

“A novel approach for Velopharyngeal prosthetic rehabilitation: Case series.”

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Abstract: Palatopharyngeal dysfunction may take place when palatopharyngeal valve is unable to perform its own closing due to a lack of tissue (palatopharyngeal insufficiency) or lack of proper movement (palatopharyngeal incompetence). Palatopharyngeal insufficiency induces nasal regurgitation of liquids, hypernasal speech, nasal escape, disarticulations and impaired speech intelligibility. Prosthetic management of palatopharyngeal insufficiency requires a close co-operation between an otolaryngologist and a speech pathologist. As a result, the patient can be socially and physically rehabilitated with the improved speech quality as well as prevention of leakage of liquids. This case series describes rehabilitation of two patients with soft palate defect and subsequent velopharyngeal insufficiency by velo-pharyngeal prostheses using novel approach.

Key words:- hinge, speech, Velopharyngeal

INTRODUCTION:

The soft palate acts as a dynamic separator between oral and nasal cavity.¹ The soft palate, lateral and posterior pharyngeal walls form the velopharyngeal (VP) closure so that all of them create a three dimensional muscular valve which is known as VP sphincter.² The VP closure pattern depends on the contraction degree of the sphincter components. Adequate VP closure is required during swallowing and production of all consonants except for the nasal ones.³

Impairment of VP function can be due to insufficiency or incompetency.³⁻⁸ VP insufficiency is distinguished by speech and nasal resonance abnormalities related to defects of the soft palate, which may be congenital as in cleft lip and palate (CLP) or acquired as in palatal tumor resection.⁵⁻⁷ VP incompetence describes dysfunction of an anatomically intact VP mechanism as in patients with neuromuscular disorders.^{3,4,8}

Beumer⁹ described that the reconstructive surgery of acquired soft palatal defects is not indicated because of excessive tissue loss and the need to monitor the tumor site for recurrent disease. Also surgical reconstruction of these defects can result in a deficient, non-functioning

palatopharyngeal mechanism. when surgical treatment is not considered as an option, prosthetic management of VP insufficiency is carried out by means of a pharyngeal obturator, whereas VP incompetence is traditionally managed by a palatal lift prosthesis.^{4,5,7,8}

A pharyngeal obturator is a removable maxillary prosthesis which has a posterior extension to separate oropharynx and nasopharynx.^{5,9} This obturator prosthesis restores the defects of the soft palate and allows adequate closure of palatopharyngeal sphincter.^{5,7} When a pharyngeal obturator is placed, the patient can exhibit adequate separation between the oral and nasal cavities during production of plosives consonants or while blowing with variable intensity.^{10,11} An effective prosthesis will restore speech, allow proper swallowing, and have an acceptable appearance.¹² However, it should have sufficient retention and stability. It is important to note that if the pharyngeal portion of velopharyngeal prosthesis is immobile and fix, it will irritate during the movement of the soft palate. Therefore we report two cases with soft palate defects rehabilitated by velopharyngeal prostheses using hinge joint of the spectacles joining the hard and soft palatal parts of the prostheses.

Case :-1

A 38 year old male patient reported to the department of prosthodontics , GDC&H with chief complaint of nasal regurgitation of fluid.On examination he had a partial soft palatal defect due to surgical excision of tumor (Fig -1). He gave history of radiotherapy before 3 months. He exhibited symptoms of velopharyngeal dysfunction,so a speech aid prosthesis with speech bulb was planned.Entire procedure was explained to the patient and his consent was obtained.

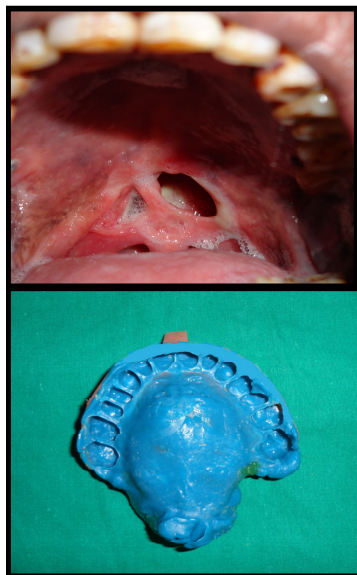


Fig:-1 Intra oral view of defect
Fig:-2 Final impression

Defect was blocked with gauze piece and impression of the maxillary arch was taken using irreversible hydrocolloid impression material. Impression was poured using dental stone type III and primary cast was obtained. Custom tray extending in the defect was fabricated on primary cast with autopolymerizing acrylic resin blocking the area of teeth with wax. Area of the defect was functionally molded using low fusing green stick compound during which patient was instructed to perform various head and neck

