

Case Report

Prosthetic Rehabilitation of Finger Amputee, Basics And Beyond: Clinical Case Reports

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Abstract

Finger and partial-finger amputations are some of the most frequently encountered forms of partial hand losses. Fingers as organs of manipulation have an important role in function and aesthetics. Amputation can cause devastating physical, psychosocial damage to an individual. Though several reconstructive techniques such as Toe – foot transfer, osseocutaneous flaps, and distraction osteogenesis are used to reconstruct lost finger surgically, but esthetic outcome is not predictable with surgical techniques.

The second best option for rehabilitation is by artificial prosthesis, due to predictable esthetic results and no need for additional surgery. The problem of replacing external parts of the body missing from surgery or trauma often falls to the maxillofacial prosthodontist. Maxillofacial prostheses replace lost body parts using artificial substitutes like acrylic or silicones. The retention for prostheses may be obtained from friction, adhesive and implant. These prostheses support the patients psychologically and enhance their social acceptance.

The authors describe rehabilitation of two patients with traumatic amputation of fingers using custom made silicone prostheses. First case report describes a 16-year-old girl with partially missing index and middle finger in her right hand rehabilitated using a silicone prosthesis retained by friction and adhesive and second case report describes a 19-year-old boy with partially missing middle finger of left hand rehabilitated using implant retained silicone prosthesis. The implant retained finger prosthesis tends to be more retentive, functional and more patient acceptance than adhesive retained finger prosthesis.

Key Words

Trauma, Silicone Prosthesis, Adhesive Retained Prosthesis, Implant

Introduction

The loss of the fingers can be due to trauma, disease or congenital abnormality whereas trauma being the most common reason. Loss of finger results in functional deficiencies, esthetic problem and social dysfunction for the patient. The rehabilitation can be done by two methods; reconstructive surgery and prosthesis^[1]. Several techniques such as toe-foot-transfer, distraction osteogenesis and osteocutaneous flap have been advocated for rehabilitation of finger amputee^[2]. The esthetic outcome of these reconstructive surgical techniques is unpredictable. The use of silicone finger prosthesis represents an alternative technique which has adequate esthetics. The retention can be obtained from friction, adhesive or bone anchored implants.

The amount of tissue lost, the current condition of the bone, and involvement of the other fingers are some of the factors that have to be considered when choosing a suitable treatment option. Osseointegration biotechnology has revolutionized the retention of dental and maxillofacial prostheses, and the benefits of osseointegrated reconstruction have been well documented. Osseointegrated implants provide firm retention for prostheses^[3]. It is generally agreed that such retention is more secure than the retention obtained by using conventional glues or undercuts. Today, the use of bone-anchored implants

for anchoring silicone prostheses provides an alternative technique to reconstruct lost or absent fingers^{[4], [5], [6]}. An implant placed in the intra medullary canal of the residual bone of the amputated digit offers additional advantages, because the technique enables short stumps, whereas traditional prosthesis is not successful, to be restored and provides for tactile sensation by transferring stimuli to the bone through implant. This article describes two cases of finger amputations rehabilitated with adhesive retained finger prostheses and implanted retained finger prostheses.

Case Reports

Case 1:

A 16-year-old girl reported to the Department of Prosthodontics and Implantology at Army Dental Center R&R for replacement of missing fingers in her right hand (**Fig.1**). A detailed history revealed that the patient lost her fingers 8-year-ago due to trauma. The amputated stumps were well-



Figure 1

healed with partially missing index and middle finger. The advantages and limitations of replacement of the finger were explained to the patient and her parents. Retention of the silicone prosthesis by using a glove type of finger prosthesis was chosen for this patient since two-thirds of the finger was remaining to provide adequate retention.

An impression of the right hand was made with alginate

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(Zelgan 200, DENTSPLY) and cast was poured with type IV dental stone (Fig.2) (DENTSPLY, Germany). Then, the wax pattern (Carvex TT 100 soft, Carvex, Haarlem, Holland) was sculptured and tried on patient to her satisfaction (Fig.2). When the patient was satisfied with the wax pattern, color matching was done it was transformed to the silicone finger prostheses (Silastic, MDX 4-4210, Medical grade silicone elastomer, Factor II, Lakeside, AZ, USA) by curing at room temperature and (Fig.2). The prosthesis was delivered to the patient and advised to use the adhesive (Daro Adhesive Regular Strength, Factor II, Lakeside, AZ, USA) while wearing the prosthesis. Necessary instruction were given to patient for maintenance of hygiene and prosthesis.

