

# ***THE AESTHETICS OF MAXILLOFACIAL PROSTHESES***



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# ***INTRODUCTION***

***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.***

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 4<sup>th</sup> dynastic period of Egypt (1613-2494 B.C.), revealing that maxillofacial prostheses have been produced for thousands of years.

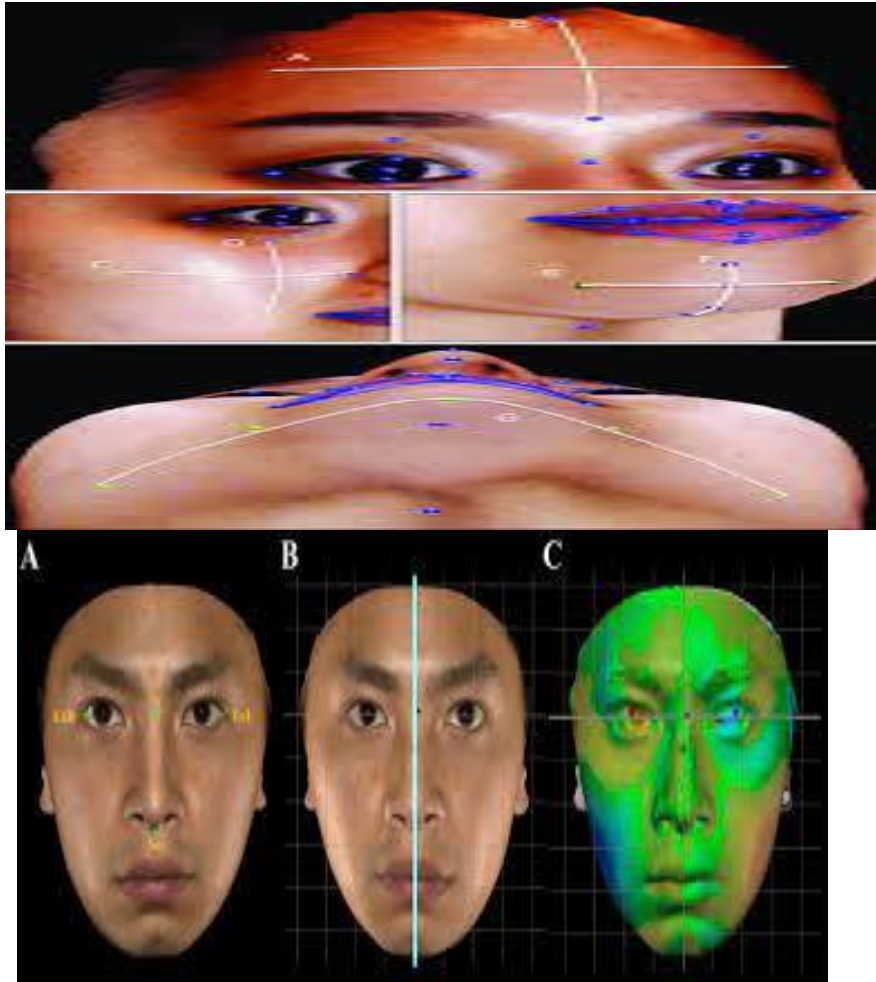


# ***AESTHETIC CONCEPTS***

1. **Composition:** When the contrast ratio of a material rises, its visibility also increases. Those can be contrasts on tissue, color, and line borders. The relationship between materials becoming visible through contrast is called composition.
2. **Unity:** The first condition of composition is to be unified. Unity makes the parts of the composition to be a single unit. **There are two types of units:** **Static Units** are geometrical shapes with iterant figures, colors, and lines. For example, inorganic shapes, snow crystals, rain drops, and crystals are static units. **Dynamic Units** are active, alive, and growing units existing in animals and plants

**3. Cohesive and segregative forces: Cohesive forces are the force which keep elements together in a certain form. Segregative Forces, in contrast with cohesive forces, allows many designs in unit. Both of these forces can be seen in dento-facial composition.**





**4. Symmetry:** Symmetry refers to the order of the line of objects. There two types of symmetry: Horizontal symmetry is the lining up of all of the elements with a certain distance from each other from left to right side. Radiational symmetry is the lining up of objects as mirror images of each other at the two sides of central points. Both of these two types of symmetry are seen in dental line up.  
up.

