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Prosthodontic Management of Velopharyngeal Insufficiency with Pharyngeal Obturator: A Case Report

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Abstract

Success in Maxillofacial Prosthetics depends on full cognizance of the principles that emphasis on facial harmony, anchorage and retention, weight bearing and leverage, durability, tissue compatibility and tolerance. The maxillofacial prosthodontist normally provides prostheses to restore aesthetics and function to the patients who cannot be restored to normal appearances or functions by means of plastic reconstructions. The velopharynx is a dynamic anatomic structure which is essential for normal breathing, eating, and speaking. The soft palate acts as a separator between oral and nasal cavities. Impairment of velopharyngeal function can be caused by insufficiency or incompetency. It primarily affects the articulation and resonance of speech and often leads to nasal intonation due to escape of air through the nose. This article describes a clinical case report pertaining treatment of palatopharyngeal disorders using prosthetic rehabilitation.

Keywords: Velopharyngeal insufficiency, Hypernasality, Training Plate, Pharyngeal obturator with maxillary complete denture.

Introduction

Velopharynx is a muscular sphincter located between the nasopharynx and the oropharynx that regulates passage of air during speech.[1] The complete closure of this muscular valve is required for normal physiologic activities like speaking, swallowing, whistling, blowing and sucking. The closure of the sphincter usually

involves the movement of soft palate, lateral and posterior pharyngeal wall.[2]

Any abnormality in/of these structures may lead to velopharyngeal defects. Soft palate abnormalities can be grouped into three categories– congenital, acquired and developmental.[1,3] In congenital cleft lip and palate, the development of the soft palate is hampered. In neoplastic involvement surgical resection may involve hard and soft palate affecting the continuity and resulting in acquired defect.[4] Hypernasality and decreased intelligibility of speech are a result of congenital or acquired defects of the velopharyngeal mechanism.[5]

Apart from etiological classification, defects may also be classified based on anatomical and physiological involvement of structures. Palatal insufficiency and palatal incompetency are two forms of velopharyngeal deficits.[4] When some or all of the structure of soft palate is absent or has been surgically resected, deficiency of the tissues creates palatal insufficiency and implies the presence of hypernasality, inappropriate nasal escape and decreased air pressure during the production of oral speech sounds (weak pressure consonants). When soft palatal tissues are of adequate dimension but lack movement due to trauma, disease affecting muscular or neurologic activity is called as palatal incompetence.[2]

Gust of Passavant described a horizontal “cross roll” on the posterior pharyngeal wall, which occurred during speech and swallowing. This forward bulging which corresponded to the level of the atlas was termed as Passavant’s ridge or pad. Some of the upper fibres of the palatopharyngeus circulated deep into the mucous membrane of the pharynx, and they constituted Passavants muscle, which on contraction, raised a ridge (Passavants ridge) on the posterior wall of the nasopharynx. When soft palate is elevated, it would come in contact with this ridge, thus closing the pharyngeal isthmus. Passavant’s pad would extend forward and superiorly as much as 5mm. Passavant’s pad serves as a guide for the placement of the soft palate obturator prosthesis.[6]

This clinical case report describes the treatment of palatopharyngeal disorders using prosthetic rehabilitation, which will restore the defect, improve aesthetics and phonetics thereby benefit the morale of patient.

Case Report

A 64 yrs old male patient reported to dept of prosthodontics with the chief complaint of missing teeth in his upper and lower arch for 8 months and also complaint of difficulty in speech with an acquired soft palatal defect. (Fig.1)

On examination a portion of soft palate and pharynx were missing in the anatomical midline. It extended from posterior one-third of the soft palate to middle one-third of the pharyngeal wall measuring 7 cm in length and 6 cm in width. Difficulty in speech and communication along with hyper nasality was detected.

Figure 1: Preoperative intraoral view

Speech evaluation was performed to assess resonance, the occurrence of inappropriate nasal air emission, and articulation. The patient refused to undergo a surgical reconstruction. A pharyngeal obturator with maxillary complete denture and mandibular partial denture was planned.

