

## Review Article

**The Aesthetics of Maxillofacial Prostheses**R Raheja<sup>1</sup>, T Mahajan<sup>2</sup>, A.V. Rajanikanth<sup>3</sup>, A. Sharma<sup>4</sup>, C. K. Roy<sup>5</sup>**Abstract**

The first region to give information about people and to be recognized first is the facial region. For these reasons, the face has always been significant historically. The mouth is one structure which significantly affects the appearance of the face. People regularly appeal to dentists to meet their aesthetic demands. For example, some people do not pay attention to the health and appearance of their rear teeth, but they do give attention to frontal decay, malformation, or shape problems and want them to be treated as soon as possible. The main motivation for this is to have a beautiful and attractive face because the facial region contributes, positively or negatively, to the self-esteem and self-respect of people, which cause people to feel better and also positive effects on social relationships and achieving life goals.

**Keywords:** Aesthetics, Color, Maxillofacial prosthesis, Nasal prosthesis, Orbital prosthesis

**Introduction**

An aesthetically acceptable appearance constitutes the base of a healthy psychological structure. The human, the unity of his physical and psychological parts, always tries to balance them. One of the most important duties in this regard belongs to dentists. Here, the importance of the practice of aesthetic dentistry in human life appears. Maxillofacial prostheses have a special place in dentistry terminology as the science and art of anatomical, functional, and cosmetic restoration of any region of maxilla, mandible, or any other region which has any defect due to surgical operation, trauma, pathology, congenital defect, or other reasons. Although materials and techniques have been widely developed in the past century, the first primitive maxillofacial prostheses were produced much earlier.

Nasal, orbital, and auricular prostheses are seen on mummies from the 4th dynastic period of Egypt (1613-2494 B.C.), revealing that maxillofacial prostheses have been produced for thousands of years. It is also known that Chinese people have produced maxillofacial prostheses from paraffin and many other materials for many centuries. The French Surgeon Dentist Ambroise Pare is the first representative of the modern artificial eye. He produced an artificial ocular organ by using glass and porcelain in the year 1575. The contribution of dentistry to the development of an acrylic ocular organ is the production of ocular prostheses by measuring sockets rather than using traditional empirical methods. In the early 20th century, especially during and after the First World War, prostheses began to be produced with cooperation of surgeons and dentists. Because the restoration of all the parts of the stomatognathic system and related environmental tissues with artificial materials and the reprovision of aesthetic results are very important for social adaptation and life quality, maxillofacial prostheses hold a very important place between all the classes of prosthetics [1-4].

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**Aesthetics of Maxillofacial Prostheses****a. Aesthetics of Auricular Prostheses**

While auricular defects may be reconstructed by using autogenous tissues, an appropriate prosthetic reconstruction using a suitable material is a quick and affordable solution for a natural or almost natural appearance. Additionally, it requires no surgical operation in order to achieve cohesiveness and retention, except a first surgery for preparation of the defect region. Although there are many techniques for preparation and positioning of the prosthesis morphology to be similar with the other ear and for its adaptation to tissues in the defect region, those

methods depend on the talent of the technician and they carry a high risk of failure. To prepare an ear prosthesis prototype and to achieve the mirror image of the ear, the use of CT, KIBT, optic systems, and laser surface scanners, CAD, CNC and fast prototyping techniques is very advantageous. CT data are also very useful for correct positioning of prosthesis. The paraffin prosthesis sample must be controlled on the patient in terms of some rules of aesthetics and compliance, position, slope, and level. The references used in this phase are anatomic landmarks such as the hair line, mandible angle, and mastoid bump.

Also, the guidance of vertical and horizontal orientation lines are used. The top height of the helix should be controlled by comparing it with the normal ear. The upper lines of helixes and lower lines of both the ears should be on the same horizontal line. Another helpful reference point is the distance between the back of ear and cranium. Considering those rules, the paraffin sample is controlled on the patient. After appropriate compliances, the prosthesis is finished by giving tissue characterizations to the paraffin sample [1-5-9]. Because the location of the implant to be placed on the temporal region in an implant reinforced auricular prosthesis is also aesthetically important, the placement of retention systems in the borders of auricular prosthesis should be at the same level as the anti-helix. Implants must be 7mm away from hairy skin and 15mm away from each other. By taking the width of the outer ear on mastoid bone as a reference, implants must be placed on a line 18-22 mm away from the canal. Locations between 9-11 o'clock for the right ear and 2-3 o'clock for the left ear are appropriate for implant placement. Creating a completely adopted frontal line for auricular prosthesis is aesthetically important. It may lead to confusion in cases of mimics, head posture, mandible movements, facial asymmetry, and finally aesthetic. While those problems can be generally solved by randomly digging the frontal border of a master model, desired results may not be always achieved because this implementation is not a controlled method. The distance occurring on the frontal border due to the movements of the chin and head can be solved by providing a barrier on the frontal region of the master model and by elastically preparing the frontal border of the prosthesis. The digging of the model should be preceded by a clinical evaluation of the soft tissues.

### **b. Aesthetics of Nasal Prostheses**

The implementation of nasal prostheses can be started 4-6 months after surgery. The size and shape of the defect are very important for the success of prostheses. A prosthesis is more successful in cases

protected by nasolabial sulcus. Because most of the lower border tissues in nasal defects are mobile, prostheses must be prepared as elastic and as thin as possible in those regions. The main factors affecting the aesthetic success of prostheses are appropriate creation of contours, masking demarcation lines, and compliance of the prosthesis surface and the skin. The width of nasal wings must be prepared in such a way as to not exceed the distance between the inner edges of the eyes. Also, the conjunction of columella and skin must be finished as narrow and perpendicular so the demarcation line will be less visible because of the shade of the nasal edge. For male patients, this region can also be masked by adding a mustache. Eyeglasses are used for masking the demarcation lines in lateral and upper regions and for retention purposes. Considering the color loss during painting and finishing phases, the painting must be performed slightly more significantly than the near skin. After final controls and corrections on the patient, the finishing stage begins [10-22].