**5. Proportion and Iterant Proportion: Proportion is the mathematical expression of beauty and the numerical relationship between two parts.**

**Iterant Proportion: When a surface is to be divided into parts with aesthetically different volumes and shapes, there must be a numeric proportion between them.**



**6. Balance is the arrangement of all the parts in such a way that none of them would be conspicuous and they would be equal to each other. As a result, there is a stabilization occurring by balancing contrary forces. Our visual sense is accustomed to providing this balance**

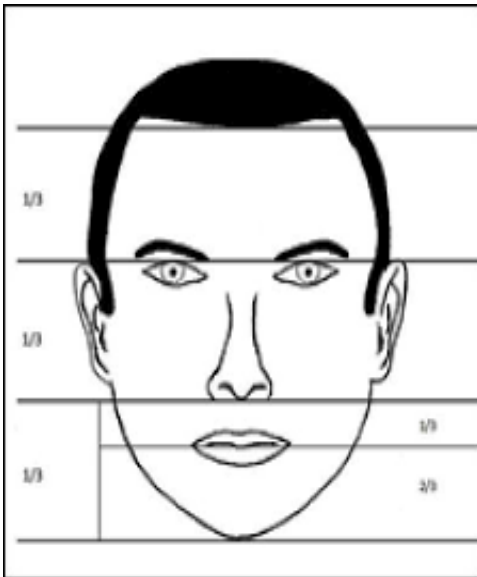


- **7. Lines:** The most compatible structure consists of two parallel lines. The most powerful visual relationship is orthogonal lines. That is why the symbol of (=) is used for equilibrium and the symbol of (+) is used for a powerful relationship.
- **8. Dominance:** is a necessity for a unit. Color, shape, and lines may be a factor of dominance. It expresses the existence of a similar element continuing in the unit. That gives a dynamic structure to the composition.

# THE PRINCIPLES OF STRUCTURAL AESTHETICS

1. Facial Components The human face can be divided into three parts in terms of a frontal perspective:

trichion (hairy skin) and supraorbital region supraorbital and nasion (nasal base) nasal base and gnathion (the edge of chin) region When the lips are closed, the face can be divided by a line from upper side of upper lip, whereby the bottom part of face constitutes  $\frac{1}{3}$  of the total face. When looking at the face from the top, it can be concave, convex, or flat in accordance with lines passing on glabellas where the start point is the upper lip and chin edge.



a. **Facial specifications** Indicators of aging start to be seen around the 25th year of life. These indicators gains speed between the 35th and 40th years of life. In general, there is water loss in cells and increasing fibrosis in all tissues and organs. As a result, the epidermis slims and skin rugae start due to the lack of elastin and collagen in the skin. After the 60th year of life, the nasal edge, chin edge, and brows begin to lean out due to the effects of gravity. The nasal base falls down. The chin edge looks like it would touch with the nasal. The mouth edges lean out. Because of a decrease in vertical height, the vermilion line"s width decreases and lips become indistinct

**Middle Line:** Although the right and left halves of the face looks symmetrical, there are some differences between its two halves. If the mirror image of one part is placed on other side, the resulting image will not be a natural appearance. For example, eyes have slightly different levels and depths in the eye socket. Also, for many people, nasal and chin edges may deviate according to a middle line. But those shape, volume, and color differences cannot be recognized by the naked eye.

# ***AESTHETICS OF AURICULAR PROSTHESES***

**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.**



## Orientation lines for positioning of auricular prostheses



Horizontal line  
Helix —  
EAM —  
TRAGULUS (beyond)



Vertical line  
Above the tragus —  
EAM —  
LOBE —



Defect ear

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***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***

## *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 18-22mm away from the canal.*



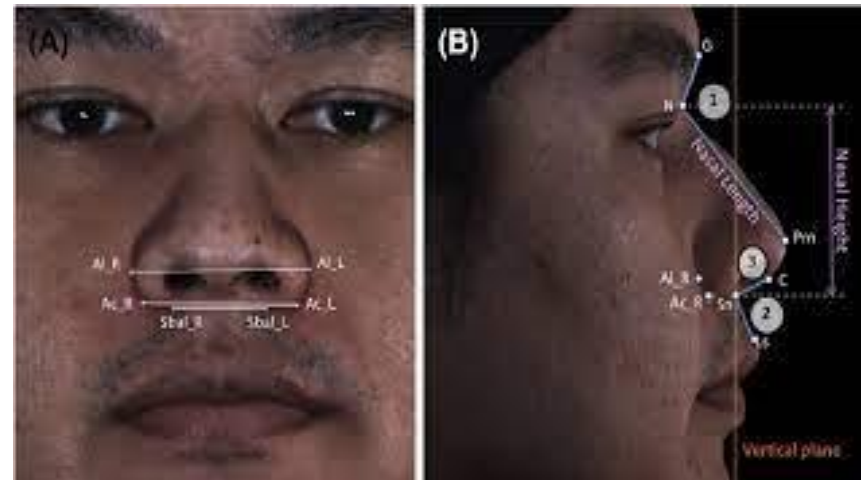
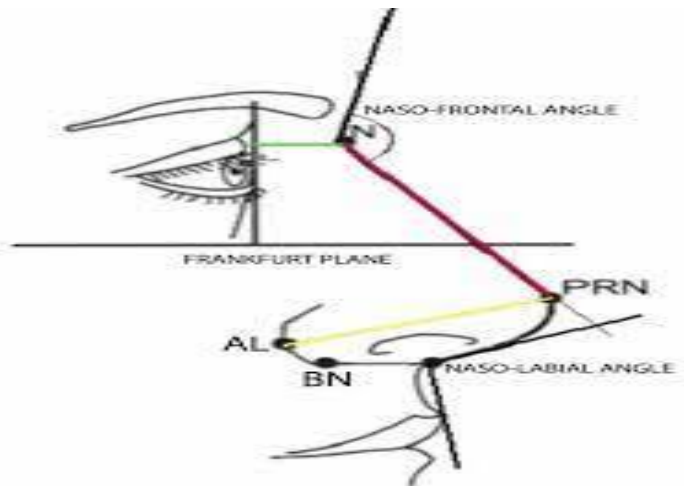