movements. Procedure was repeated until the defect was correctly recorded by green stick compound.Wax used for blocking the teeth was removed and final impression record of the defect was obtained by using light body addition silicone impression material(Fig -2). The greenstick speech bulb was relieved to create space for light body material by removing a surface layer. Light body material was added as a thin layer on the bulb and placed in the defect. the contours of the defect were recorded while the patient swallowing, speaking and making a circular head movement.Final impression was checked for proper extension , poured using typeIII dental stone and final cast was obtained.

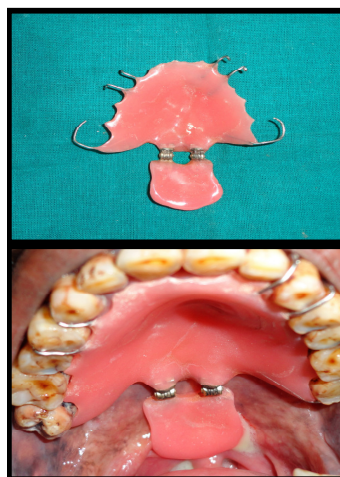


Fig:-3 Final prosthesis
Fig:-4 Final prosthesis in patient's mouth

Clasps were fabricated from 19 gauge stainless steel orthodontic wire for retention of prosthesis.Two parallel lines 1.5 cm in length extending from the posterior part of the hard palate to the anterior part of the soft palate defect were drawn on the final cast using marking pencil. Two hinge joints used in 555 number spectacle frames were checked for their smooth movement and placed on these lines parallel to each other. Separating medium was applied on the cast in two layers and allowed to dry.Autopolymerizing resin was used to prepare the

final prosthesis embedding both ends of the hinge in resin while the joint proper was left uncovered for movement. After complete setting prosthesis was removed from the cast and finishing and polishing was completed(Fig -3). Final prosthesis was places in patients mouth and evaluated for proper extension as well as the movement of the posterior portion with the movement of the soft palate(Fig -4). Patient was asked to seep water and there was no regurgitation. Patient was recalled for follow up every one month for six months .

Case :-2

A 42 year-old female patient reported to the department of prosthodontics , GDC&H with chief complaint of missing upper front teeth. On examination all maxillary anterior teeth were missing and defect in the premaxilla and in the soft palate were present(Fig -5).She had a history of a cleft of the hard and soft palate and suffering from speech difficulty and communication problems. In her medical history, the patient had an operation for restoring the cleft palate during her early childhood. She was talking with soft intensity (ie, volume) to decrease the nasal emissions. Speech difficulty and hypernasality were also detected in the clinical examination. Speech evaluation was performed by speech pathologists that assessed resonance, the occurrence of inappropriate nasal air emission, and articulation. Along with the replacement of missing teeth speech aid prosthesis was planned for this patient. Entire procedure was explained to the patient and her consent was obtained.

Impression procedure was essentially the same as described in the first case(Fig:-6,7). After obtaining the final cast anterior teeth setting and try-in was done. Adams clasps were fabricated from 19 gauge orthodontic stainless steel wire on first molars

bilaterally(Fig:-8). Wax up was completed after placing a hinge joint of 555 no spectacle frame connecting the hard and soft palatal portion of wax(Fig:-9). Flasking was completed making sure that clasps as well as exposed portion of the hinge were completely embedded in the plaster(Fig:-10).

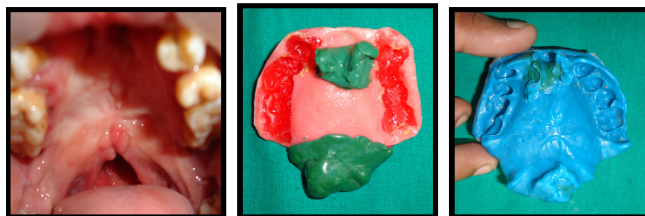


Fig:-5 Intraoral view of defect

Fig:-6 Functional moulding

Fig:-7 Final impression

After the plaster was completely set dewaxing was done(Fig:-11,12). Molloplast-B was placed in the posterior defect of the cast in such a way that the defect was slightly underfilled over this and on the anterior portion of cast heat cure acrylic resin was packed in the dough stage. Flask was closed with counter part ,bench pressed and long curing cycle was followed for acrylization. After the curing and initial cooling process completed , prosthesis was carefully removed from the cast.Final finishing and polishing was done and prosthesis was placed in patient's mouth and evaluated for proper extension(Fig:-13,14,15). Special burs were used for finishing the molloplast-B.Patient was instructed for proper insertion and removal of the prosthesis. She was advised to follow up every one month for six months. Patient was completely satisfied with the prosthesis and there was marked improvement in her speech and pronunciation.

