

## Retentive aids in maxillofacial prosthesis: A review

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### Abstract

One of the most important factors that determines the success of a maxillofacial prosthesis is retention. The struggle to achieve adequate retention has reduced as retentive measures have evolved over a period of time. Increased retention provides comfort and confidence to the patient to go out in social settings. The journey from using metal bands to using adhesives to placing implants for retaining a maxillofacial prosthesis has been fascinating and satisfying to many, but, the aim of achieving the full potential still remains incomplete.

**Keywords:** Retention, Maxillofacial prosthesis, Adhesives, Magnets, Implants.

### Introduction

Maxillofacial prosthetics is defined as that branch of prosthodontics concerned with restoration and replacement of both of stomatognathic and associated facial structures by artificial substitutes that may or may not be removed. Rehabilitation includes treatment of acquired or congenital defects affecting various facial structures which otherwise leads to severe depression.<sup>1</sup>

Various factors such as size, location and severity of defect, patient's age and satisfaction and lastly economical aspect govern the choice and success of prosthesis. The ultimate goal of the treatment is to create an illusion by developing such a prosthesis for the lost part that would improve the standard of living of the patient.<sup>2</sup>

Possible treatment modalities, their probable outcomes and impact of the same on ability to cope in life by the patients is reviewed in this article.<sup>3</sup> Retention of prosthesis on the face is the most important factor in creating a useful prosthesis for the patient. Before the dawn of the era of osseointegrated implants, mechanically retained prosthesis using patient's anatomy of defect and undercuts followed by use of bioadhesives majorly governed retention of prosthesis.<sup>4</sup>

Even today, many modern prosthetic replacements may be opted to be secured with adhesives like interfacing pastes, liquids, sprays, or double-coated tapes.<sup>5</sup>

Combination of intraoral and extraoral restorations using implant support has become a viable treatment option. The location and orientation of extraoral implants is important to obtain an optimal prosthetic result.<sup>3</sup>

Rate of surviving disfiguring injuries which earlier claimed lives has remarkably increased over the years due to advances in surgical procedures. Maxillofacial prosthetic therapy for acquired defects has become more complex and sophisticated with advances in surgical and radiation treatment procedures. A team effort is essential for the effective and efficient treatment of patients with maxillofacial problems.<sup>1</sup>

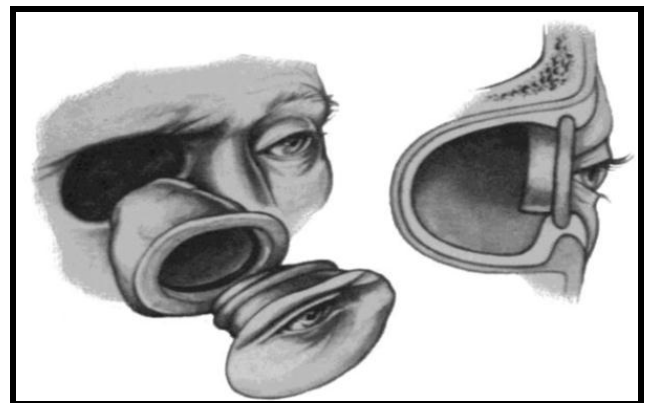
This article critically reviews various retentive aids used for maxillofacial prosthesis with recent advances in the same using bar-clip, O-ring, or magnet retention.<sup>6</sup>

### Modes of Retention

Prostheses that replace soft tissues are known as epithesis. There are four ways to retain such a prosthesis: by adhesion, anatomically, mechanically or surgically.<sup>6</sup>

### Anatomic Methods

Ocular prosthesis: It takes a few weeks for prosthesis to settle into the socket after being fitted. The weight of prosthesis and contraction caused by upper eyelid of the ocular prostheses may cause sagging of the lower eyelid. Anatomic undercuts must be utilized in conjunction with flexible conformer in the defective space.<sup>7</sup> Conformer is a device that is fitted into the socket and holds the prosthesis maintaining the size of socket. It also prevents scar tissue contractures from distorting the socket bed. Not only it aids in retention but also maintains competence of the eyelids and residual muscle movement.<sup>8</sup>



**Fig. 1: Two piece orbital prosthesis showing anatomic retention gained from the conformer.<sup>7</sup>**

## Adhesives

Several factors should be considered when selecting an adhesive system for a facial prosthesis:

1. The strength of the adhesive bond to skin and to the facial prosthetic material.
2. Biocompatibility of the adhesive.
3. Material used in fabrication of prosthesis.
4. Components of the adhesive.
5. Texture of patient's skin.
6. Ease of handling of the adhesive by patient.