Case 2:

A 19-year-old male reported to Department of Prosthodontics and Implantology at Army Dental Center R&R for replacement of missing part of middle finger in left hand lost while cutting grass in field. On examination, the left hand showed his middle finger was amputated at the level of distal phalange (Fig.3). He gave no other relevant medical history. His primary concern was an esthetic problem especially at the social gatherings. Radiographic examinations were done to evaluate the condition of remaining bone. After consultation, patient was explained the treatment options and later rehabilitated with the implant retained prosthesis.

At the time of surgery, ring nerve block was given. Skin incision was made at the selected implant site. Implant bed preparation was done with sequential osteotomy drills under copious saline irrigation. The position and the angulation of the implant was guided by the radiographic evaluation at each step of implant placement in medullary canal of bone. Implant of 3 mm diameter X 10 mm length (I-5, ALB Surgical, Israel) was placed into the medullary canal of ring finger of the left hand with the insertion torque more than 35 Ncm. Radiographs were taken to verify the implant position (Fig.3). Then, the skin flaps were repositioned using the sutures and implant positioning was marked on skin, the skin over the implant site was punched and titanium ball abutment was attached to reduce morbidity for second stage surgery. (Fig.3)

After 12 weeks for undisturbed healing and successful osseointegration prosthetic rehabilitation was taken up. An impression of the left hand was made with alginate (Zelgan 200, DENTSPLY) and cast was poured with Type IV dental stone (DENTSPLY, Germany). (Fig.4) Clear acrylic resin (DENTSPLY, Germany) substructure was fabricated which housed the 'O' ring attachment. (Fig.4) Then the wax pattern (Carvex TT 100 soft, Carvex, Haarlem, Holland) was sculptured and tried on patient. (Fig.4). When the patient was satisfied with the wax pattern, shade matching was done both internal and external shades were applied to give prosthesis a more natural and life like appearance. Wax pattern was invested and transformed to the silicone finger prostheses (Silastic, MDX 4-4210, Medical grade silicone elastomer, Factor II, Lakeside, AZ, USA) by curing at room temperature and final external staining was done. The prosthesis incorporating acrylic substructure was delivered to the patient with necessary hygiene maintenance and follow up instructions. (Fig.4)

Discussion

In finger loss, trauma is the most common cause. It presents



Figure 2



Figure 3



Figure 4

various levels of amputation; metacarpal or phalangeal bone. Most often, distal and middle part of the phalangeal bone is affected. The amount of remaining tissue is the key for choosing the mode of retention for the finger prosthesis^[1].^[2] Friction is only used when we can use a soft tissue undercut. Adhesive retained is a conventional and conservative method, as it is noninvasive and with no surgical complications. The main advantage of adhesive retained prostheses is that it is cheaper and easy to maintain. The adhesive retained finger prosthesis is useful when the presence of inadequate bone quality and quantity^[6], or the systemic health of the patient contraindicates the surgery like in osteoporosis, or patient not willing to go for additional implant surgery. Marginal tear of the prosthesis, discoloration and allergic reaction are some of the complications associated with adhesive retained prostheses.

The prosthetic retention of finger prosthesis from the friction or adhesive is challenging if the part of the finger is missing at the level of proximal phalange or metacarpal. In such cases, the implant retained finger prosthesis offers the best option to improve the retention and stability.^{[3],[7]} The case selection is important; the systemic health of the patient, bone quality and quantity of the finger should be thoroughly examined and evaluated before for the implant placement.^[6] The implant retained finger prosthesis presents various advantages; provides optimal retention, prevent tearing of the margin of the prosthesis and better aesthetic than other methods of retention. Patients can perform some functions also it allows a partial recovery of the tactile sensation to some extent by transferring

stimuli to the bone through implant because of the direct pressure of the implant on the bone.

Implant retained finger prosthesis presents minimal risk of infection and complications. The major complications are: lack of osseous integration of the implant, detachment of the prosthesis, mild periimplantitis or lack of acceptance by the patient. Our case study showed that, both the adhesive and the implant retained finger prosthesis increase the overall esthetic outcome of the hand whereas the implant retained finger prosthesis showed more functional outcome. The implant retained finger prosthesis tends to be more retentive, functional than adhesive retained finger prosthesis. So, implant retained finger prosthesis is a better choice for the prosthetic rehabilitation of finger defect and in case where implant cannot be placed, the adhesive retained finger prosthesis is an alternative to implants retained finger prosthesis.

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