DISCUSSION:

Prosthetic rehabilitation of the patients suffering from VP deficits with obturator prostheses varies according to the location and nature of the defect or deficiency.^{4,5,7,8} There are

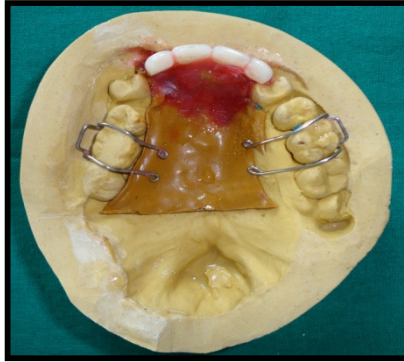


Fig:-8 cast with adams clasps

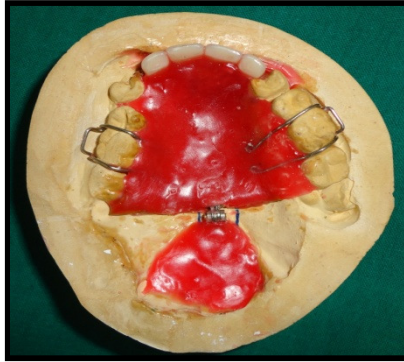


Fig:-9 Complete wax up



Fig:-10 Flasking



Fig:-11 Dewaxing done



Fig:-12 Dewaxing done



Fig:-13 Final prosthesis (intaglio surface)



Fig:-14 Final prosthesis (cameo surface)



Fig:-15 Final prosthesis in patient's mouth

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.^{4,7,8,9}

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.^{5,9,13}

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.^{2,13} Because the movement of the lateral pharyngeal walls is essential for the control of nasal emission, little or no movement of VP mechanism makes it difficult to achieve normal speech with either surgical reconstruction or prosthetic therapy.^{2,4,11,13}

In the literature, several types of prostheses have been described to improve speech ability.^{4,5,7,13,14,15} A pharyngeal obturator prostheses may prevent the hypernasality and/or nasal emission associated with VP inadequacies.^{4,5} In order to obtain adequate VP closure during speech and swallowing a posterior extension is added to prosthesis.^{5,10}

The impression should be examined for contact with the pharynx bilaterally and posteriorly.¹⁰ In this report, patients were 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.⁹ The success of the soft palate defect prosthesis depends on the functional adaptation of the impression material.^{7,9,10} In current cases, low fusing green stick compound was used in functional contouring of the palatal defect and VP portion. Light body addition silicon impression material was added to make the final impression.

Retention of pharyngeal obturator can be obtained by direct and indirect retainers for patients with complete maxillary dentition, as in the first case. Although removable partial denture designs for patients with VP 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.^{7,9,12} 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.^{7,16,17}

The degree of defect affects the functions of the obturator. If the defect includes both soft and hard palate resections, the discomfort in the usage of obturator increases.¹⁸ Most individuals with a history of radiation therapy have poorer satisfaction with obturator function due to their dry mouth.¹⁸

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.⁷ 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.

In this case report we have described a novel approach of using hinge joint of spectacle frame between the hard and soft palatal portions of the prosthesis for better movement of the prosthesis along with the movement of the velopharynx with much less irritation. Most patients have initial concern over whether they will experience a gag response or choke on the prosthesis. Careful explanation of the causes of the reflex and how to control it should be given. Apprehension can be reduced by constant reassurance by the clinician that he or she will be present to recover the prosthesis if there is any distress noted by the patient.

CONCLUSION:

Combining the prosthesis with the patient's compensatory phenomenon may provide an improved quality of life and appropriate and effective velopharyngeal obturation. In this case series, two patients with soft palate defect as VP insufficiency and different oral conditions were treated successfully by velopharyngeal prostheses using a novel

approach of hinge joint. It is crucial to rehabilitate these patients with suitable prosthetic management for successful results.

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