During an attempt to make an impression patient experienced gag reflex. Once the impression is in the

mouth, patient was distracted further by talking to him and asking him to raise his leg during the impression-making. The impression made was used to fabricate acrylic training plate to desensitize the patient gradually from gag reflex. (Fig 2)

Figure 2: Alginate impression covering the defect area

Type III gypsum (GOLDSTONE Easy Flow, Asian Chemicals, India) was used to pour the cast, and primary cast was fabricated. (Fig 3) A layer of modelling wax was adapted over the cast (Hindustan Modelling Wax, The Hindustan Dental Production, Hyderabad, India) (Fig 4) and heat cure PMMA (DPI limited, Mumbai, India) clear acrylic training plate prostheses was fabricated.(Fig 5)

Figure 3: Primary cast

Figure 4: Wax pattern fortraining plate

Figure 5: Training plate made of clear heat cure PMMA

Figure 6: Training plate Ex-situ

Fig. 7: Training plate In-situ

Fig 6 and 7 shows ex-situ and in-situ images of training plate. As Bassi et al in 2004 recommendation patient was instructed to try and wear the plate once a day for 5 minutes, before steadily increasing the frequency of wear to twice a day for 5 minutes, three times a day for 5 minutes and so on.[7] Patient was asked to wear the plate when they are particularly busy, as the busy activity may distract them from the fact that they are wearing an appliance. However, the period of time patients can tolerate the plate will clearly depend on the severity of their gag reflex. Patients was encouraged to keep a diary documenting the length of time for which he can retain the plate on a daily basis.

At subsequent review appointments, the diary was analysed and patient was praised for his efforts. There are reports showing severe gagging patients may need to wear their plates for a period of at least 3−6 months before they can tolerate wearing the plate throughout the day. However, this period of adaptation will clearly vary from patient to patient.[8]

Once patient became desensitized with training plate, border molding and secondary impression was made followed by jaw relations were recorded. During try-in orthodontic wire was made into loop and secured onto the mid posterior extent of trial denture base to stabilize the materials while recording the defect. (Fig 8)

The impression of the velopharyngeal defect (obturator) was made with admixed technique [7 parts of green stick (DPI Pinnacle tracing sticks the Bombay Burmah Trading Corporation, Mumbai, India) and 3 parts of impression compound (DPI, India)] during the functional movements of the patient. The patient was instructed to flex his neck to achieve contact of the chin to the chest to establish contact of the posterior aspect of the material with the soft tissue covering the anterior tubercle of atlas. Rotation and flexion of the neck to achieve contact of chin with the right and left shoulder was performed to record the lateral aspects of the defect. The patient was asked to swallow warm water to elicit pharyngeal muscle activity. (Fig 9)

Reduction of 1–1.5 mm of material on the peripheral surfaces of the impression was undertaken. Afterwards, detailed impression was made with light-bodied elastomeric impression material (SPEEDEX-light body consistency condensation-cured silicone impression material, Coltene/Whaledent Pvt., Ltd., Alstalten, Switzerland). (Fig 10)

Figure 8: Looped ortho wire attached to stabilize the materials while recording the defect (Class III cross arch-cross bite teeth arrangement)

Figure 9: Defect recorded withadmixed technique

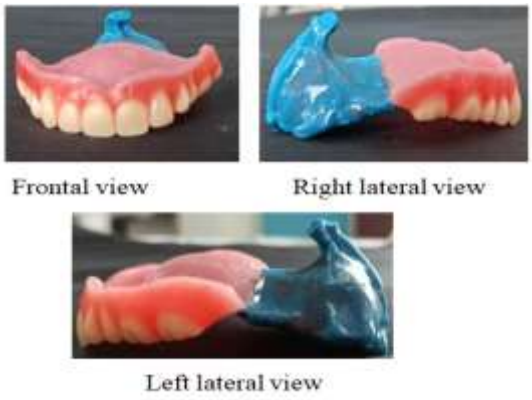

Figure 10: Final impression of the defect made with light bodied elastomeric impression material

The prosthesis was then flasked keeping the impression side in a manner that the impression material could be removed with ease after dewaxing without making any alteration in the extensions. The prosthesis was processed in heat activated acrylic resin (DPI Heat Cure, Mumbai, India), polished (Fig 11) and inserted in the patient's mouth. (Fig 12) The prosthesis was monitored closely to ensure it did not cause soreness to the soft tissues.

Figure 11a: Frontal view

Figure 11b: Right lateral view

Fig. 11c: Left lateral view

Figure 11d: Intaglio surface

Figure 11e: Polished surface

Figure 11(a-e): Acrylized maxillary denture with pharyngeal obturator

Figure 12: Maxillary denture with extension covering the defect

Adequate VP closure was detected after the patient was examined during drinking water in the upward head position. Moreover, no nasal reflux was observed. Hypernasality was reduced after testing the production of oral and nasal consonants and the speech was noticeably improved after perceptual speech evaluation. The patient was trained in oral hygiene and instructed in the specific care for his new prostheses. The checkups were done at 1st week, 2nd week, 1 month, and 6 months after insertion of the prostheses.