Various materials used for their tissue adhesive properties are acrylic resin, latex, silicone, pressure sensitive tapes, spirit gum, water based adhesives.<sup>7</sup>

The MDX silicone material has a greater edge strength than other silicone materials and its further reinforcement with nylon mesh provides it adequate edge strength facilitating its use in thinner areas which are responsible for blending with the adjacent skin. A mild adhesive does not irritate the tissues nor does it damages the prosthesis, but only functions to acts as a sealant hence does not serve as a major source of retention.<sup>9</sup>



Fig. 2: Adhesives for Maxillofacial Prosthesis<sup>10</sup>

## Mechanical

1. Nasal Prosthesis- Strings and straps were used to anchor heavy metal containing prosthesis for chin and nose behind the head. Intraoral or intranasal extensions, gold springs or leaves, and internal conformer have all been described to mechanically retain nose prostheses.

Use of eyeglass was proposed as possible means of retaining a nasal prosthesis by for the patients who has had the bridge of the nose surgically removed. These frames are favoured to be opaque than being translucent to avoid standing out. They are practical, trouble free, economic, and also provide camouflage to the borders of prosthesis. They can also be used for provisionalization. Eyeglass frames have gained popularity with accessory retentive features such as intraoral bar-clips, snaps, and magnets.

2. Ear Prosthesis- Eyeglass temple pieces have also been used for support and alignment of ear prostheses. Use of stainless steel to serve as projections into the external

auditory meatus to gain additional retention has also been suggested.

Other popular mechanical retentive measures are:

## Magnets

It can be used to connect osseointegrated implants and prostheses and different part of prostheses. They are considered to be the best possible source to obtain retention and stabilization for the maxillofacial prosthesis.<sup>10</sup>

Rehabilitation of patients who have undergone maxillectomy can be carried out by constructing a two section intra oral prosthesis with the use of attracting magnets as positive locking device.<sup>12</sup>

In case of small oral opening as in microstomia the magnets in such appliances facilitates easy insertion as well as retention.<sup>11</sup>

## Precision Attachment

Bar clips, telescopic crown, extracoronary ball attachment are most commonly used precision attachment to connect implant and prostheses, and between different part of prostheses.<sup>10</sup>

## Surgical Methods

Bar or magnetic abutments are commonly employed retentive measures for implant supported craniofacial prostheses. Bar attachments offer more support and stability when compared to magnetic attachments, but hygiene is a constraint. Surgical templates are used to assess proper angulations for the implant placement. In the second stage, a full-thickness flap is elevated to expose implants and the peri-implant soft tissues are left to only 2 to 4 mm thickness. The advisable osseointegration period is 3 months for the auricular region and 6 months for the nasal and orbital region.

Osseointegrated implants have many advantages compared to conventional retention methods in maxillofacial prostheses. There are three factors which may affect the outcome of the extraoral implants- the quality and volume of the bone, hygiene condition, and radiation therapy in cases of carcinoma. Implant failure, if occurs, is usually attributed to weak or no primary stability of the implant during insertion. Previous studies reported that the mastoid process has the best bone quality in the facial skeleton to achieve primary stability. Extraoral implants are a successful option but should be planned considering the general health condition of the patient and the administered dose for radiotherapy before proceeding with maxillofacial prostheses.<sup>13</sup>

Widely commercially available osseointegrated implant retention systems, (Bar-clip, O-ring or magnets) were considered in this review. Bar-clip has been the choice for most of auricular and nasal prosthesis.

