



Palatopharyngeal function rehabilitation after partial maxillectomy with an obturator combined with speech aid: a clinical report

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ARTICLE INFO	ABSTRACT
<p><i>Article Type:</i> Case Report</p> <p><i>Received: 23 Apr 2015</i> <i>Revised: 28 May 2015</i> <i>Accepted: 16 June 2015</i></p> <p>*Corresponding author: Mehran Bahrami Prosthodontics Department, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran</p> <p><i>Tel: +98-21-88097617</i> <i>Fax: +98-21-88360143</i> <i>Email: m-baharmi@sina.tums.ac.ir</i></p>	<p>A palatal defect may result from surgical resection, and its consequences could include difficulty in speech and nasal regurgitation of food and liquids. An obturator combined to speech aid prosthesis can improve nasal emission during speech, and assist in preventing nasal regurgitation of food. This article presents a clinical report of the reconstruction of palatopharyngeal function by prosthetic obturator and speech aid.</p> <p>Keywords: Palatopharyngeal function, Speech Aid, Obturator, Rotational path.</p>

Introduction

There are several tumors in oral environment that lead to maxillectomy. Maxillectomy defects can be categorized as limited, partial, medial, subtotal, total, radical, or extended [1].

Some maxillectomies can affect intelligibility of speech in addition to anatomic defects. Ablative cancer surgeries of the head and neck encompassing more than two anatomic sites (i.e., hard palate, soft palate, tonsil, lateral pharyngeal wall, base of tongue) most often require an obturator with a speech aid component to adequately restore the patient's speech to a functional level. Several methods of restoring these patients to increase presurgical speaking ability have been used throughout the years, including speech aids and obturator prosthetic appliances. Microvascular free-flap

tissue transfers have also been attempted for optimal restoration of speech for acquired defects [2].

Velopharyngeal insufficiency is usually managed prosthetically by fabrication of an obturator, a speech aid, or an obturator combined with a speech-aid-component prosthesis. Obturators alone are customarily used to restore an acquired hard palate opening and/or contiguous alveolar structures. Speech aid prostheses are removable prostheses usually required to restore an acquired or congenital defect of the soft palate with the central component extending into the pharynx to separate the oropharynx and nasopharynx, thereby allowing completion of the palatopharyngeal sphincter [3].

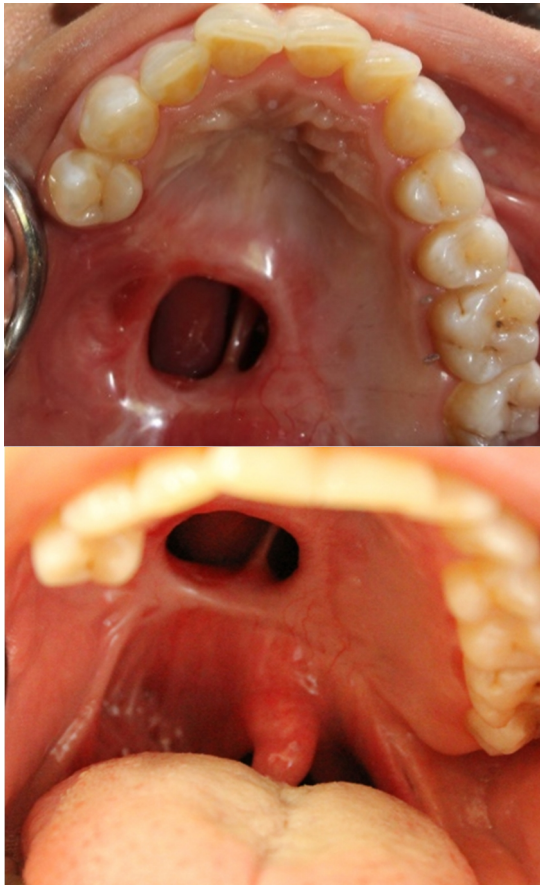


Fig 1. Intra oral view of the lesion.



Fig 2. Interim maxillary obturator.

This additional speech aid component to the obturator is usually placed superiorly to any remaining soft palate and contacts the lateral and posterior pharyngeal wall, thus closing the anterior defect of the hard palate in addition to the posterior defect of the soft palate, ultimately aiding in speech intelligibility and preventing foods and liquids from leaking through and out of the nasal cavity [2].

