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Retentive Aids in Maxillo Facial Prosthesis

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Abstract

Retention is one of the most crucial elements that affects a maxillofacial prosthesis's success. A higher retention rate gives the patient the comfort and self-assurance to interact with others. Increased retention enhances the patient's comfort and self-assurance when wearing a facial prosthesis in social and professional contexts, which benefits the prosthesis's long-term outlook. Apart from aesthetics, retention has always been an issue in prosthodontics.

For a long time, prosthodontists have struggled with retention in maxillofacial prostheses. Significant improvements have been made in the materials and methods used for maxillofacial prosthesis retention in recent years. The objective of achieving the full potential of a maxillofacial prosthesis remains unmet, despite the fact that many people find the process of maintaining one to be both fascinating and rewarding. This covers the application of implants, adhesives, and metal bands. The many types of retentive aids utilized in maxillofacial prosthetics are attempted to be described in this article.

Keywords: Retention, maxillofacial prostheses, extra oral and intra oral defects.

Introduction

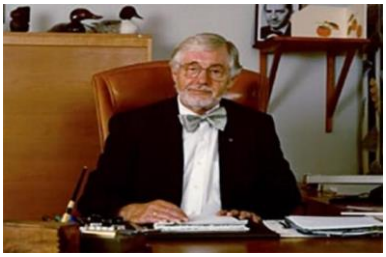
A maxillofacial prosthesis is any prosthesis that replaces all a portion of a craniofacial stomatognathic structure.

"That quality inherent in the dental prosthesis acting to resist the forces of dislodgement along the path of placement" is what retention is defined as.

The ability to firmly attach the artificial replacement to its designated location without causing pain or irritation to the tissues it comes into contact with is essential for the success of any prosthetic restoration of any portion of the body. Retentive aids have evolved from metal bands to implants, while materials for rehabilitation have gone from wood to polymers. We can anticipate that more patients will be saved from accidents and cancer as surgical and radiation treatment techniques advance in sophistication.

Large physical deformities are occasionally left behind by the major surgical operations required to eradicate head and neck cancer and prevent localized recurrence or regional metastases. Because of these irregularities, it is practically difficult to restore acceptable function or aesthetics. A prosthetic device is typically designed to enable sufficient post-operative examination of the area that was treated because the surgeon typically does not want to conceal a postoperative defect with skin grafts.

In 1965, Branemark and others started treating edentulous individuals with titanium implants. Since 1977, titanium implants for bone-anchored hearing devices have been used in clinical settings in Sweden. The viability of employing transcutaneous, osseointegrated implants in the temporal bone to hold ear prosthesis was further illustrated by Tjellstrom and associates. The efficacy of osseointegrated skin piercing titanium fixings in maintaining face prosthesis has since been demonstrated by Parel, Jacobson, and others. [2]



A person's physical structure and function may be significantly impacted by facial deformities, thereby lowering their quality of life.

The restoration of facial abnormalities, especially those of the nose, is a difficult undertaking for both prosthodontists and surgeons. In the past, treating patients with maxillofacial anomalies has proven challenging. The numerous challenges associated with maxillofacial prosthetic treatment are typically not encountered by patients who need traditional prosthodontic treatment. Compared to those undergoing conventional prosthodontic therapy, these individuals usually require more hard and soft tissue replacement.

Additionally, most maxillofacial patients need more emotional support than those in traditional prosthodontics. Successful maxillofacial prosthetics still need to incorporate the standard prosthodontic treatment goals of stability, support, retention, and aesthetics. A maxilla face prosthetic is unlikely to precisely replicate the structure and functionality of absent or damaged tissues.

To replace lost tooth structure, jaws, and facial features, doctors who were also clinicians performed prosthetic restorations. Pierre Fauchard (1728) utilized palate openings to hold artificial dentures, Ambroise Pare (1880) is associated with being the first to use an obturator to secure palatal openings, and Kingsley (1880) defined constructed devices for the restoration of orbital, nasal, and palate defects that were acquired as well as congenital. [2]

Maxillo Facial Defects

There are numerous classifications and names for post-ablative problems in the literature. In addition to being helpful for descriptive purposes, these classifications also give the surgeon direction during the repair and rehabilitation phases. However, there is still ambiguity in nomenclature and terminology usage because there isn't a single, widely recognized classification.

