CASE REPORT

Finger Prosthesis with an Alternative Approach

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ABSTRACT

This report describes the case of a 42 years old male patient whose one right hand finger was partially lost as a result of occupational trauma. A modified impression technique was used for impression making and wax pattern was fabricated using the normal hand of the same patient. A special type of wax was formulated to make a pattern which was easily molded and carved. Two indexed casts were used to determine the length of fingers. Intrinsic and extrinsic staining was also done to match the adjacent skin colour. A ring was used as a retentive method. The patient was highly appreciative of the social acceptance after he started wearing the finger prosthesis.

Key words: *Silicone prosthesis. Finger amputation. Impression technique. Digit prosthesis.*

INTRODUCTION

The general inadequacy of hand prosthesis underlines the importance of utmost conservation whenever hand amputation is under consideration. The success of any prosthesis depends on many factors, including the extent and location of the defect.[1] Once a part of a body is amputated, it is difficult to get the same result even after plastic surgery.

Cases where there is minimal or no surgical prognosis are usually referred to a prosthetist, mostly for aesthetic purpose. By the time the injury heals most of the patients feel social, psychological and emotional distress without prosthetic rehabilitation. Prosthesis form, colouration and texture must be as indiscernible as possible from the surrounding natural tissues. The ideally constructed prosthesis must duplicate the missing parts so precisely, that the casual observer notices nothing that would draw attention to the prosthetic reconstruction. Rehabilitation efforts can only be successful when the patient can appear in public without fear of attracting unwanted attention.[2]

The aim of this report is to present a case of finger prosthesis fabricated by a modified impression technique.

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CASE REPORT

A male patient, aged 42 years, reported to the department, with a history of partial loss of right hand little finger, about 3 years back, due to occupation-related trauma. The patient had suffered a long period of psychological depression immediately after the injury. Postsurgery, the patient had also observed difficulty in holding large-sized objects and any work that would be related to them for example using a hammer. Medical history was non-contributory except he was taking anti-depressants for many years. Clinical examination of the affected hand revealed that remaining part of little finger was approximately 20 mm in length (Figure 1). Examination of the fingers revealed the presence of undercuts in relation to lower one third of the remaining tissue. The undercuts present were within the soft tissue and no evidence of hard tissue undercut was found.

The surrounding area appeared to be normal with no signs of any infection over the digit. After having informed consent from the patient, to ensure his willingness and cooperation the treatment was executed.

Technique: For impression making, patient's amputed finger and the adjacent area was lubricated with a thin layer of petroleum jelly for preventing adherence of impression material to the skin and hair. A baseplate wax box was prepared which was extended upto 10 mm beyond the defect, the box was then tried on the patient's hand. For impression making irreversible hydrocolloid (Alginate, Zelgan 2002, Dentsply, India) was mixed with 50% more water than normal water in powder ratio to produce thin consistency leading to satisfactory and optimum impression without any undue pressure over the tissue bed. The box was filled with impression material and placed over the defect.

The patient was instructed to keep the hand in the normal resting position without stretching. When the material was set the impression was retrieved and sent

Figure 1: The remaining stump.

Figure 2: Wax pattern trial.

Figure 3: Investing of wax pattern.

Figure 4: Final prosthesis with ring attached.

to the laboratory for the fabrication of model. The impression was poured in stone plaster, type-III (Kalstone, Kalabhai, Mumbai: India); at the same appointment another impression was made of patient's left little finger in a combination of light body and putty (Express, 3MESPE, India). The impression of the patient's left little finger was poured with wax. The pattern was removed from the elastomeric impression. The wax pattern was then adjusted by sculpting and adapted on the working cast. Approximate length and angulations were determined on working cast and later confirmed during trial of wax pattern. The wax pattern was tried on the patients affected right hand little finger. Necessary adjustments regarding the length, contour and angulations of the finger were done at this stage of prosthetic fabrication. Also the necessary shades were selected for different areas of the finger especially the junctions of adjacent two surfaces (Figure 2).