## Orbital Prosthesis

For orbital region, magnet retention has emerged as retentive aid has as magnets are less stressful in comparison

to bar-clip and may allow longer implant useful life, but it depends on the bone quality prior to the implant installation.<sup>13</sup>

For an orbital defect, the superior, lateral, and inferior orbital rims are possible sites for 3 or 4 mm implants (Fig. 3). Ideally three or four implants are needed. The long axes of the implants should be directed toward the center of the orbit.<sup>14</sup>

Normally, the anterior position of the ocular prosthesis is 5 to 8 mm posterior to the supraorbital rim, 0 to 2 mm posterior to the infraorbital rim, and 8 to 12 mm anterior to the lateral orbital rim. It may be necessary to use the medial walls of the defect for additional retention and stability.<sup>14</sup>



**Fig. 3: Superior, Lateral and inferior orbital rims are favourable sites for implant placement.**<sup>13</sup>

#### Nasal Prosthesis

For a nasal defect, the anterior surface of the maxilla just inferior to the nasal cavity offers sufficient thickness of bone and an optimal position for 4 mm implants. Longer implants, 6 mm or greater, are possible in this area. A split-thickness skin graft is needed on the sides of the defect to provide a firm non-movable foundation for the nasal prosthesis. This procedure will reduce the mobility of the tissue bed under the prosthesis and minimize the stress on the implants.

The septal cartilage must be surgically reduced anteriorly. This procedure will provide room for the prosthesis to engage the lateral walls of the defect and increase the stability of the prosthesis.

A minimum of two implants are required, positioned in each lateral rounded nasal eminence (Fig. 4). Because the implants are not evenly distributed and are located in one part of the defect, the abutments are connected by a bar. The bar can be extended superiorly 10 to 15 mm from the abutments for better distribution of retention for the prosthesis. An acrylic resin section is constructed with the prosthesis to house the retentive elements. Retentive clips or magnets can be used. A waxed pattern of the prosthesis must be completed and tried before the placement of the implants so that the position of the abutments and the

retentive elements do not compromise the contours of the prosthesis.<sup>15</sup>



**Fig. 4: Anterior part of maxilla or lateral rounded eminence serve as preferred sites for implant placement.**<sup>13</sup>

#### Auricular Prosthesis

The temporal bone has sufficient thickness to accept a 3 or 4 mm implant. With the use of a surgical guide made from the fabrication of a waxed prosthesis, the optimal position of the implants is determined. The abutments must exit the skin beneath the concha of the anticipated prosthesis so that the contours of the prosthetic ear are not compromised. A minimum of two implants are needed, positioned approximately 18 mm from the center of the external auditory meatus and 15 mm from each other. This design permits better support, stress distribution, and retention of the prosthesis.

The abutments are joined by a bar constructed in a C-shaped design to improve the stability and retention of the prosthesis. The bar can be extended 10 to 15 mm beyond the abutments for better distribution of stability and retention (Fig. 5).

Three retentive clips or magnets and a bar do not appear to compromise the contours of the prosthesis. The presurgical waxed prosthesis will determine whether magnets or retentive clips should be used. An acrylic resin section is constructed within the prosthesis to house the retentive elements.<sup>15</sup>



**Fig. 5: Implants with abutments joined through bar in C-shape.**<sup>13</sup>

## Conclusion

Maxillofacial defect creates a scar not only in physical appearance but also traumatizes the patient mentally. Fabricating a maxillofacial prosthesis alike to the original tissue is a complex process but with the resultant prosthesis the patient gains confidence to face the world. Retention of the prosthesis governs the comfort with which patient can carry the prosthesis. Various retentive measures of the period of time have evolved.

However, some consensus of practitioner's preferences can be gleaned from the literature.

The extraoral maxillofacial prosthesis implant retention systems have evolved more due to biological responses from the tissues, and the aesthetical factors than from the patients' preferences.

Implants have gained popularity owing to the process of osseointegration which makes them more reliable as a retentive aid. Whenever it is possible to employ osseointegrated implants, they are the first choice because they provide the best retention for extraoral maxillofacial prosthesis. For auricular prosthesis, the bar-clip system was the most chosen. In ocular and nasal regions, either bar-clip or magnets may be selected. The choice is principally governed by; indication, practitioner's ability and economical factor. There are several choices for the retention of extraoral maxillofacial prosthesis, wherein are also very valuable non-osseointegrated mechanical or adhesive retention techniques. They are the least expensive and present no contraindication.

**Conflict of Interest:** None.

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