ABSTRACT

The purpose of this report is to present a case of prosthetic management of partially missing thumb by fabrication of silicone thumb prosthesis. Thumb is one of the vital parts of the hand and has an important role in function and esthetics. Partial or complete loss of thumb leads to dysfunction and psychological disturbance to individual. A 23-year-old male reported for prosthetic rehabilitation of partially lost thumb, with the complaint of pain in thumb on prolonged writing. Thumb was partially chopped in sugarcane crusher. Part of second phalanx was missing, and thumb was broad at first and second phalanx joint. Silicone thumb prosthesis was fabricated. The thumb prosthesis was retained by an undercut present at first and second phalanx joint. Silicone material Silastic-MDX 44210 was used to provide function and esthetics. The thumb prosthesis offered psychological, functional and rehabilitative advantages for the patient. Restoring the natural appearance with the prosthesis eliminated the trauma generated by the dysfunction and represented an efficient psychological therapy.

Key Words: Maxillofacial prosthesis, silicone prosthesis, thumb prosthesis.
broad at first and second phalanx joint (Figure 1). There were no signs of inflammation, infection and surrounding area was normal. Patient complained of pain on prolonged writing due to improper pen grip. The prosthetic rehabilitation was a challenge due to the functional demand from the prosthesis and also the mode of retention was important in this case.

Treatment plan
The treatment plan was decided depending upon the level of missing part of thumb and mode of retention. It was decided to fabricate silicone prosthesis extending up to metacarpal joint, with the groove in mesial part of prosthesis for pen grip. The mode of retention used was undercut present at first and second phalanx.

Impression making
The patient’s hand with missing thumb was lubricated with a thin layer of petroleum jelly and the area around the hand was boxed. A thin layer of irreversible hydrocolloid impression material was placed over the palmar side first and then the dorsal side. The patient was instructed to keep the hand in the normal resting position without stretching while impression making (Figure 2). The impressions were then poured in dental stone (gold stone) and after setting a positive replica of the hand was retrieved. In order to train the patient to write and get the proper grip, a temporary putty cap with groove was given to the patient, adjustments were made in this prosthesis to make it functionally effective and copied in the final prosthesis (Figure 3).

Wax pattern fabrication
Impression of the unaffected side thumb was made in putty into which molten modeling wax was poured to get the wax pattern of the prosthesis. The wax pattern was then hollowed from inside by sculpting. The wax patterns were placed in warm water and then placed on the cast and modifications in sculpting were carried out to resemble the thumb of the affected hand (Figure 4).

Acrylic nail fabrication and nail bed preparation
Tooth colored acrylic resin material (DPI, cold cure tooth molding powder) was used to fabricate custom made acrylic

Figure 2: Alginate impression of the right hand.

Figure 3: Putty cap.

Figure 4: Wax up of prosthesis.
nail for the prosthesis. Color and shade matching was done with the nail of adjacent fingers and integral half-moons, white margins and other details were incorporated. The size and position of the acrylic nail was established and the nail bed was prepared, where the custom made acrylic nail was adapted into place (Figure 5).

**Try in**
The wax patterns were tried on the patient’s hand and the length and the fit was verified. The shade matching of artificial nail was also verified. Approval from the patient was taken and then the artificial nail was removed.

**Investment technique**
The wax patterns were invested separately in Type II gypsum product using two pour techniques to facilitate an easy packing of silicone and separate color matching for dorsal and ventral surfaces. This mold was dewaxed by immersing in a boiling water bath and separating medium was applied (Figure 6).

**Color matching and packing**
The silicone (RTV Silicone, Silastic-MDX 44210 MP Sai Enterprises, Mumbai, India) and pigments were mixed intrinsically to match patient’s skin. Color matching of the dorsal and ventral surface was done separately in natural light. After getting the desired shade, the silicone material was packed into the mold, and light pressure was applied to remove excess material. After polymerization, the prosthesis was carefully retrieved from the mold and finishing was done.

**Acrylic nail fixation**
A slit was made in the prosthesis along the crease on the nail bed area, where nail is to be inserted. The excess 2 mm nail portion was inserted into the slit and a cyanoacrylate adhesive was applied on the under surface of the nail for bonding with the silicone surface and placed back on the mold to achieve a stronger bond to the nail bed.

**Final prosthesis**
The final prosthesis was inserted on the residual stump, and the fit and color matching was evaluated (Figure 7). The patient was demonstrated about the use and instructions were given about maintenance of the prosthesis. The retention of the prosthesis was achieved by engaging the undercut present at the first and second phalanx joint and also the vacuum effect on the stump associated to a mechanical adaptation with adequate shape. The patient could reproduce the movements of the stump without displacement of the prosthesis (Figure 8).

Patient was advised to clean the prosthesis with a dilute soap solution, such as shampoo, rinse well and pat dry with tissue. He was advised that nail varnish may be used, but extra care to be taken to ensure that no varnish remover comes into contact with the silicone, and that this is best achieved with a cotton bud.²

**Follow-up**
For prosthesis evaluation, the patient was asked to return on day 1 and 7 for follow-ups. There after a 6 months follow-up...
was done, and it was noted that the patient had no complaints and was satisfied about writing efficiency, esthetics, comfort and retention of the finger prosthesis. The dynamic ability of the stump was determined for some basic functions as restoring normal length, providing opposition for the remaining digits, protecting a sensitive stump, and transmitting pressure and position sense for activities such as writing or typing.

Discussion

When surgical reconstruction of lost finger is contraindicated, unsuccessful or unavailable, a prosthesis can provide and offer great psychological help. A precisely fitting prosthesis can improve function by restoring normal length, providing opposition for the remaining digits, maintaining sensitivity through a thin lamina, protecting a sensitive stump, and transmitting pressure and position sense for activities such as writing or typing. Both psychological and functional effects of the prosthesis enhance rehabilitation by helping patients to adjust to their loss and by permitting a more normal professional and social life.

The acrylic resin and silicone are the most common materials used for rehabilitation. Although resin can be easily characterized and presents great durability, it is a very hard material and uncomfortable for the patient. On the other hand, silicone has texture and flexibility similar to the skin, provides a more comfortable prosthesis and presents better capacity for skin-prosthesis linkage. However, this material is more difficult to pigment and degrades due to color instability when exposed to ultraviolet rays. Buckner, stated that the acceptance rate of individually sculpted custom made silicone prosthesis has been much higher. Among the sculpture techniques, there is the analogous finger technique, which is performed by molding and sculpture of another person’s finger or can also be carried out based on anatomy reproduction.

Retention is the primary determinant factor for the success of prosthetic restoration in any part of the body. It is important for aesthetics, function, and comfort thereby improving the patient’s quality of life. Finger prostheses are retained by a vacuum effect on the stump. Currently, the methods for prosthesis retention to the remaining part of the finger include ring, double ring, adhesives and osseointegrated implants. Leow et al. suggested in his study that a 5-7% circumference reduction in the finger model showed good fit of a thimble-type prosthesis for distal finger amputation.

In this particular case, silicone prosthesis was fabricated as patient’s complaint was pain on prolonged writing. Silicone prosthesis provided cushioning effect due to flexibility and a groove created in mesial aspect of prosthesis provided pen grip. The primary mode of retention in this case was from the undercut.

Conclusion

Loss of thumb may have a negative impact on functional and psychological well-being of the individual. In this case, the prosthetic rehabilitation of thumb with high quality silicone prosthesis restored functional, esthetic and psychological well-being of the patient. Such types of prosthesis are widely accepted and also boost the morale of the patient.

References