Figure 13: Pre-operative image

Figure 14: Post-operative image (Class 3 cross arch teeth arrangement)

Discussion

Prosthetic rehabilitation of the patients suffering from VP (Velopharyngeal) defects with obturator prostheses varies according to the location and nature of the defect or deficiency.[9-12] There are differences between obturator prostheses constructed for patients with developmental or congenital malformations of the soft palate, as compared with those constructed for patients with acquired defects.[6,9,11,12] However, the objectives of obturation are to provide the capability for the control of nasal emission and inappropriate nasal resonance during speech and to prevent the leakage of material into the nasal passage during deglutition.[6,10,13]To achieve normal

speech with a prosthesis, an accurate prognosis is extremely important for the patients exhibiting considerable movement of the residual VP complex during function.[13,14] Because the movement of the lateral pharyngeal walls is essential for the control of nasal emission, little or no movement of VP mechanism makes is difficult to achieve normal speech with either surgical reconstruction or prosthetic therapy.[9,13-15]

In the literature, prostheses have been described to improve speech ability.[9-11] A pharyngeal obturator prostheses may prevent the hypernasality and/or nasal emission associated with VP inadequacies.[9,10] In order to obtain adequate VP closure during speech and swallowing a posterior extension is added to prosthesis.[10,16] The extension must be positioned at the level of the hard palate during the most active movement of the pharyngeal sphincter.[6,15] This movement can be achieved by asking the patient to say 'ahh' or by touching to posterior wall of the pharynx.[6,16] An acrylic resin extension must be formed functionally. This extension must be in static contact with the soft tissues and must not affect the stability of the prosthesis.[6,17] The impression should be examined for contact with the pharynx bilaterally and posteriorly.[16] In this report, patient was allowed to drink water to test the complete closure of the anatomical defect of soft and hard palate. The water should not reflux into the nasal cavity when the patient is in upright position.[6]

The dental management of a patient with a hyper-responsive gag reflex can be challenging. A number of strategies have been suggested including: Relaxation techniques, Distraction, Hypnosis, Sedation, the use of local anaesthesia, Acupuncture/acupressure and numerous methods of desensitization.[8] The remainder of this article focused on the method of sequential patient desensitization using acrylic training plate, emphasized on construction and use in ultimately replacing maxillary teeth in edentulous patient with severe gag reflex.

The success of the soft palate defect prosthesis depends on the functional adaptation of the impression material.[6,11,16] In current case, admixed technique was used in functional contouring of the palatal defect and VP portion. Circumferential reduction of 1-1.5mm of impression material followed by final light bodied elastomeric impression was made. light bodied elastomeric impression material is accurate with minimal dimensional changes during setting.

In edentulous patients, achieving an effective retention by conventional prostheses for the edentulous patients with both hard and soft palate defects is very difficult, if not impossible. This is especially due to the weight of the prosthesis and the inability to obtain a border seal.[17]

In the literature prostheses was made shallow by reducing the bulk from the polished surface, which made the prostheses light-weight and appropriate for speech and deglutition.

The treatment of VP insufficiency requires multidisciplinary approach. Accordingly, a speech pathologist should participate in treatment of these cases to test articulation errors and inappropriate oro-nasal resonance balance.[11] Perceptual and instrumental measures of hypernasality and nasal escape along with a profile of the patient's articulation provide the diagnostician information about the frequency and consistency of VP insufficiency. However, perceptual speech evaluations were demonstrated significant improvements in speech ability and VP function. In the course of time dissatisfaction of patients using definitive obturator increases. It seems that adjustment to an obturator might be a lengthy and changing process that requires close clinical monitoring.[18]

Conclusions

Sophistication in the surgical and prosthetic reconstructions of structural and functional defects in the cranio-maxillofacial region improves the final rehabilitation results. If it is carefully planned, unbiased rehabilitation regimens can be established. In this report, patient with soft palate defect as VP insufficiency was treated successfully by pharyngeal obturator prostheses. It is crucial to rehabilitate these patients with suitable prosthetic management for successful results. The improvements in aesthetics and function are not only essential for the patient's physical well-being, but they also contribute to his/her mental attitude.

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