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Facsimile Auricule: The Auxiliary Lobe

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Abstract

The psychological impact on an individual due to loss of any facial structure is highly devastating and cannot be ignored. The most important aspect of anatomical replacement of body parts is to attain the exact color, form, size and the texture which resembles the adjacent soft tissue and should be so perfect that the other person should not be able to differentiate the prosthesis, while achieving the exact esthetical and functional form. Over the years, remarkable developments in medical field has been achieved and applied in the prosthetic field.

Introduction

Over the years, the importance given to the appearance of a person has increased ominously. As the saying goes, "the first impression is the best impression" which indirectly can be imparted to the looks/ appearance of the person. Moreover, the face has always been the structure of highest significance, since the existence of the human race. This has led to a rapid rise in the field of research for enhancing the beauty of the patient with the development of various procedures (both surgical & non-surgical) and also various cosmetics.

The psychological impact on an individual due to loss of any facial structure is highly devastating and cannot be ignored. The highest consideration is when the patient losses facial structure such as the eye, nose or the ear. There can be various reasons that might be responsible for the loss of the facial structure which includes developmental malformations, trauma, surgical procedures performed for the betterment of the patient and tissues that were removed due to their cancerous potential. [1,2].

Discussion

Replacements of lost body parts, artificially is not a new trend and has been practiced since a long time. They can either be done surgically or with the help of a silicon prosthesis, which is economical, esthetic and most importantly avoids the need for a surgical reconstruction and its complications. [3-5]

The most important aspect of anatomical replacement of body parts is to attain the exact color, form, size and the texture which resembles the adjacent soft tissue and should be so perfect that the other person should not be able to differentiate the prosthesis, while achieving the exact esthetical and functional form. [3,5]

Various Techniques for Fabrication of Auricular Prosthesis

1. Conventional technique.
2. Shaper/Tracer:
3. The photocopy technique.
4. Computerized tomography (CT) scanning:

5. Magnetic Resonance Imaging (MRI).
6. 3-D laser scanning system.
7. Computer Numerically Controlled (CNC) milling.
8. Rapid prototyping.
9. Stereo lithography.

Conventional technique

The construction of the auricular prosthesis is not an easy task as it involves the construction of a complex anatomical structure. Not only does it require skilled labor but also the patience to construct the auricular prosthesis keeping in mind the minute details which resembles the counterpart of the face, all of which should make the prosthesis not differentiable from the original ear. The procedure is arduous and involves the use of preoperative cast, which is sectioned for the ease of fabrication of the contours of the prosthesis. [6]

Consecutively another stress free technique is the donor technique, which is not as laborious as the previous technique. Here, the procedure involves the selection of a family member with ear silhouettes that meticulously resemble the auricle of the patient. Later, the impression of the ear is acquired and wax cast is obtained. The wax cast is altered and modified as per the requirements of the prosthesis. Further, technology plays a significant role in the fabrication of the prosthesis, by providing us with a mirror image which helps in contouring the wax pattern.

Shaper/Tracer

In this technique the cast of the adjacent side of the auricle is obtained by the help of a mirror image pantograph. This is accomplished by a machine having the capability of shaping the metal which is done by a hand consisting of two arms with cutting and tracing action in reverse directions in an horizontal plane with the master cast in place. [7]

Over the years, technological advancements in the field of radiology have given rise to further specialized imaging techniques like CT, MRI and other 3-D systems.

The photocopy technique

It is the process in which color slides are overlapped in order to form a sculpted cast. A Transparent sheet is used to duplicate the cast of the normal ear and pasted on glass plate and put on the side of the cast of the defective side. Further it is used to mold the wax pattern.

As time progressed, technological advancement in the field of digital imaging has made Non-contact 3-Dimensional (3-D) models of the facial region a possibility.

The fabrication of the auricular prosthesis takes place in 3 steps which are:

1. Acquisition of 3-D data using scanning.
2. Generation of blue print of the defect area.
3. Obtaining a prototype.

Computerized Tomography (CT) scan

Computed Tomography scan is well known and has established its presence in the field of diagnosis since a long time. Numerous slices are compiled together to structure and form the anatomical structure acquired by imaging. It is used to fabricate prosthesis with precision to attain the details and reach a high amount of accuracy mimicking the real structure. However, the high amount of radiation exposure during the CT scan remains the primary disadvantage. The 3D data obtained from the CT scan and used to mill polyurethane blocks to achieve ideal soft tissue models for waxing. [8]

Magnetic Resonance Imaging (MRI) scan

The high amount of radiation dose made the search for an alternative the need of the hour. MRI was the next option which was free of the high amount of radiation. However the requirements such as no patient movement and the limitations occurring due to metallic restorations leading to scattering and artefact backlogged its use.

3-D laser scanning system

Even though laser scanning had been popular, however the vertical direction limited the ability of laser scanning to record the specifics in the undercut areas. This was overcome by the arrival of the 3-D laser scanning technique. [9].

A 3-D laser scanner, scans the cast of the existing ear to make an exemplar model of the wanting side with the resin material. In other words, a 3D laser scanner develops an assimilated 3D digital image of the unaffected ear, which is imitative in nature. A swift prototyping device gathers the essential information to fabricate the absolute resin ear. [10,11].

The various Steps in laser scanning are

- Getting hold of "e-model" (3-D dental cast) using laser scanning.
- Using color pins to guide the site of the cast.
- Locating cast in 8 locations to record the undercut areas.
- More than 1million points are documented to obtain scan of the cast which are used to produce e-model software records.
- Create 3-D mirror image of the cast.

Computer Numerically Controlled (CNC) milling

Laser scanning helps in collection and structuring of data and is reversed to form the normal ear of the missing side. This is accomplished by poly-tetraflouro-ethylene is milled to the desired shape. The inability of the scanner to record all the accurate details is the reason for which undercut areas remain un-milled. A skilled maxillofacial technician then modifies the contours to obtain the desired shape. Rapid prototyping is the solution for the problem of the undercut areas. [12]

Rapid prototyping

Here, the prosthesis is formed by deposition of various layers one over the other like a plywood rather than milling it from a single unit which helps in facsimile of undercuts and fine details. This is cost effective as there is less material wastage, however it is time consuming. [13,14]

Stereo-lithography

This technique allows creating a model with the thickness to as less as 0.5 mm. UV (Ultraviolet) light is used to cure the resin to form an anticipated shape and fuse layers of metal/resin and can laminate thin sheets to obtain the desired shape. [15].

Other than silicone, even acrylic resin has been used for extra-oral prosthesis, and sometimes it is combined with each other to enhance the properties. [4].

Conclusion

Over the years, remarkable developments in medical field has been achieved and applied in the prosthetic field. However the fact that silicon is the best material for the fabrication of auricular prosthesis is a time and again proven entity.

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