The master cast was duplicated and the duplicate cast was used for investing. The pattern was sealed to the master cast at the junction, where the margins of the pattern overlapped the cast. The pattern and the cast were then invested in a large size Hanau flask. The mold was first poured only upto half of the pattern. Tin foil substitute was applied and then the other half was poured, wax was eliminated in the conventional way. The mold cavity was prepared by first coating the external tissue surface with application of extrinsic colour; a base colour mixture of the silicone material (Multisil Epithetic, Bredent Gmbh and Co.kg, Seden, Germany) was prepared to fill the mold cavity.

Kaolin powder was added to provide the radiopacity. Then silicone catalyst was added after satisfactory base colour was developed. The two shades of silicone were used, one for the first layer which would represent the dorsal surface of the finger and the second which would represent the ventral surface of the artificial finger. Air dryer was used to partially polymerize the first layer. Air was removed from the mixture by placing the container in a bell jar under vacuum. The coloured, catalyzed, airless silicone base was then placed into the mold cavity (Figure 3). The two pieces were re-assembled and excess silicone was expressed using light pressure. The mold was then clamped and placed into a dry heat oven at the manufacturer's prescribed time and temperature.

After polymerization, the mold was allowed to cool at room temperature, opened and flash removed with a sharp scalpel and finished with an abrasive stone. The prosthesis was tried in the patient. The artificial prosthesis was quite retentive due to the vacuum created; for additional retention metal ring was also given .The prosthesis was finally delivered to the patient after giving instructions regarding its maintenance (Figure 4). The patient was recalled after one month to evaluate colour stability and the functioning of finger prosthesis. The results were promising and he was quite satisfied with the outcome of the treatment.

DISCUSSION

In this technique modified impression method is used which has a certain advantage over the conventional technique. It is a less cumbersome quick, easy and economical technique using minimal material.

For making of wax pattern the same person's unaffected hand can be used to eliminate the error in respect to size and shape. We can also use the analogous finger technique.[3] Wax was preferred over clay to make the pattern because residual oils from clay contaminate the mold surface, which interferes with the platinum catalyst employed in silicone prosthesis materials. The wax was made by mixing of two sheets of bees wax, one sheet of hard pink base plate wax and two strips of clear rope boxing wax. The resultant wax was pliable enough to form into small shapes with fingers when warm, yet stiff enough to carve with an instrument when chilled.[4] There were few problems associated when we used the same patient's other hand to make the wax pattern. One was the length and the other was the angulation of the artificial fingers. It can be easily overcome when a pliable wax pattern is made. The length and angulation can be easily adjusted by superimposing the hands at one level using the same anatomical landmarks on the inner side of the palm or the wrinkles of the palm. While adjusting, care should be taken not to touch the wax surface with hands, otherwise the pattern will loose surface details. Placing it in chilled water for some time prevents distortion of the pattern. If any surface details were lost, then the wet gauze technique was used to recreate surface details.

Silicone prostheses do not have colour longevity. The ideal colour properties required in a maxillofacial

prosthetic material must accept and retain intrinsic and extrinsic colouration, and that the appearance and mechanical strength of the prosthesis must not be changed by sunlight or other environmental factors.[5] Colour instability of the prosthesis may be attributed to ultraviolet (UV) light exposure, air pollution, cosmetics, and the use of strong solvents to clean the prosthesis.[6,7]

The colouring of silicone is a technically sensitive procedure. The intensity of the non-polymerized silicone matched the one but after polymerization the same shade looked light, so external staining was also done. This definitely shows that there is a difference in intensity between non-polymerized and polymerized silicones. The retention of artificial prosthesis is of utmost important needing ring, adhesives and osseointegrated implants.[8,9] That in turn enhances the function, comfort and improve quality of life of the patient.[10]

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