Armany's Maxillectomy Defect Classification: Armany presented a method for categorizing maxillectomy defects in 1987. Based on their relationship to the abutment teeth, he categorized these defects into six types.

Class I: The excision is made in the anterior midline of the maxilla, and there are abutment teeth on the front of the arch.

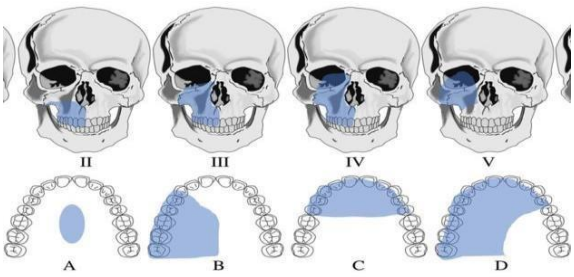
Class II: Because of a unilateral lesion, the front teeth on the opposing side are kept in this group.

Class III: A piece of the soft part of the palate may be impacted by the palate defect, which is placed in the middle region of the hard part of the palate.

Class IV: The defect traverses the midline and affects both ends of the maxilla, with the abutment teeth located on one side.

Class V: The postoperative defect is bilateral and located posterior to the contact teeth. The labia may need to be stabilized.

Class VI: bilateral back abutment teeth with an anterior maxillary deficit. [11]



An Obturators for Cranio Facial Defects

Intraoral

1. The surgical, intermediate, and permanent obturators of hard part palate that address maxillary defects. Speech assistance, soft palate and meatus obturator, palatal lift prosthesis.
2. The mandibular resection prosthesis and guide flange prosthesis have a defect.
3. Glossectomy
   prosthetic tongue.
   palatal prosthesis.
4. Stents or Splints
   TMJ appliances, biting splints, and surgical splints
   The orbital Mid-facial Nasal-Auricular Combination [7]

Orbito-maxillary

Naso-maxillary[7]

Methods of Retention

There are many different kinds and techniques for achieving immobilization, stability, and retention in maxillofacial prosthesis as needed. Finding ways to produce irregular flaws to improve anatomic retention is made easier with careful case review with the surgeon both before and after surgery. The following retention techniques for extraoral and intraoral prosthesis are covered.

The Retention of Intraoral Prostheses

Both hard as well as soft tissues, such as bone, mucosal, and tooth tissues, are utilized in anatomic retention. The extent, location, and surgical outcome of a defect all influence how effectively intraoral retention functions. A slight palate abnormality, for instance, can be closed with a conventional removable bridge. The advantages of obturation alone or in conjunction with a dental replacement could be provided by this.

Additionally, it might have a pharyngeal extension and a speech bulb extension added, making it a speech therapy device, obturator, and bridge for mastication.

1. **Undercut anatomy:** In the postoperative context, anatomical areas are a helpful feature. These may be found in the cheek, palatal area, palate, septum, posterior nasal pharyngeal, or anterior nasal spine.

   In general, high palatal vaults and large alveolar ridges offer greater retention than flat ridges. Depending on the patient's prior unpleasant denture habits or the existence of lower natural teeth, this anatomy might not yet offer a fully stable replacement. Combining the patient's flexibility with the operator's skill, creativity, This meticulous attention to detail can lead to a "one of a kind" successful prosthesis in cases of significant defects involving both the mandible and the maxilla, like in a commando deployment.
2. **Retention via Mechanical:** Means the operator in this category can use a variety of tools. In order to keep the temporary prosthesis in place while the wound heals, mechanical retention for a limited period of time may be achieved by fitting an 18-gauge stainless steel wrought wire to a cast of the remaining teeth. A lower prosthesis or an existing denture can readily accommodate certain wire clasps that are manufactured and fit into the acrylic palate of an obturator or saddle.
3. **Long term Mechanical retention by Cast snares:** Placing a clasp made of cast metal into is the most common undercut method of holding a prosthesis in place. A well-made and designed clasp provides reciprocation, retention, bilateral bracing, stability, and splinting. The most successful candidate for the cast clasp is a mouth that has been prepared to receive it, i.e., one with castings over the abutment teeth that have been meticulously planned, surveyed, and fitted. The easiest way to describe this metal extension of the detachable prosthesis is as a direct retainer.