This clinical report describes fabrication of a maxillary obturator combined with speech aid for reconstructing palatopharyngeal function.

Clinical Report

This report describes the prosthetic treatment of a 34-year-old Iranian woman with a history of aggressive mixed tumor of accessory salivary glands of the maxillary palate.

The patient underwent unilaterally resection of maxillary posterior segment; include alveolar ridge and a part of hard and soft palate. The report of pathology showed that all margins around the defect were free of neoplasia and thus the patient received no postoperative radiation.

The lesion was located in the right side of palate, with approximately 15mm by 17mm opening. In the posterior aspect, the uvula was deviated as a result of wound closure and a firm scar tissue was extended to the soft palate which restricted its normal function. The resiliency of the scar tissue was examined with a t-burnisher which showed a little ability of displacing (Fig. 1).

The patient received an interim obturator prosthesis in the first week after surgery, which improved swallowing and nutrition but the difficulty in speech remained (Fig. 2).

After stabilization of the defect, the patient required a definitive prosthesis with better retention, stability, and improved speech ability. The patient refused any further surgery, so that an obturator with a posterior extension (speech aid) to restore speech and swallowing abilities was recommended.

In the process of fabricating this definitive prosthesis, primary impression was made with cake compound and an irreversible hydrocolloid (Chromogel; Marlic Co. Iran) with a stock tray. The diagnostic cast was poured in type III stone



Fig 3. Framework design. A: wax up view, B: intra oral view

(Micro stone; Whip Mix Corp, Louisville, Ky). The survey process was done and the framework design and location of teeth preparation was determined. After teeth preparation and border molding of the defect and peripheries with a little extension to posterior aspect with a tube compound (Kerr, Pofadental, Switzerland), a light-polymerized acrylic resin custom tray was used to make the final impression with a silicone material (Monopren; Kettenbach, Germany). The impression was boxed and poured in type III stone. The master cast was surveyed and the frame work was designed. Design philosophy was broad stress distribution to transfer load to the whole dental arch. A metal process which extended posteriorly about 1 cm and in level of palatal bone was designed as close as possible to the posterior and lateral pharyngeal walls for optimal functional outcomes, and the remaining soft palate and uvula was circumvented with little displacement, to avoid interfering with

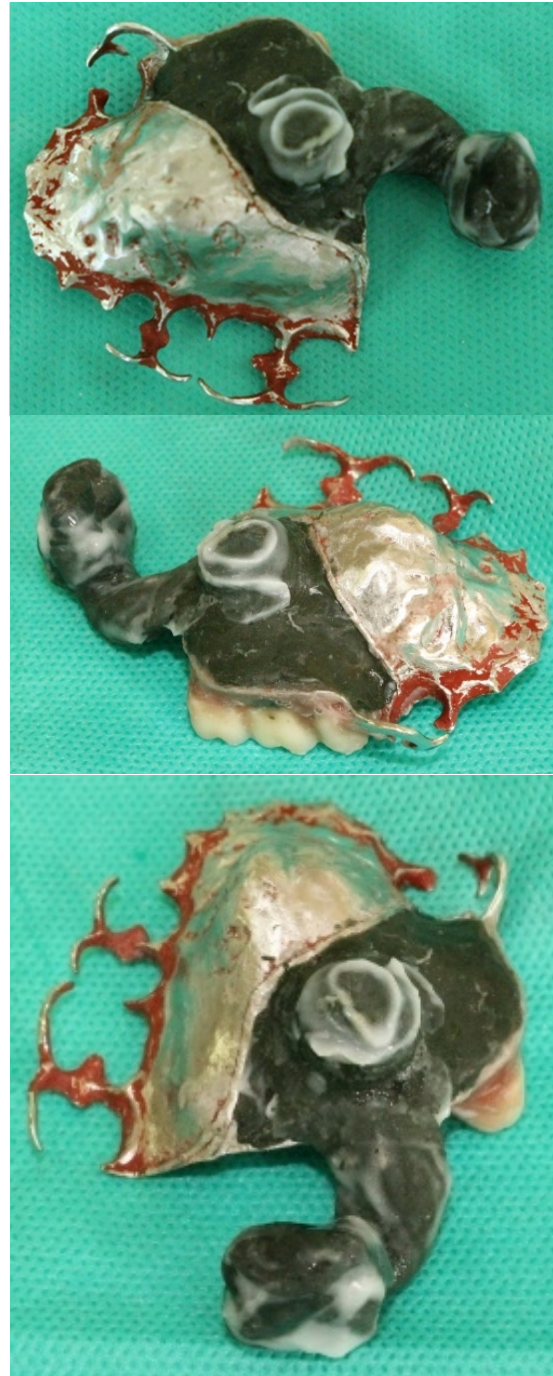


Fig 4. Functional border molding and impression.

tongue movements (Fig. 3).

