



EVALUATION OF NASALENCE VALUES FOR PRESSURE CONSONANTS AND VOWELS IN PATIENTS WITH PALATAL OBTURATOR AFTER MAXILLECTOMY

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ABSTRACT

Prosthetic management of palatal defects is fundamental to improve patient's life undergoing to a maxillary surgical treatment arising mostly due to direct consequence of surgical treatment of malformations, neoplasms or trauma. The obturators are prosthesis used to close these palatal defects and restore masticatory function as well as improve speech. Obturators preserve the remaining teeth and tissue and provide comfort, function, and aesthetics to the patients. Abnormal nasal resonance and nasal escape of air are sometimes associated with velopharyngeal dysfunction or nasal sound transmission.

Main Objectives: This study examines the nasalance values with and without using palatal obturator after maxillectomy.

Method: An individual 53 year female with hemimaxillectomy of right upper jaw involving hard and soft palate was recommended for palatal obturator by oncosurgery team members. The speech recordings were taken in two situations. a) Without prosthesis b) After using the prosthesis for six week without speech therapy. During these two conditions, Hindi words loaded with pressure consonants (/p/, /b/, /t/, /d/, /k/, /g/) were recorded using praat software version 5.1. Nasometry was also used to measure the nasalance values for pressure consonants followed by vowels (/a/, /i/, /u/) with and without prosthesis using Nasometer II – 6400.

Results: The results indicated that the Nasalance values were reduced with obturator than without obturator.

Conclusion: The nasalance values of speech measured are influenced by the usage of the palatal obturator in case of patients with maxillectomy.

KEYWORDS : Prosthesis, Nasometry, Nasalance values, palatal obturator

INTRODUCTION

The obturator prosthesis has been used to restore masticatory function and improve speech and cosmetics for maxillary defect patients. (1) 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 tissue's support to restore midfacial contour, and an acceptable aesthetic results (2).

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 (3). In 1564 Ambroise Parè called his small obturators "couverts" and only in 1575 changed the name in "obturateur" which is derived from the Latin "obturo" meaning to stop up. In 1634, Johnson 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 general diseases or gunshot wounds. In order to create his obturators Parè filled the cavities with 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 (4). 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 (5). In 1841 Stearn, who had undergone few unsuccessful operations, attempted to construct a new kind of obturator extended 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 nasopharynx at the same time (6). 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.

Abnormal nasal resonance and nasal escape of air are sometimes associated with velopharyngeal dysfunction or nasal sound transmission through the fistula (7). Obturation of oronasal fistulae or residual clefts has been used mainly to improve speech. However, reflux of fluid and food into the nasal cavity has been reported to be the most common complaint (8). Temporary obturation of the anterior residual cleft is most often recommended. The size of the anterior palatal opening had "no exact relationship" to air leakage. Henningson and Isberg (1987) studied the influence of palatal fistulae on speech and resonance in ten patients by temporarily covering with chewing gum and concluded that "hypernasality, weakness of pressure consonants, and audible nasal escape can be caused by an open fistula of the hard palate, even when the fistula has a small area". (8)

Objectives of the study:

To investigate the nasalance values of pressure consonants

(/p/, /b/, /t/, /d/, /k/, /g/) as well as vowels /ɑ/, /i/, & /u/ with and without using palatal obturator in patients treated with hemimaxillectomy.

METHOD

Participant: An individual aged 53 year female with large hemimaxillectomy defect involving hard and soft palate served as participant of the present study. She was recommended for palatal obturator by the oncosurgery team members. On evaluation, she was diagnosed to have hypernasality, nasal emissions and misarticulations. Palatal obturator to the anterior portion of the hardpalate was given with a two weeks time to get adjusted to it. Then, based on the feedback from the participant and perceptual analysis of speech, modifications were done. Recordings of the speech samples were done before fitting the palatal obturator and after using for six weeks.