### **c. Aesthetics of Orbital Prostheses**

Prostheses made for the restoration of upper and lower eyelids, inner and outer canthi, and tissues extending from the orbita through the face, except eyeball, are considered orbital or oculo-facial prostheses. Because communication between people generally begins with eye contact and the position of the eyes, the contour of the eyelids and even minimal differences in the colors of the prosthesis can be discerned easily, making aesthetic success very important. It is important to take care of orbital prostheses by masking borders and artificiality by preparing it in accordance with the structure and color of healthy tissues. Besides skin properties, the symmetry of synthetic eyebrows and lashes in terms of color, thickness, and shape is also important for aesthetic success. Also, the preparation of the prosthesis with borders as thin as possible, in a way which does not break the harmony of the mimicry, should be considered. The most frequently used camouflage method for borders of these prostheses is the usage of thick eyeglass with light colored lenses. The rugae and lines around eye are exploited in old patients. In cases where surgical resection exceeds the border of the orbita, some aesthetic problems increase due to the failure to mask the conjunction regions between skin and prosthesis. In order to produce an adequately compliant prosthesis, the measurement must be performed for the entire face. With developments in digital technology, the measurements of the facial region are performed by fast prototyping the data acquired from laser surface scanners and optical systems by using CAD&CAM, without measuring the face manually. Then, a model

is created. Because this method records tissues in a static state, the adaptation in conjunction points can be broken with movement, and movements can be limited with pain [23-27]. The placement of the ocular part of orbital prosthesis at the same level as the healthy eye in terms of horizontal, vertical, and sagittal axes is very important for aesthetic success. While the patient looks directly at a far point when he stands tall, the ocular part of prosthesis must be placed inside of the defect in such a way as to imitate that look. After the ocular part is located with the assistance of horizontal and vertical drawings and measurements, then the eyelid contour of the healthy eye is drawn on the prosthesis by using paraffin. Computerized monitoring techniques may be used for determining the correct ocular and eyelid position. For this purpose, a digital image of the patient is created by a digital camera from lens-object distance and the mirror

Image of healthy region is reflected over the orbital defect region with a software package such as Adobe Photoshop. After a cut-paste process by taking images of the paraffin model, where the ocular part placed, from object lens distance, the image of the healthy eye is placed on the prosthesis. Through that image, the position of the ocular part and eyelids can be controlled. After providing correct positioning, the paraffin sample is given skin properties by Correcting contours and borders. Then it is finished by coloring and shading through the use of silicon material. While retention can be provided by using adhesives, tissue undercuts, eyeglasses, and implants for most cases, implants are preferred more for large defects such that the resection is on the cheek or other mobile tissues.

#### **d. Aesthetics of Mid-facial Defects**

The treatment of advanced tumors in the middle region of the face generally requires very large tissue resection. The defects in such kinds of cases include the loss of intra-oral and extra-oral tissues together. Nasal, upper lip, cheek, or orbital structures may be included in that lost of tissue. Also, mandible, soft tissues, teeth, and segments of the maxilla may be lost.

Functional losses can be very advanced as a result of such kinds of surgical resections. The loss of the oral cavity may lead to malfunctions in chewing, swallowing, saliva control, and speaking. With cosmetic losses, those functional losses create serious psychological trauma in patients and their relatives. However, because of the development of materials and techniques in recent years, patients with such kinds of defects can be successfully

rehabilitated through prosthetic restorations. The monoblock prosthesis is preferred for the restoration of large maxillofacial defects, including cheek regions and orbital-nasal regions, not including the lip and oral cavity. The usage of cranio-facial and zygomatic implants is very important for retention of those prostheses. In order to provide the retention of large prosthetic restorations, the use of adhesives and tissue undercuts is almost impossible. Secondary surgical procedures may be required for those defects or there may be significant contour failures, asymmetries, or skin discoloration due to radiotherapy. For the best results, the contours and surface structures of the prosthesis must be in accordance with those of the patient's skin. The compliance of the prosthetic surface with the patient's skin is very important. Intra-oral and extra-oral prostheses are generally used in combination for midfacial defects. Generally, the aesthetic desires are not as important for those patients as the need for filling the defect. In such cases, sensitive retentioners are used for only retention indication without any aesthetic purpose in treatments of intra-oral defects. However, after uncomplicated maxillectomy implementations, sensitive retentioners are used for providing both aesthetics and retention by eliminating buccal clasp booms [28-29].

#### **Discussion**

The choice of the rehabilitation of maxillofacial defects by surgical or prosthetic methods depends on the patient's desires as well as the size and etiology of defects. While young patients usually desire their facial region to be treated with their own tissues rather than prostheses, older patients usually desire to be treated by using prostheses. Generally, small maxillofacial defects are treated by surgical methods, while larger defects are treated by prosthetic restorations in order to give a more natural appearance. This process requires more complicated procedures.

#### **Conclusion**

Maxillofacial prostheses should restore lost tissues which cannot be rehabilitated by plastic surgery, including its color, shape, texture, and light transmittance, which must be in accord with near tissues. It should not be noticeable to society. A noticeable prosthesis increases the anxiety of the patient and it does not allow the desired social adaptation to occur. The aesthetic result at the end of the implementation of the prosthesis will bring clinical success.

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