   The clasp improves retention by extending into the supporting tooth's undercut or infra bulge zone. Only when it is meticulously crafted as a component of the partial denture does it provide protection to the tissues holding up the abutment teeth. The level of retention is influenced by several aspects of clasp design. The retentive clasp's general dimensions, such as its length, diameter, taper, substance, and depth of undercut, are among them.

a. Retentive Clasp Arm Length: A clasp arm's length, measured in cubes, dictates how much it can flex and relax when it sits in an undercut part and crosses the height of the contour. For example, increasing the length of a clasp arm by 20%, from 5 to 6 mm, can achieve a 75% increase in its load deflection rate.

b. Retentive Arm Diameter for Clasps: It has been determined that the impact of this factor is inversely related to the diameter's fourth power. Thus, a relatively small increase in the cross-sectional diameter of a clasp arm can have a significant effect on its ability to bend and relax.

c. The form of a clasp arm that retains: Compared to an arm with a uniform contour, one with a tapering clasp has more flexibility. Appropriate tapering greatly increases a clasp arm's flexibility.

d. The Material of the Retentive Clasp Arm: Because it is composed of fibrous material, Compared to a cast clasp, which has a more brittle crystalline structure, a wrought clasp is more flexible. Additionally, some alloys of cast metal are inherently more flexible than others.

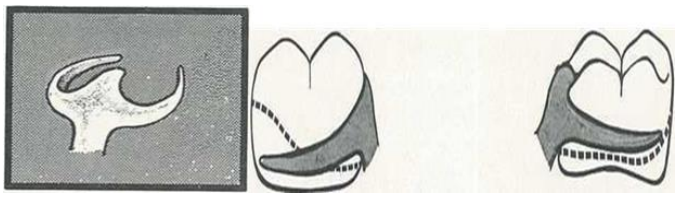
When comparing a cobalt-chrome alloy example with a representative type IV partial denture gold casting, the two materials' degrees of flexibility diverge considerably. Arm contour with a retentive clasp. There are two factors at work here. Round clasp arms of the same diameter are less flexible than half-round clasp arms, which are similar to the majority of cast clasp arms. The clasp arm's shape in respect to its plane in space could be another problem. The contour of a clasp arm that has both a horizontal and a vertical component, and it stretches from the minor connector on one proximal aspect to the point of retention close to the opposite proximal surface.

e. Reciprocating Clasp Arm: When placed in the infra bulge area, a retentive clasp reverses back to its initial passive condition after deforming when it crosses the height of the abutment tooth's contour. In order to resist the lateral portion of the force required to bend the clasp arm, the tooth surface receives a force that is inversely proportional. [1]

Reciprocity is then accomplished by means of a guiding plane on the opposite side of the abutment tooth's retentive undercut and the direct retainer's clasp arm appears more rigid. While the retentive clasp arm makes contact with the plane, the later clasp arm makes contact with the suprabulge surface simultaneously. This contact will be there till the partial prosthesis is fully made.

f. Occlusal Rest: This element of the partial prosthesis frame is made especially to fit into a rest seat built into the abutment tooth. It acts as a point of stress transfer to the abutment teeth as near to its extended length as is practical, keeps the partial dentures from overseating and impinging on the periodontal tissues, and provides a beneficial point of alignment between the partial prosthesis and its abutment. Rest seats are often found on the lingual portion of anterior connections or on the occlusal portion of posterior abutment teeth, however they can take many different shapes.

