

Palatal obturators in patients after maxillectomy

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SUMMARY

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Prosthetic management of palatal defects is fundamental to improve patient's life undergoing to a maxillary surgical treatment. A lot of maxillary defects are a direct consequence of surgical treatment of malformations, neoplasms or trauma. The obturators are prosthesis used to close palatal defects after maxillectomy, to restore masticatory function and to improve speech. The primary goals of the obturator prosthesis are to preserve the remaining teeth and tissue and to provide comfort, function, and aesthetics to the patients. Different materials and retention methods are a characteristic of new types of obturators.

Keywords: obturator, maxillectomy, bulb, oral-nasal communication, prosthesis

Introduction

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The obturator prosthesis has been used to restore masticatory function and improve speech and cosmetics for maxillary defect patients. The basic design of obturator prostheses uses the available tooth and bearing tissue to achieve maximum retention and stability. The primary goals of the obturator prosthesis are to preserve the remaining teeth and tissue and provide comfort, function, and aesthetics to the patients. The goals of prosthetic rehabilitation for total and partial maxillectomy patients include separation of oral and nasal cavities to allow adequate deglutition and articulation, possible support of the orbital contents to prevent enophthalmos and diplopia, soft tissues's support to restore midfacial contour, and an acceptable aesthetic results (¹).

History of palatal obturator

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Prosthetic management of palatal defects has been employed for many years, in fact maxillary obturator prostheses's history is well documented.

Interestingly the earliest evidence of simple retentive dental prosthesis was found at El Gizeh dating from the end of the old empire approximately 2500 bC, it was made of gold wire linked lower left second and third molars together and had been woven around.

In 1560 Lusitanus was probably the first to describe what is today known as palatal obturator used for permanent luetic fistula of the palate (²).

In 1564 Ambroise Parè called his small obturators "couvercles" and only in 1575 changed the name in "obturateur" which is derived from the Latin "obturo" meaning to stop up.

In 1634, Johson translated Parè's "surgery", published for king Henri the third, the most christian king of "France and Poland": this text described an appliance to restore the palatal defect caused by venereal diseases or gunshot wounds.

In order to create his obturators Parè filled the cavities with a gold or silver plate a little bigger than the cavity; probably it was flat and the part towards the brain was inflatable in order to fill the concavity of the palate: in this way the device would remain fixed (3).

Since surgical correction of palate defect offered difficulties for centuries, in fact the surgeons of the middle aged avoided surgery of the palate, prosthetic aids of the renaissance deserved praise and were used for about 200 years.

The technique was improved in 1728 by Pierre Fouchard, the father of modern dentistry, who invented the fixation of the obturator to dental prosthesis.

He described five different obturators with a sophisticated design, with movable wings operated by screws and each covered with soft sponges which could fill most of palatal perforations no matter how irregular their margins are (4).

In 1841 Stearn, who had undergone few unsuccessful operations, attempted to construct a new kind of obturator exerted the pharyngeal area to help the patient in phonation.

In 1867 Wilhelm Suersen, a German dentist, also improved steams with the creation of fixed prosthesis and emphasized the importance of the pharyngeal area muscle activity, in particular in securing contact of the pharyngeal section of the prosthesis with the pharyngeal musculature to occlude the naso pharynx at the same time (5).

In 1932, H.D. Gillies e T.P. Kilner in "The Lancet" revealed one of the major problems in secondary cleft surgery:

"The commonest contour deformity seen in old hare-lip and cleft palate cases is produced by flatness of the lip and depression of the nose it is obvious that the flat lip is caused lack of forward projection in the undetiving maxilla most marked when the premaxilla has been removed but present in lesser degree in large proportion of lips either or unilateral".

In 1965 A.C. Robert presented obturator more complex, probably derived from Fauchard and designed to open in the cleft to provide retention movement of the wings is achieved by using a key. Even if surgery had been so traumatic palatal obturator has been of use as surgery has improved obturator has left aside, but in some areas and in some condition it may be of value.

Guidelines

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Kenneth Adisman of Dental Center of New York University, author of the chapter "Cleft Palate Prosthodontic" in the magazine "Cleft Lip and Palate" in 1971, highlights the need to integrate dental treatment with plastic surgery and education to language.

According to Adisman there are three types of implants:

- fixed prosthesis (non-removable) that allows the palate and the pharyngeal muscles contraction working against the side wall and top. This is the best condition for the prosthetic treatment;
- removable prosthesis or partially removable, very popular in the nineteenth century, but by the difficult retention;
- prosthesis type metal, which extends into the nasal cavity instead of the hypopharynx, indicated in the perforations. This prosthesis is indicated for irreparable damage to the hard tissue or soft palate.