After framework try-in, the functional molding of the defect and soft palate was done with tube compound (Kerr, Pofadental, Switzerland) and then one millimeter of the tissue surface of the tray was removed to make enough space for a tissue conditioning material (F.I.T.T; Kerr, Italy) for functional impression. This functional impression was made by asking the patient to swallow, speak, and move her head to left, right, upward and downward. The impression included hard and soft tissues of the

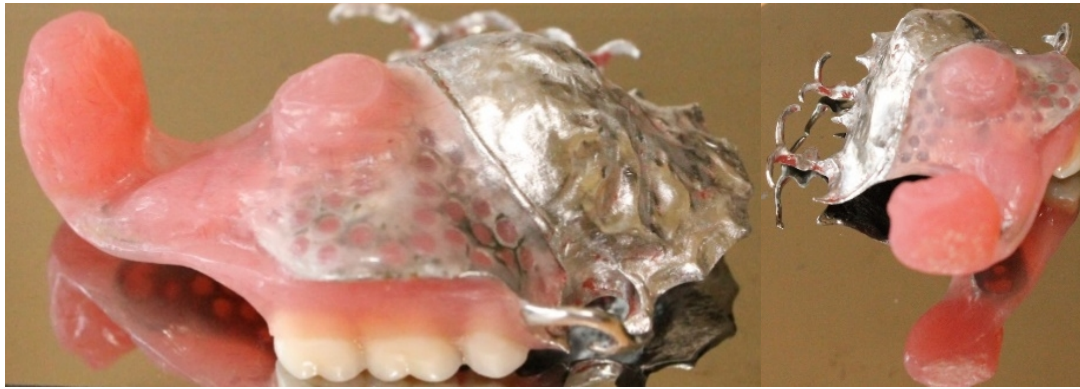


Fig. 5. final prosthesis.

posterior and lateral pharyngeal walls, in their static and dynamic states (Fig. 4).

Afterwards, the corrected cast was poured in the functional impression section with type III stone. The facebow and maximum inter cuspal position was recorded and the casts mounted and teeth setup was done. After teeth try-in, the polishing surface was contoured. After investing; the solid obturator was processed in heat-polymerized acrylic resin (Lucitone 199; Dentsply Intl), then finishing and polishing were done (Fig. 5).

The prosthesis was placed intraorally using a rotational path of insertion. The posterior extension was positioned first over the remaining soft palate, and the anterior portion was then rotated upward onto the teeth. Tissue surface fitting was checked with pressure indicating paste and the occlusion was adjusted. The obturator was then polished and inserted.

The patient learned how to insert, remove, and clean the obturator. The patient was instructed to remove the prosthesis only for cleaning. Prosthetic retention and stability were evaluated subjectively. Speech intelligibility improved and the patient was then referred to the speech pathology department for further evaluation of speech and swallowing abilities. Swallowing evaluation revealed neither leakage nor nasal regurgitation. Speech intelligibility was adequate for conversational purposes. In order to evaluate nasal resonance, words beginning with nasal consonants such as /m/ and /n/ were compared with words beginning with non-nasal consonants such as /p/, /b/, and /t/. It was also important to assess oral air retention during speech production. Nasal air emission was evaluated during the production of sounds that require implosion of oral air prior to their production, such as /p/ and /t/.

The patient was followed-up one day and

one week later and precise adjustments of the intaglio surface of the prosthesis were done. The patient was satisfied with her swallowing and speech and the retention and stability of the prosthesis.