4. **Cast Circumferential Clasp:** Because of its versatility, ease of production, and dependability, the cast circumferential clasp—also known as the Akers clasp—is one of the most widely used clasps. It is especially recommended for use in modification spaces, on a side of the arch opposing a unilateral missing teeth space, and in circumstances when the prosthesis will be fully tooth supported and tilted leverages won't be felt. It is not recommended for use on abutments next to an alternative free end saddle. [1]



5. **Amount of undercut depth:** The amount of deformation required to pass through the height of an abutment tooth's contour is influenced by this component. In terms of retention setup, it is possibly the most changeable element.
6. **Cast-worked Combination Circumferential Clasp:** In this variant of the first clasp shape described, the cast clasp is replaced with a contoured wrought wire on the retention side. It can be employed in a free end saddle scenario as well as any other situation where the fully cast circumferential clasp is indicated. [1]
7. **The Roach-Akers Clasp or T-Bar Cast Circumferential Combination:** Using an existing disto buccal or disto labial undercut is made possible by this clasp, which offers a cervical approach to the tooth surface. It is recommended in cases of unilateral or bilateral distal extension. In situations when rotation of the base under stress is an issue, it

is known to treat the abutment tooth more generously. Unfortunately, it is also known to create a food trap that the user must pay close attention to.

8. **Ring or Ring-around Clasp:** This clasp shape circumnavigates the tooth to access the edentulous area, which is also reached by an undercut next to it. It is particularly useful for lone-standing molar abutments that are excessively inclined or pointed distal to the edentulous region. For the rehabilitative dentist, the clasps on exhibit can function as a reasonably entire toolset. but there are other designs and modifications that are better suited to particular situations.
9. **Prefabricated Precision Attachments:** For optimal mechanical and aesthetic retention, these attachments can be incorporated into cast crowns. There are construction issues here, and success requires far more accurate measures. The rehabilitation of cleft lip and cleft palate situations is where these prefabricated attachments are most helpful. With or without a reciprocal arm, they can be utilized.

10. **Semi precision Attachments, Custom made:** A specifically designed mandrel installed on the parallelometer is used to produce this attachment in the wax pattern. There must always be a reciprocal arm.
11. **Snap-on Attachment:** It is also a precision item made of prefabricated precious metal that is intended to stabilize and hold a prosthesis in place. Abutment crowns are joined by a rod called the Anderson bars or Bakers bar, which is engaged by the clip. This fastener is typically used in conjunction with other retentive tools such a thimble telescopic crown, precise attachment, or clasp. [1]
12. **Thimble Crown and Telescoping Overlay Crown:** These are commonly used when an overlay denture is intended or when a severely malpositioned tooth needs support. Additionally, it is used for mandibles that are prognathic or resected, or when a considerable change in the straight or centric axis is indicated.
13. **Magnets:** In denture teeth, magnetized metal rods or discs are easily inserted into the saddle extension that covers the edentulous ridge, the dentures themselves, or both. A non-stabile denture can be effectively retained with magnetic retention, which is at most a helpful technique. In cases involving hemi maxillectomy or severely atrophied ridges, this idea might be helpful. [1]
14. **Gate Type or Swing Lock Device:** *Many* loose or periodontally affected teeth can be partially retained with the use of this retentive device. When the majority of previous approaches have been exhausted, this retentive method might be employed. Other approaches, though, ought to be taken into account first.

15. **Intermaxillary "George Washington" Springs:** To help stabilize dentures on the ridges while they are in use, these prefabricated pieces can be placed into both upper and lower sets.
16. **Devices for accessory retention:** Examples include guiding planes, contact attachment, buccal-lingual continuing clasp, valve seal, the Fourchard wing tool for openings, and prosthesis surface adhesion devices such as Durabone and Porceline. Screws. These are custom-made, specially-made things.
17. **Implants:** Trays of tantalum, acrylic mandibles and wires, and intraosseous wires are examples of implants.