Adisman considers the use of such devices in all those cases in which there is need to aid feeding and in all those cases in which the plastic surgery is not indicated for the precarious health: extended defects of the palate, lack of local soft tissue, orthodontic or surgical failures.

The standard of a prosthesis according to modern Adisman is composed of three parts:

1. a section of the maxillary acrylic resin, that restores hard palate and teeth held by hooks of gold;
 2. a section that recreates the extension of the palate, characterized by the presence of a metal bar of the same length of the palate and ending with a ring in the hypopharynx;
 3. the section nasopharyngeal, that ends with a “bulb” of the proper size, according to the deformity.
- Generally it consists of methacrylate transparent resin, so as to highlight possible reactions of the underlying mucosa; it is usually large enough to have a sealing function and enable a good swallowing and phonation, without blocking the air passages to the nose needed for breathing.

In inoperable case, many peripharyngeal “bulbs” are located in the high hypopharynx, with the lower part of the prosthesis, in line with the nasal spine and the palatal plane. In patients post-operated the “bulb” is located lower in the naso-pharynx, just enough to not be displaced by the movements of the tongue during swallowing considering that the soft palate contributes to partially occlude palato-pharyngeal area.

Currently the palatal obturator is a fundamental means to minimize the inconvenience for patients who cannot and do not want to undergo another surgery to close the oro-sinus communications, which do not allow the normal functions of the stomatognathic (6, 7).

The obturators are removable prosthesis that can restore missing teeth as well as having a resin extensions, very often at palatine level, necessary to restore proper chewing function, phonetics and breathing. In order to restore the correct phonetic features you should position the teeth following correct criteria and a technical process that requires anatomical knowledge of the problem between the teeth, facial muscles and tongue; in fact anterior teeth's mounting must satisfy the criteria: aesthetics, phonetics and function (8).

As regards the aesthetic is appropriate to consider some anatomical elements that contribute to make pleasant and harmonious the face of the patient: the prolabium, the tubercle of the upper lip, the filter lip, the chin-labial furrow, naso-labial cleft lip and labial marginal.

All these elements which in the presence of a healthy dentition are incurred, we should try to recreate them even in the presence of artificial teeth compatibly with the remaining tissues after surgical treatment.

As already pointed out anterior element's position affects compromises the speech which is already partially compromised by adhesions, these normally remaining after surgical incisions.

To achieve a correct assembly of the teeth is used phonemes technique: for the correct pronunciation of the phoneme “s” you have to recreate a space between of 1–2 mm from the incisal edge of upper and lower anterior teeth, through this space the air passes allowing the correct pronunciation; instead during the pronunciation of “f” and “v” the incisal edge of the upper anterior teeth should be touching the lower lip. If these criteria are not follow, the speech will be altered in both healthy patients and in those with cancer.

Regarding third and last standard to be respected, the function, it is evident that also in this case the incorrect position of the anterior teeth may cause a prognathic chewing.

Prosthetic's characteristics listed until now should be followed in cancer patients surgically traits but, as we say before, these patients do not have an optimal soft tissue and bone such as to ensure the stability and retention of the prosthesis.

The scientific literature in this regard suggests the realization of the impression, respecting what is called the neutral zone, namely the area where the force between agonist and antagonist muscles are equals in such a way as to avoid, the prevalence of a muscular structure on other, involving in the displacement of the prosthetic (9).

At this point it is appropriate to pay attention to the surgical adhesions that remain after surgical resection, in fact these can modify muscle fiber's insertion and then the muscles themselves (10).

Even the position of the teeth on the prosthetic is made based on the location of the neutral zone, also when it is possible the teeth are positioned according to reports first-class molar and canine. Sometimes, however, it is necessary to positioning the elements in not ideal positions for avoid areas of trauma to the tissues themselves.

Just as happens in non-surgical patients also in post-surgical one soft tissue may be subject to change, especially if the resection was extended, then it is appropriate, a periodic rebasing of the obturator in order to recreate the correct stability (11).

Often in post-surgical patients there are problems like: the movement of the obturator itself, the presence of periodontal dental elements on which rest the hooks of the prosthesis, the distal extensions compared to the area of surgical resection (12) and vertical dimension and occlusal relationships, altered after surgical treatments (13-15).

The use of such obturator in these patients allow not only to close nasal and sinus communications but also to restore a correct chewing, swallowing and pronunciation especially of those phonemes that require a correct labial and dental position.

It is very important to consider patient's psychological aspect and his social relationships.

Regarding third and last criterion, the function, it is evident how the closure of the communication and the restoration of absent teeth can allow patients reinstatement of a varied diet and the removal of nasogastric tube (16, 17).

