stump and retentive grooves were made using inverted steel vulcanite (Henry schein, USA) on the dorsal and ventral surfaces of the stump before mould preparation.

The previously tried wax pattern was then reoriented in the finger stump and fused. Separating media (DPI cold mould seal, DPI India) was applied in the finger stump. A three part mould for silicone packing was prepared using modelling wax (The Hindustan Dental Products ,India) dental stone was poured into the prepared wax mould and the dorsal surface of the finger stump was immersed into it (fig 4). Grooves were made on the first counter for reorientation. Separating media (DPI cold mould seal, DPI India) was applied and a layer of wax was placed on the counter to establish equalization of pressure during silicone packing. The second pour was done using dental stone. After the final set of the three part mould, dewaxing was done. Following dewaxing the mould was coated with a layer of silicone releasing spray (Miracle Aerosol industries, India). Finger nail of suitable shade was fabricated and placed on the dorsal counter in the mould using cyanoacrylate

A layer of separating media (DPI cold mould seal, DPI India) was applied on the finger nail section of the mould , then a thin layer of clear and pink auto polymerizing acrylic resin (DPI RR cold cure, DPI India) was poured in dough stage. After polymerization the nail segment was removed from the counter and trimming was done using acrylic trimmers (shofu dental, India)

The manipulation of silicone (Technovent, Macfacindia, India) was carried out on a neutral white tile. Gradual addition of intrinsic satins was performed for an evenly stained silicone mass. Colour matching was done individually for the dorsal and ventral sides of the finger. Once the desired shade was achieved, silicone was packed in increments on the both the counters. The incremental addition of silicone was carried out to eliminate entrapment of air bubbles that may lead to voids. Then the counters were reoriented and clamped for overnight curing for room temperature vulcanization. Following the overnight curing the prosthesis was removed from the stump and the excess was trimmed by using sharp scissors. The acrylic nail was removed from the silicone finger and reattached with platinum primer (A304 Factor II, Inc, USA). The prosthesis was finished by the burs which was provided in the kit by the manufacturer. The prosthesis fit was checked on the patient and final extrinsic shade matching was

performed. In order to attain additional retention and to camouflage the margins of the prosthesis prefabricated metal ring was used (fig .5). Proper postinsertion instructions were given for the patient to maintain the finger prosthesis. Patient was recalled after a week for review and patient was highly satisfied and happy with the prosthesis. Periodic follow up was followed for every three months.

Discussion

Defect or loss of a finger greatly affects the quality of life of the individuals like ability to perform function, dexterity of the hand is lost, the perception of one's wholeness is lost, the individual becomes conscious to cloak himself in the society and if the defect was due to a trauma or illness, may induce symptoms of posttraumatic stress disorder (PTSD)[5]. Hence rehabilitation is necessary to regain the physical and psychological wellbeing on the patient.

Allen classified the amputation level for fingertip amputations as Type 1 - injuries only involving the pulp. Type 2- injuries involving both pulp and nail bed. Type 3-injuries involving fracture of distal phalangeal accompanying pulp and loss of nail. Type 4- injuries involving the lunula, distal phalanx, pulp and nail loss[6]. The present case report deals with a Type 4 Injury. Rehabilitation of such defect can be done by reconstruction or prosthetic rehabilitation.

Though advances in the microsurgical and plastic surgical reconstruction techniques have emerged, the reconstruction of the digits may not be successful for all patients and so rehabilitation has to be benefitted with a passive prosthesis. Though the passive prosthesis cannot perform function the purpose of prosthesis is to allow the patient to camouflage in the society[7]. According to Michael et al scoring of the finger model could improve the fitting of the prosthesis by mild compression of residual stump tissue[8]. Silicone was used in this patient as it has good strength, lighter in weight, durable and provides more esthetic appearance. Burkhardt et al had stated that silicone has a property of hydration which can improve the pliability and comfortability of the hypertrophy scars[9]. It can also protect and desensitize the amputation region by providing constant mild pressure over that area.

Retention of finger prosthesis can be enhanced by ring, medical grade adhesives, implants etc[10-12]. Patient's normal hand can be used for fabrication of wax pattern and the angulation can be modified by sculpting. The major drawback of using silicone elastomer is its color instability when it is exposed to sunlight, chemicals, cosmetics and pollution. So patient needs to be recalled after specific interval to evaluate the prosthesis if required repair has to be done. According to Pilley et al the rings used for retention of finger prosthesis improved the esthetics and psychological response of the patient[13]. So ring retained finger prosthesis is said to be a durable, simple, agreeable and inexpensive treatment in developing countries when compared to expensive options like implants.

In the present case, fabrication of prosthesis was done with conventional silicone. The potential benefits of using a silicone prosthesis are, they desensitize the free nerve ending and protect the finger stump from painful hypersensitive tissue by applying gentle pressure constantly over the area of amputation. As silicone prosthesis was found to enhance the residual stump hydration, the scar tissue becomes more pliable and comfortable[14]. The finger prosthesis can be retained in the finger stump by various modes, Larcher advocated the usage of rings around the margins of the finger prosthesis, adhesive medical grade adhesive, Bickel KD used implant-retained endoprosthesis[15-16]. In the present case retention was obtained using a prefabricated ring placed on the silicone tissue interface.

Conclusion

A suitable finger silicone prosthesis should have appealing shape, merged margins, good fitting, color matching to the adjacent skin, well contoured, more detailed and aesthetic fingernails. It should also restore the patient esthetics, function and comfort. Restoration of finger defects with an artificial substitute is no more a challenging procedure for a maxillofacial prosthodontist. So when care is given to prepare the silicone finger prosthesis it can improve the life like appearance and psychological support of the patient.

Clinical significance

The effective method of using customized ring retained silicon finger prosthesis could improve the phycology, confidence level, retention and aesthetics of the patient.

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