

FINGER PROSTHESIS RETAINED USING A BICORTICAL IMPLANT –A CASE REPORT

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Abstract:

The loss of a finger can adversely affect the patient physically and psychologically. Most common causes being trauma, congenitally missing or deformities. Such deformities can be rehabilitated prosthetically by means of adhesives, vacuum retained or ring retained prosthesis. An osseointegrated digital prosthesis offers better retention than the other methods. This article describes the rehabilitation of an amputated thumb with implant retained silicone prosthesis to restore the patient's physical, mental and social wellbeing.

Finger prosthesis, osseointegrated, bicortical implant

Introduction:

The absence of human body parts by trauma, diseases or congenital deformities lead to altered function, sensation and image. One of the most common examples of such situation in the industrial world is the loss of fingers that can cause the above impairments.^{1,2} Today, several surgical and microsurgical techniques are available for the repair of damaged fingers when the victim approaches the hospital soon after the incident. When surgical methods not possible, due to some reasons, an esthetic finger prosthesis is a blessing

to handle the defect.³

Retention is the primary determinant factor in the success of a prosthesis. Various methods have been tried to retain a finger prosthesis, including vacuum effect, adhesives, metal rings or other means.^{1,4} Nowadays implant retained prosthesis has got wide acceptance over conventional methods when the remaining structure has adequate bone. It is possible to retain a prosthesis if the residual finger stump measures 1.5cm or less.^{2,5} Implant supported prosthesis not only shows superior esthetics and comfort but also has the ability to conduct tactile stimuli to the adjacent hard and soft tissues.

This clinical report describes the use of a bicortical implant to retain a silicone thumb prosthesis.

Case report

A 45 -years old male patient lost part of his left thumb during carpentry work 3 months ago was referred for artificial reconstruction of the lost structure. Clinical and radiographic evaluation revealed that the amputation was at the level of the distal interphalangeal joint and wound healing was satisfactory

The remaining bone measures 17mms and has

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good quality cortical bone. It was decided to place an implant into the residual bone to which a silicone finger prosthesis would be fixed. The treatment procedures explained to the patient and a consent was obtained. The width of the inner cortex and the length of the bone to the subchondral area were measured from the radiograph to determine the dimensions of the implant (figure 1). A flapless procedure was carried out under local anaesthesia (digital block) and the distal part of the bone was explored with a tissue punch and a drill hole was made into the bone with a lance drill. The drill hole was enlarged to a level of 3.2 mm by sequential drilling. A one piece bicortical dental implant (Bicortical, Oraltronic Dental Implant Technology GmbH) of 3.5mm x 23mm with square post was selected and was inserted in to the implant bed prepared on the proximal phalanx. Radiographic

verification was done (figure 2).

At the end of a 10-day healing period, the abutment part of the square post was modified as a ball head to receive a nylon O-ring on it (figure 3). Impression was made using silicone impression material (Flexceed; GC Dental Products Corp., Japan). Once the impression material had set, the impression was removed, laboratory analogue was placed and a working model was prepared using Class-III dental stone (Kalstone; Kalabhai Karson Pvt. Ltd., India). Impression of a person's thumb of similar shape and size was made using irreversible hydrocolloid impression material (Tropicalgin; ZhermackSpA) to which molten wax was poured to duplicate the lost finger. After necessary modifications the wax finger (figure 4,5) was then adapted on the working model and the



Fig 1:



Fig 2:



Fig 3:



Fig 4:



Fig 5:



Fig 6:

margins were merged to the edges of the defect.

The nail was customized and fabricated with a built in retentive element (figure 6,7), using self –polymerising acrylic resin (DPI-self Cure tooth moulding powder) and was incorporated into the nail bed created on the wax model. It was then flaked and dewaxed (figure 8). Different shades of intrinsic colours were mixed with silicone (Maxillofacial Rubber; Technovent) to match the colour of the thumb (figure 9). The O ring was securely placed over the implant analogue before packing the material and the curing process was performed according to the manufacturer’s instructions. The prosthesis was retrieved from the mold and finished (figure 10). Fine details of color matching was done with extrinsic stains and evaluated for fit. The patient could reproduce the finger movements of the stump without displacement of the prosthesis. The patient was

able to grab and hold things as like normal thumb (figure 11).

Home care instructions explained to the patient which included mechanical debridement of the skin around the abutments with a soft tooth brush and irrigation with warm water and soap. Clinical and radiographic follow up done 6 months post operatively and did not reveal any complications.

Discussion:

Traumatic amputation of a finger can cause physical and emotional difficulties. An aesthetic prosthesis for the finger can offer psychological, rehabilitative and functional advantages.⁶ Prosthetic rehabilitation of the finger restores the body anatomy and allows the patient to expose his hand with confidence.⁷ A precisely fitting prosthesis is essential for this purpose.⁴



Fig 7:



Fig 8:



Fig 9:



Fig 10:



Fig 11:

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The prosthesis is attached securely by means of an osseointegrated implant placed within the intramedullary canal of the residual bone of the amputated digit.⁵ ball and socket type of retentive features provided optimum retention and could be easily taken on and off by the patient. The prosthesis was fabricated from silicone, contributing to the satisfactory aesthetic results, also feel like soft tissue.²

Partial recovery of the tactile sensation (osseoperception) can be attained by using implant retained finger prosthesis. Lundborg et al. proposed that this occurs as a result of the transfer of tactile stimuli to intrasosseous nerves via the osseointegrated implant.¹ The patient is able to perform daily manual activities such as holding or grabbing objects like small boxes, cups, etc. In the studies of Manurangsee et al. and Sierakowski et al., patients scored highly in the Jebsen Hand Function Test, with results close to the contra-lateral hand.^{12,13} A restricted metacarpophalangeal joint would restrain the adequate functioning of the prosthesis.² The placement of one piece implant eliminated an additional surgical intervention, shortened the treatment time and reduced the trauma for the patient.¹⁴

Out of the available maxillofacial materials, customized silicone prosthesis has a comparatively larger acceptance rate due to their superior comfort, esthetics, durability and stain resistance. Few other added benefits of silicone prosthesis are desensitization and protection of the hypersensitive tissue at the amputation site, which is achieved by the constant gentle pressure exerted over the affected area.⁹

Conclusion:

Fingers are quintessential in daily life. Apart from their functional purpose, they also pay an important part in human communication and expressions. Amputation of fingers will result in

functional deficiency as well as aesthetic problems. An osseointegrated digital prosthesis addresses both the issues and permits the patient to perform daily activities and thereby eliminating the physical and psychological trauma occurred to the patient due to the loss of finger.

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