Considerations of Speech in Various Prosthodontics Rehabilitative Procedures: An Insight View

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Abstract

Speech is a very sophisticated autonomous and unconscious activity. Speech in matured man is a learned habitual neuromuscular pattern, which makes use of anatomical structures, designed primarily for respiration and deglutition. Because oro-dental morphological features also may influence an individual speech, the dentist should therefore recognize the possible role of prosthetic treatment on speech activity. The loss of teeth and supporting structures alters the main articulatory cavity and produces a marked effect on the speech pattern proportionate to the location and magnitude of alterations. An empiric approach to the phonetic factor in denture construction frequently places the burden for compensating for speech changes for the adaptability of the tongue.

Keywords: Speech, Prosthodontic, Rehabilitations, Complete Denture

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Introduction

Corrections of faulty speech is the primary task of the speech specialist, but the complexity of the voice producing mechanism implores the services of the allied health sciences successful treatment of defective speech usually requires close cooperation between the speech therapist and the practitioner in some branch of the medical or dental professions. A missing bicuspid will permit a lateral emission, which is intolerable to the precise speaker or singer.[1-4] A missing anterior tooth will permit an anterior emission, which impairs speaking until an accommodating articulations pattern in learned. Gross removal of gingival tissues denies the tongue its usual soft tissue contact and because a potential escape of the air stream between the interspaces of the exposed root portions of the teeth. Mechanical movement of the tooth or teeth in the maxillary arch, will increase or decrease the area for speech articulations. Speech rehabilitations following dental treatment is an obligations of the profession, and failure to include phonetics in the dental curriculum is not coincident with the high standards established by dental educators to provide maximum health service.[5-9] The poorly contoured replacement for a single tooth can cause speech impediment, and larger prosthetic restorations fabricated without regard for speech articulations will impair speech articulations will impair speech until an accommodating articulations pattern is learned. A very high percentage of the English speaking sounds are produced by contact of the tongue with some portions of the palate and teeth. Since these contact areas are either replaced or covered by the complete denture, speech rehabilitation for the edentulous patient becomes the serious task of the prosthodontic. Failure to contour the palate to accommodate normal tongue contact usually results in poor speech for a period of several days or several weeks, depending upon the amplitude of the patient and the discrepancy in the palatal contour. This inarticulate period, generally accepted as “getting used to denture”, could be markedly reduced or completely eliminated if proper attention were given to palatal contour at the time of the waxed trial denture try in. Faculty speech is never desirable, even for a short period of time. It is unpleasant for the listener, embarrassing to the patient, and adds to the burden of adaptation is dentures. Contour of the palate for proper tongue.[10-16] Contact is not difficult, time consuming, or expensive, however it does require some knowledge of the fundamentals of phonetics and a precise knowledge of the normal tongue contact areas for speech articulation.

Neurophysiological Background

A very complex neuro-physiological mechanism governs the production of speech. A large number of oral mechanosensitive receptors (tactile and kinesthetic) are involved in its molar control. Therefore, all prosthodontic treatment will, more or less, have an influence on speech performance because a great number of these structures will be involved. Speech production includes large number and sequences of innate and learned motor acts produced in sequences of 12-16 sounds/sec in a rhythmic behavior. It has been hypothesized that less cortex area is required for processing of skills as they become automatic. Once automatized, speech control becomes localized in certain areas such as the pre-motor and motor cortex. For the precise movements executed in speech production the pyramidal motor system has the primary role.[17-19]

Feed back plays a dynamic and flexible role in the control of most motor events, including sequencing and timing of speech movements, there seems to be a subconscious but learned type of pattern recognitions, or feedback, of afferent information's used is guide central pattern generator (CPG's) and a central program. Other neural networks are also very active in the rapid transformations of the shape of the oral cavity from one fixed configurations to another. Proprioceptive mechano-sensitive afferents will establish the timing of certain aspects of the very fast motor pattern and will, in synergy with cortical information, generate the final motor output and rhythm. A precise co-ordination between different articulators is essential for the final sound production. A prerequisite for the satisfactory speech sounds and adaptation in an intact general feed back system, with auditory feed back regarded as a every important mechanism. When impaired hearing is present, speech production will deteriorate. Adaptation after an oral rehabilitation also may create problems in the formation of new neuromuscular pathways.[20-26]

Components of Speech

Respiration: During respiration, inhalations and expirations are approx, equal in duration and the airflow and regular and repetitive. During speech, however, the inhalation phase is shortened and the inhalation phase in prolonged and not repetitive.