Osseointegrated implants

Implants are believed to be the most successful means of maintaining an extra-oral replacement in place in comparison to other traditional retention strategies. Types of implant retention

- Retentive clips and bar construction.
- Retention of magnetic fields
- A magnetic retention or bar splint
- Attachments for balls
- combined magnetic retention and direct adhesive. [1]

Suction Cups: For maxillary resection, suction cups made of inflatable balloons are utilized. adhesives. The following are necessary to aid in retention: a large surgical wound; a flat palate; the absence of maxillary tuberosities; the absence of soft tissue undercuts in the surgical area; the anterior posterior adjacent septal wall that is not undercut rather than angles away from the normal palate; or "the the patient's production of saliva decreased because of pre-and post radiation therapy."

Occlusion: Denture strength and retention can be ensured by using the appropriate cusp level and fossa depth, which are determined by a functioning mandible and connected to the movement sequence collected from the healthy jaw joint. [1]

Extraoral retention

- **Anatomic Retention:** This calls for using both the soft and hard tissues of the head and neck area. For a positive outcome, stability of the active extraoral region depends on a number of things. These elements have to do with the tissue defect's location and size.
- **Mechanical Retention:** In exceptional situations, such as significant radiated tissues or extensive abnormalities covering half of the face, where the use of adhesive is unfeasible, further retention is typically required. It is recommended to conceal the prosthesis' edges with spectacles, which also serve as an indirectly mechanical retention. The spectacles should stand alone as a distinct object rather than being a component of the prosthesis. It may be useful to wear spectacles and an elastic band to keep the device and glasses in place**.**
- **Magnets:** To help secure an orbital or nasal prosthesis to a maxillary obturator that might come into touch with the prosthesis above, they might be added. [1]

Classification of Magnets [1]

Depending on the alloys used:

Cobalt that contains, Not containing cobalt

Depending on the surface coating:

Coated and Uncoated

Depending on how many magnets are utilized in the system:

One-person pair

According to the kind of magnetism:

Attraction and Repulsion

Depending on the magnetic field type:

Field that is closed

Field that is open.

Straps and snap buttons: applied to an extensive extraoral prosthesis.

Adhesives

"A material used to adhere external prosthesis to the skin and associated structures around the periphery of an external anatomic defect" is how Maxillofacial prosthetic adhesive is defined in GPT-9. Chemicals are held in place by adhesives. Using a surgical-grade extraoral glue may be the only way to improve retention. Generally speaking, each substance has unique adhesive qualities due to its intrinsic chemical and physical characteristics. The adhesives help with border adaption, marginal sealing, and retention. By doing this, the prosthesis is protected from unintentional dislocation. When silicone-based tissue adhesives were compared to water-based adhesives, their peel bond strength (PBS) was higher than that of double-sided medical adhesive tapes. Combined mechanical, anatomical, and adhesive retention.

Conclusion

A difficult area of dentistry is maxillofacial prosthesis. In addition to improving patients' quality of life, this profession deals with the repair of various orofacial abnormalities. There are optimistic prospects for the future, and the existing state of affairs is encouraging. To the best of his ability, the maxillofacial prosthodontist should always try to provide the therapy. Advanced prosthetic restoration of structural and functional deficits improves the outcome when well planned, objective rehabilitation programs are established.

There are numerous methods and tools available for maintaining maxillofacial prostheses. Since the prosthodontist is responsible for creating the prosthetic reintegration that will work best for the patient, he must be aware of all the possibilities available to him in order to select the optimum retentive device. A comprehensive assessment of the issue, thorough assessment, along with therapy planning can result in a satisfactory prosthesis that improves the patient's standard of life, even though the best results might not always be possible in cases with craniofacial anomalies.

Although many have found the process of retaining a maxillofacial prosthesis fascinating and fulfilling, the goal of realizing its full potential is yet unfulfilled. This includes the use of metal bands, adhesives, and implants.

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