Realization

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The impression, in particular the first, is the critical step for excellence in mobile prosthesis because it will determine the future success of the prosthesis itself; in fact the details must be clearly visible for transferring all the information to the laboratory; the anatomical structures that must be correctly detected with the impression are the following:

- the hard palate until posterior area of compressibility;
- the residual alveolar ridge, with alveolar tubercles;
- the pterygo-maxillary incisions;
- the buccal and labial vestibule;
- median and lateral frenula.

In case of patients after-surgery with oral-nasal communications it is important to be careful to choose the consistency material for impression, in order to prevent the spreading of such material in the cavities.

It is useful in this cases the positioning of gauze to prevent the flow of material in the cavity and at the same time to give a stop surface.

Once the most suitable material has been chosen, you test the tray, positioned behind the patient, introducing two-thirds of the tray in patient's mouth, while you stretch the other side mouth, at this point it completes the introduction of the impression tray with a movement of rotation of the hand.

The doctor must detect the palatal vault and the posterior edge until the mobile area of the soft palate.

Now you can proceed to knead the material and take an impression with the same method described above with the only change to functionalize the impression, namely to record the movements and muscle frenula.

To functionalize the impression we proceed to extend the lip at the top, out, down, and forward and perform the same movement with the corners of the mouth.

Once the expected time of taking you raise your lips and cheeks to rid the air seal and removed the tray.

Evaluated the imprint in order to check if they have recorded all useful areas, this is sent in the laboratory where he made a plaster model reproducing the patient's mouth.

On the model is made a resin prosthesis, with or without a metallic structure to support the teeth, which restores also the lost tissue and fills the cavity between oral cavity and those antral or nasal. In the edentulous the wax is used for bite registration and at the same time is controlled prosthesis's seal and the extension; often it is

necessary remodel the resin if it presents excessive pressures, or we can use it as an impression tray in the case of not adequate retention.

After checking the good fit of the prosthesis the vertical dimension is recorded: measuring the distance between two points fixed on patient's skin with a relaxed muscles.

In the case of rehabilitation involving the anterior area, from canine to canine, mark face's midline and to pronounce phonemes "f" and "v"; during the pronunciation of these phonemes superior wax must touch the inner part of lower lip. It is also useful phoneme "s" to check upper and lower anterior teeth position, in fact if the pronunciation is correct a space of 2.3 mm between the teeth must leave.

When the vertical dimension and the correct pronunciation are controlled, all the data are sent to a laboratory for realization, according to the medical indication because in this way the prosthesis will be personalized on patient characteristics; if necessary the prosthesis can be test before the finalization.

When the prosthesis is completed, we have to teach the patient to insert, remove and clean it; in fact the presence of the prosthesis facilitates bacterial plaque accumulation.

Clinical case

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In the first case report, a 60-year-old woman was diagnosed with an epidermoid carcinoma extended over all the palatal. Addressed to the Otorhinolaryngologist Division of "St. Giovanni Calibita Fatebenefratelli - Isola Tiberina" in Rome, the patient has undergone a resection surgery of all the hard and soft palate ([Fig. 1](#)).



[Figure 1](#)

Oral-nasal communication.

After the surgery and the complete loss of the hard palate, the crestal bone and part of the soft palate, it was made a complete prosthesis with acrylic resin ([Figs. 2, 3](#)). This prosthesis is stabilized on residue bone and restored the function, the phonetics and allowed to occlude the big space remained on the palate giving a good cosmetic aspect to the patient ([Fig. 4](#)).



[Figure 2](#)

Resin prosthesis.



[Figure 3](#)

Resin prosthesis, upper vision.



[Figure 4](#)

Patient's smile.

In the second case report, a 40-year-young man had a wide communication between oral and nasal cavity due to a surgical resection ([Figs. 5, 6](#)). On rx orthopantomography many dental elements were absent and some roots had to be removed ([Fig. 7](#)). The roots were removed, and after healing, a partial prosthesis with missing elements and with palatal obturator function were made ([Figs. 8–10](#)). The patient did not want to establish a correct chewing through a lower partial prosthesis.

[Figure 5](#)

Oral-nasal communication.



[Figure 6](#)

Frontal view without obturator.



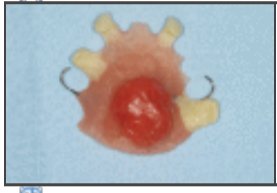
[Figure 7](#)

Opt.



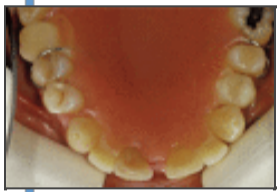
[Figure 8](#)

Prosthesis, upper view, note bulb in acrylic resin.



[Figure 9](#)

Occlusal vision of prosthesis.



[Figure 10](#)

Frontal view, with obturator.



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