Stimulus and Recordings for Acoustic Analysis:

Recordings of the speech samples were done under two circumstances: a) Without prosthesis b) After using the prosthesis for six week period. Six weeks of time was given to get adapted to the prosthesis. During these two conditions, 16 meaningful Hindi words loaded with stop consonants (/p/, /b/, /t/, /d/, /k/, /g/) were recorded using PRAAT 5.1 software version and the same software was used to extract the acoustic measures of speech.

The participant was seated comfortably in a sound leak proof room and was asked to repeat the stimuli at a comfortable level. Nasometry was used to measure the nasalance values for pressure consonants (/p/, /b/, /t/, /d/, /k/, /g/) followed by vowels (/ɑ/, /i/, /u/) with and without prosthesis using Nasometer II – 6400.

Analysis

Analyzing the nasalance in speech.

RESULTS AND DISCUSSION

The present study intended to study the nasalance values of the individual with and without obturator with hemimaxillectomy. Comparison of nasalance values without (condition a) and with palatal obturator (condition b).

Table 1: Nasalance values in condition -- (a) & (b) in the vowel contexts /ɑ/, /I/, /u/.

Subject	Mean nasalance values in CV syllables - C(α)						Mean nasalance values in CV syllables - C(i)						Mean nasalance values in CV syllables - C(u)					
	/p/	/t/	/k/	/b/	/d/	/g/	/p/	/t/	/k/	/b/	/d/	/g/	/p/	/t/	/k/	/b/	/d/	/g/
condition a	49	58	64	46	26	26	62	51	57	64	83	90	61	55	63	47	85	91
condition b	32	30	30	41	25	34	31	50	52	60	36	44	43	70	74	60	85	56

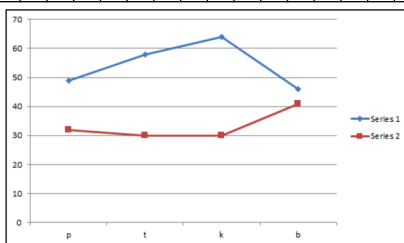
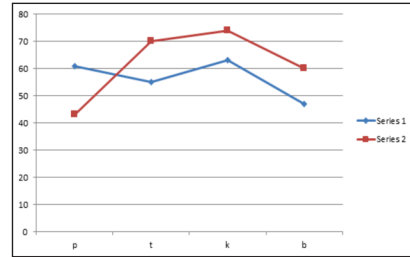
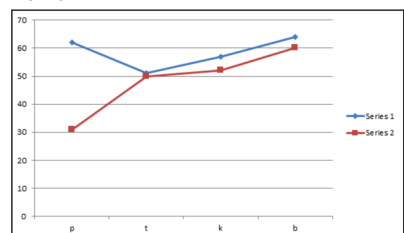


Fig 1: Nasalance values in conditions (a) & (b) in the vowel contexts /ɑ/, /I/, /u/



The changes in nasalance values associated with condition of obturation are presented in Table 1 and Figure 1. A significant decrease in the nasalance values with obturator was noticed for the pressure consonants and in the vowel contexts of /ɑ/ and /i/. However in the vowel context of /u/ inconsistent differences were noted across the stimuli. The reduction in the nasalance values with the obturation can be attributed to the improved oral resonance caused by separating the nasal and the oral cavities with the palatal obturator, and also improved velopharyngeal closure. These findings are supported by D' Antonio et al. (1993) who concluded that temporary occlusion of a palatal fistula may improve velopharyngeal closure and reduces the hypernasality.(9) Zimmerman, et al (1997) also stated that sustained palatal obturation of fistula will reduce the perceived hypernasality in speech.(10)

CONCLUSION:

The present study explores the effect of palatal obturator on nasal tonicity of voice seen in patients with hemimaxillectomy. The use of obturator reduced the nasality in speech. With the obturator overall, the results were encouraging as the participant was achieving better quality of speech by using the palatal obturator. However, the analyses of the same parameters are required after the participant is completely rehabilitated using implant supported prosthesis and attends speech therapy.

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