Discussion

The palatopharyngeal valving mechanism regulates nasal resonance during speech and is also involved in other oral activities such as swallowing, blowing, sucking, and whistling. Palatopharyngeal dysfunction may be congenital, developmental, or acquired and may affect all age groups [4]. This dysfunction may be characterized as insufficiency or incompetency. Insufficiency describes speech and resonance aberrations related to a congenital or acquired anatomic defect of the soft palate that renders the VP sphincter incomplete, such as that occurs in cleft palate or following the resection of a palatal tumor. By contrast, Incompetency describes dysfunction of an anatomically intact palatopharyngeal mechanism that occurs in patients with neuromuscular disorders or mislearning [5,6].

Although surgery is a common approach to the treatment of palatopharyngeal dysfunction, it may not be possible or practical for numerous clinical situations. In these instances, prosthetic treatment combined with speech therapy may be the treatment of choice. Prosthetic management of palatopharyngeal insufficiency may be accomplished using speech-aid prostheses (SAPs), although palatopharyngeal incompetency is treated with palatal lift prostheses (PLPs). The functional component of the SAP is a nasopharyngeal section (speech bulb) that is shaped to conform to the activity of the palatopharyngeal mechanism during speech and swallowing, whereas PLP reduces

hypernasality by approximating the incompetent soft palate to the posterior pharyngeal wall [5].

In this case, the soft palate did not act properly because of the tension of surgical closure, scar formation, and anatomical defect, so it was considered as a palatopharyngeal insufficiency and the prosthetic choice of treatment was “an obturator combined with speech aid”.

In the case of fabrication of a speech aid usually it is too difficult to impress the hard and soft tissue simultaneously in the mouth with a tray. Thus, a custom tray with little extension to the defective soft palate area was used in order to take an impression of the afflicted areas with the silicon impression material, and to pour a working model for fabricating the removable partial denture framework.

Although removable partial denture designs for patients with palatopharyngeal deficiencies are similar to removable partial denture designs for nonsurgical patients, the long lever arm created by the extension for the obturator must be considered [7]. The weight and length of the obturator portion increases the effect of gravitational forces and consequently the potential of rotation around the fulcrum line. The effect of extension will be most significant for patients requiring a Kennedy Class I or Class II removable partial denture and less significant for patients with Class III or Class IV removable partial dentures. For patients requiring Class I or Class II partial dentures, multiple indirect retainers are suggested, which may resist the downward displacement of the obturator and increase the stability of the prosthesis [8,9].

After frame work fitting, the functional border molding was done and the patient conducted the movements of swallowing, speaking, and moving the head so that the remaining palatopharynx could be shaped consistently with the afflicted area. After initial shaping, 2-3 mm of compound removed and final functional molding was down with tissue conditioner. The materials which may be used for this reason are thermoplastic wax, tissue conditioner, and resin or a combination of these [10-12].

In this case, tissue conditioner was selected for its simplicity and because there is no need to remove the whole material in the afflicted area to make the final impression. Also, it is possible to simply repair the areas with too much or too little material. A thin layer of tissue conditioner

provides enough operating time so that the patient can swallow, speak and move his head multiple times. The hardening times for the tissue conditioner and resin are fixed; there is sufficient time for the patient to complete the shaping of the edges [13].

Speech evaluations were performed with and without the prosthesis in the mouth. Recordings of the patient's speech were compared between the initial examinations, border molding session and, at delivery appointment.

Initial sound record showed hypernasality, nasal air emission, and slightly strained voice quality; however, after delivery, improved resonance and clear voice quality was sensible for patient and her family, but hypernasality was not eliminated thoroughly which may be as a result of the difference of palatopharyngeal valve size during speech and swallowing. During swallowing the valve is more constricted which will result in air escape during speech. Fortunately, this phenomenon may be improved with compensating reaction of pharyngeal muscles by passing time.

Finally, referring to the speech pathologist is critical to ensure functional speech and swallowing after delivery of the obturator prosthesis. A comprehensive assessment of speech intelligibility, vocal quality, and oropharyngeal swallowing provides important information for prosthetic modification to prevent nasal emission while speaking and regurgitation of food while swallowing [14]. An appropriate prosthetic fitness and functional success ensure that the patient ultimately uses the device during daily routines.

Conclusion

In this report, a patient with soft palate defect as VP insufficiency and hard palate defect was treated successfully by an obturator combined with speech aid prostheses. It is crucial to rehabilitate these patients with suitable prosthetic management for successful results.

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