In normal discourse, the volume and pressure of the expelled air is comparable to the vegetative breathing. Upward movement of the diaphragm with contraction of the costal cartilage and contiguous musculature creates an intrapulmonary pressure which is greater than atmospheric pressure, the permitting air to be expelled from the lungs. Prolongation of exhalation is achieved by the valve mechanism along the laryngeal, pharyngeal, oral and nasal components of the respiratory tract these valves impede the expired air and help to create speech signals. Subglottic pressure is maintained by the balanced elasticity between the inspiratory intercostals musculature and the expiratory abdominal musculature. If the vital capacity of lungs is compromised, as in emphysema, speech will be perceived as "breathy". The poor projections of the voice, in such cases are due to the reduced volume and pressure of the expired air.

Phonation: The larynx provided the first level of constrictions for controlling the respiration air stream. The primary function of vocal cords is to protect the lungs and the lower respiratory tract from inhalation of particulate matter. This mechanism requires a simple, forceful approximation of the vocal folds. Speech, conversely, requires a multitude of positions, varying tensions and vibratory cycles, and an intricate co-ordination of the vocal folds with other structures. If the vocal folds are partially or completely adducted or closed, they impede the expired air. With the proper degree of tension and sufficient sub-glottal pressure, the vocal cords may set in vibration and thus impart phonation to air stream. Where as phonation is essential for certain speech sounds, other speech signals do not require phonation, hence, the vocal folds are abducted or open. The tension and position of vocal folds will, in part, determine the pitch of the phonated sound. In the production of low pitched sounds, the vocal folds are relatively thick and flaccid. In high-pitched sounds, the margins of the approximated folds are thin and tense.

Resonation: The sounds produced at the level of vocal folds, is not the final acoustic signal with is perceived as speech. This sound is augmented and modified by the chambers and structures above the level of glottis. The pharynx, the oral cavity and the nasal cavity act as resonating chambers and the structures above the level of glottis. The pharynx, the oral cavity and the nasal cavity act as the resonating chambers by amplifying some frequencies and muting others, thus refining tonal quality. The pharynx being a muscular tube, services as a excellent resonating chamber. This tube is formed by 3 closely associated muscles namely: - inferior, middle and superior constrictor. These muscles are unique in that they share common insertions, the medial pharyngeal raphe, but have a different anterior origin. Also, it appears that each muscle constrictor, as well as portions of each muscle can contact selectively. The dimensional changes imparted by this muscular action influence the resonant characteristics of the pulsating air stream as it emerges from the larynx. The velopharngeal mechanism proportions the sound and / or air stream between the oral and nasal cavities and influences voice quality (or the basic sound) that is perceived by the listener. If velopharangeal closure is compromised, or if the structural integrity or relative size of the oral, pharyngeal or nasal cavities has been altered, voice quality can be compromised.

Articulation: Amplified, resonated sound is formulated into meaningful speech by the articulators, namely, the lips, tongue, cheek, teeth and palate, by changing the relative spatial relationship of these structures. The tongue is considered to be the single most important articulator of speech because of its ability to affect rapid changes in movement and shape. The tongue may impede, selectively restrict, and channel the air stream with precise contact against the teeth and palatal areas, thus articulating the basic laryngeal sound, or the non-phonated air stream, into recognizable speech. If oral structures such as the tongue, adjacent soft tissues, jaws or lips, are altered surgically and / or neurologically, articulation may be compromised.

Neural integration: Speech is integrated by the central nervous system both at the peripheral and central level. The sequential and simultaneous movements required throughout the speech complex demand precise co-ordination. Neurologic impairments may compromise, a specific component of the speech mech. such as the vocal folds, soft palate or tongue, or it may indirectly effect the entire speech system. A cerebrovascular accident may compromise the ability of the patient to comprehend and / or formulate meaningful speech, even though all structures used to produce speech are anatomically with in normal limits**.** In addition, a neurologic impairment may produce a specific type of speech deformity. Example: The loss of motor innervations to the soft palate may compromise elevation and velopharangeal closure.