# ***AESTHETICS OF NASAL PROSTHESES***

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



# ***AESTHETICS OF ORBITAL PROSTHESES***

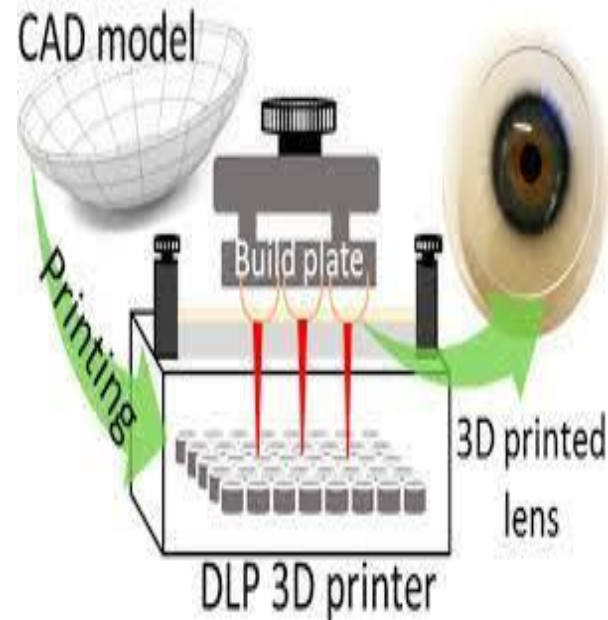


It is important to take care of orbital prostheses by masking borders and artificiality by preparing it in accordance with the structure and color of healthy tissues.

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



**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**



Computerized monitoring techniques 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 objectlens distance, the image of the healthy eye is placed on the prosthesis

**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**

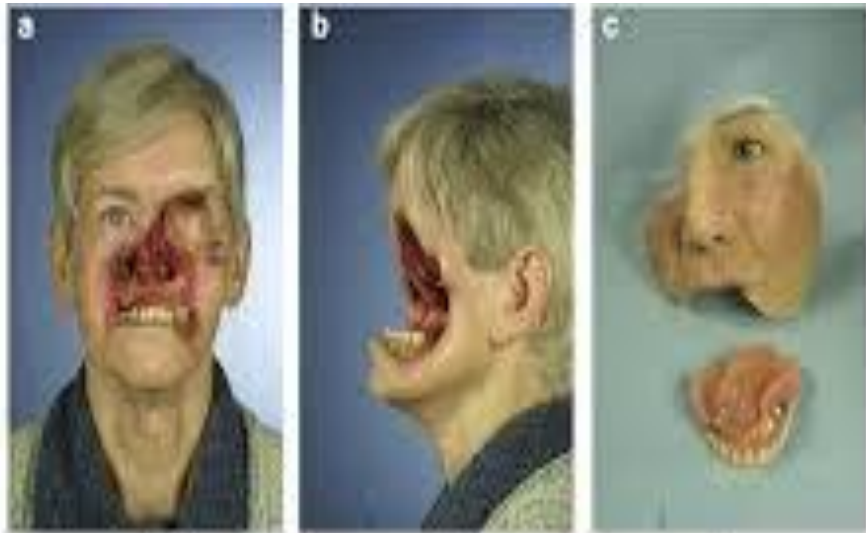


# AESTHETICS OF MID-FACIAL DEFECTS

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.

**MAXILLOFACIAL DEFECTS**

**PROSTHESIS**

→ **EXTRADRAL** NASAL  
AURICULAR  
OCULAR/ORBITAL/FACIAL

→ **COMPLEX**

→ **INTRADRAL** MAXILLA AND MIDFACE  
MANDIBLE