Discussion

The sounds b, p and m are made by contact of the lips (as shown in Fig. 6). Insufficient support of lips by teeth and / or denture base can cause these sounds to be defective. Therefore, the anterior-posterior position of the anterior teeth and the thickness of the labial flange can affect the production of these sounds like wise an incorrect vertical dimension of occlusion (VDO) or teeth positioning hindering proper lip closure, might influence these sounds. The labio-dental sounds f and v are made between the upper incisors and the labio-lingual center to the posterior third of the lower lip (as shown in Fig.7). If the upper anterior teeth are too short (set too high up), the V sound will be more like an 'f'. If they are too long (set too far down), the f will sound more like a v. If upper teeth touch the labial side of the lower lip while these sounds are made, the upper teeth are too far back in the mouth. In this situation, the relationship of the inside of the lower lip to the labial surfaces of the teeth should be observed while the patient is speaking. If the lower lip drops away from the lower teeth during speech, the lower anterior teeth are most probably too far back in the mouth. If, on the other hand, imprints of the labial surfaces of the lower anterior teeth are made in the mucous membrane of the lower lip, or if the lower lip tends to raise the lower denture, the lower teeth are probably too far forward, and this means that the upper teeth are also too far forward. Alveolar sounds (eg. t, d, s, z, v & l) are made with the valve formed by contact of the tip of the tongue with the most anterior part of the palate (the alveolus) or the lingual sides of the anterior teeth (as shown in Fig. 9). The sibilants (sharp sounds) s, z, sh, ch & j (with ch & j being affricatives) are alveolar sounds, because the tongue and alveolus forms the controlling valve. The important observations when these sounds are produced are the relationship of the anterior teeth to each other. The upper and lower incisors should approach end to end but not touch. A phrase such as "I went to church to see the judge" will cause the patient to use these critical sounds, and the relative position of the incisal edges will provide a check on the total length of the upper and lower teeth (including their vertical overlap). The exact measurement of the natural vertical dimension is most essential in the successful practice of many phases of dentistry. It has been found that the greatest cause of full denture difficulties is the failure to duplicate the normal vertical dimension. In occlusal reconstruction, many fine dentists have found, through experience that increasing the vertical dimension for patients with supposedly shortened vertical dimension ended in failure.[27-32]

Also it is proved scientifically by the speaking method that vertical dimensional must not be increased. Those dentists who reconstruct the occlusion of patients will generally find that failures can be avoided by completing the treatment without the increase of vertical dimension. If this dimension should be increased, this treatment must be based on scientific proof and not on the opinion of the operator. The patient is seated in an upright position without the use of the headrest, with the eyes forward, and the occlusal surface of the upper posterior teeth parallel to the floor. The measurement is taken under identical conditions of posture and vigor of speech. The head must not tilt forward or backward and the patient should speak rapidly in a calm and relaxed manner. A particular observation must be made that the patient does not consciously control the movement of the mandible, as any variation from normal might affect the measurements. Direct the patient to close into centric occlusion, with the upper and lower teeth together in maximum occlusal contact. Draw the centric occlusion line with sharp pencil on a lower anterior tooth at the horizontal level of the incisal edge of the opposing upper anterior tooth. Have the patient say “yes” and while the phonetic sound s is being pronounced, draw the closest speaking line on the same lower anterior tooth at the horizontal level of the upper incisal edge. The distance between the centric occlusion line (lower line) and the closest speaking line (upper line) is called the closest speaking space. This closest speaking space is the measurement for vertical dimension. It is always advisable to measure the closest speaking space of all full denture patients at least once a year until it is found that there is an end to discomfort and perhaps to alveolar shrinkage or wear of the artificial teeth. If the closest speaking space remains constant in the full dentures, it is simple to duplicate this same vertical dimension when registering the maxillomandibular relation of new dentures, with the additional help of tattoo dots on the alveolar ridges. The closest speaking space to measure the vertical dimension in this speaking method must not be confused with free way space of the centric relation method. The free way space establishes vertical dimension when the muscles involved are at complete rest, and the mandible is in its rest position. The closest speaking space measures vertical dimension when the mandible and muscles involved are in the active full function of speech.

Conclusion

Speech difficulties as sequelae of oral rehabilitation with complete dentures are generally a transient problem. When encountered the difficulties may not be easily solved. Therefore efforts should be made to avoid them by pretreatment records or assessment of speech and provision of information to patients about likely initial deviation from normal speech, immediately following oral rehabilitation. In the past speech therapist have been expected to undertake the diagnosis as well as the management of ones who suffer from speech disorders. Yet a high proportion of children or people referred to speech therapist suffer from diseases which directly affect the structure and function of lips, tongue and palate, or they suffer from conditions which are the primary causes of their speech difficulties, e.g. Mental defect or hearing loss, many show psychiatric abnormalities which may be primary or secondary to their speech defect. Therefore it is important that the assessment of the person should be regarded as one that merits a team approach, though the team may differ in content according to the nature of the child disability – with the speech therapist as the constant member of the team. In maxillofacial prosthetics, the clinician may have responsibility of reestablishing velopharyngeal integrity to provide the potential for acceptable speech. The largest group of patients with defective speech is the patients with congenital clefts of the soft palate. Most acquired soft palatal defects result from surgical resection of neoplastic disease/ trauma. Prosthodontist play an important role in restoring speech in these patients by giving palatal; lift prostheses.

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