

Phonetics in Dentistry

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ABSTRACT

The proper knowledge of speech production and phonetic parameters will enables the clinician in fabrication of dentures with good phonetic capabilities. In achieving the optimum phonetic potential by providing correlation among three key objectives i.e. (mechanics, aesthetics and phonetics) of dentistry is the eventual goal of every dentist. This article provides a correlation between occlusion and speech, since the time these two factors are mostly not considered related to each other. But during phonation, the lower teeth functions independently and there remain no contact with upper teeth. This article also highlights the basic utilization of phonation as an indispensable part in placement of upper anterior teeth in complete and partial denture rehabilitation. This is basically because, while restoring natural teeth, we may have to depend on pre-extraction records in order to achieve necessary objectives. And if these records are missing, it is difficult to determining the position of artificial teeth. Hence here, we use phonetics as a guideline for proper placement of artificial teeth.

KEYWORDS: Dentistry, Esthetics, Phonetics

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INTRODUCTION

The Proper knowledge of phonetics enables a dentist for fabrication of prosthesis, which encounters the key objective of oral rehabilitation.¹⁻³ Hence, this article focuses on the significance of teeth arrangement on phonation. This article also focuses a bit on the utilization of phonetic parameters for teeth arrangement.⁴⁻⁵ Our Voice is mainly produced in the larynx and modified by the tongue by continuously altering the shape, position and by contacting lip, teeth, alveolar processes, hard palate and soft palate.⁶ Voice generated by larynx is divided into two air streams- upper and lower by the velum. The upper air stream is used to pronounce the sounds like “N”, “M” and “NG”. Resonance of voice and all other sounds are produced by the lower air stream as it strikes to palate and gets altered by the oral structures.⁷ The Normal functioning of speech is mainly inveigled by five aspects which are as follows:

- Motor: Consists of lungs and associated muscle and which supplies air.
- Vibrator: Consists of vocal cord and which offers pitch to the voice.
- Resonator: Consists of oral, nasal, pharyngeal cavities and para-nasal sinuses, which creates a tone and is specific for each individual.
- Enunciators and Articulators: Consisting of lips, tongue, soft palate, hard palate and teeth, which form musculoskeletal valves to control the amount of air passage
- Initiator: motor speech area of brain and nerve pathways, which convey motor speech impulses to speech organs.^{8,9}

Here the main concern is changing the stream of air passing through the oral cavity. Lips, tongue, soft palate, hard palate and teeth, which

forms the musculoskeletal valves to control the amount of air passage are more vital to us.¹⁰ Amongst all this, the tongue plays a major role in pronouncing the consonants by making contact with specific parts of oral cavity like teeth, alveolar ridge and hard palate. These structures are replaced by dentures when the person becomes edentulous and hence the dentist should have utter knowledge of speech production and phonetic parameters with the aim of fabricating the phonetically good dentures.¹¹ The consonants which are relevant to clinician can be classified according to the anatomic structures involved in their productions:

- Palatolingual sounds - produced by tongue, hard palate or soft palate.
- Linguo-dental sounds - produced by tongue and teeth.
- Labiodentals sounds - produced by lips and teeth.
- Bilabial sounds - produced by lips.

OUTCOMES OF PHONETICS

Speech is vital to human activities. Thus, phonetics must be considered with mechanics and aesthetics, as a cardinal factor which contributes to a successful dental prosthesis. The following are few considerations which dentists should bear in mind while planning for fixed or removable prosthodontics rehabilitation.

Using Phonetics to Position and align the Upper Anterior Teeth:

During the teeth arrangement for complete or partial dentures, formulating the exact position of upper anterior teeth is an essential task

because arrangement of these teeth determines the position of the rest. As briefed by Robinson, when a patient is pronouncing “S”, “SS”, “F” and “V” sounds, the incisal edges of maxillary central incisors should contact to vermilion border of lower lip at the junction of moist and dry mucosa and this position is referred as “F” position.^{3,12} The correct position of the maxillary anterior teeth cannot be established until the lower anteriors are placed in the exact “S” position and satisfactory phonetics, lower lip support, esthetics and anatomic harmony is achieved.⁵ The position of tongue and its relation with teeth are also crucial at this stage when the patient pronounces “S” and “SS”, there should be enough space present for the tip of the tongue to protrude between the anterior teeth and at the same time when the patient repeats “Emma” and “Mississippi” the upper and lower teeth should not contact.³ Pronunciation of labiodental sounds like “F” and “V” are also used to determine the accurate occlusal plane. These letters are produced by the air stream being forced through a narrow gap between lower lip and incisal edges of upper anterior teeth. If the occlusal plane is set too high the exact positioning of lower lip may be difficult. On the other hand, if the plane is too low, lip will overlap labial surfaces of upper teeth to a greater extent which is required for normal phonation and the sounds produced may be affected.^{6,7}

Using Phonetics to Position and Align the Lower Anterior Teeth:

Positioning of the lower anterior teeth should always be associated with that of the upper anterior teeth. If the upper anterior teeth are placed incorrectly, then lower anteriors as well as the entire posterior teeth placement will be incorrect. The key to this crucial bond is usually known as “S” position. This “S” position is

offered by setting incisal edges of four lower anterior teeth slightly lingual to labial edges of upper incisors teeth with a space of 1 - 1.5 mm when “S” or “Z” is pronounced. This position is most protruded position of mandible ever seen during speech and the most intimate or closest contact of any teeth during speech.^{4, 5} The method is not only helpful for the functional positioning of anterior teeth for complete dentures, but also for locating the incisal edges of maxillary and mandibular anteriors for fixed and removable partial denture rehabilitation.

Using Phonetics to Position and Align Posterior Teeth:

Every effort should be made to give them enough space for dorsum of the tongue to make contact with palatal surfaces of upper posterior teeth during articulation of consonants such as “T”, “D”, “S”, “N”, “K” and “C”, because if the teeth are set to on an arch which is too narrow then the tongue will experience spasm affecting the size and shape of the air flow.^{6,7}

Using Phonetics to Determine the Class of Occlusion:

Determining the vertical dimension and centric relation are critical steps in denture construction. By using technique suggested by Pound, we can precisely record the patient’s class of occlusion, vertical dimension, centric occlusion and incisal guidance.⁴ This technique involves to determining the “S” position as previously mentioned. From this mode, allow the patient to relax in the hinge position and note the amount of retrusion. The sum of movements will indicate the patient’s occlusion and also when closed at this position we will be able to make conclusion about the patients original vertical dimension. If there is 2 to 3

mm of retrusion, the incisal edges of lower anterior teeth will be seen close to the cingulum of the upper anterior teeth. Henceforth this will automatically adopt a class - 1 occlusion. If there is distal movement of anterior teeth of more than 3mm for the “S” position, the incisal edges of lower anteriors will be distal to cingulum of upper anteriors and many a times may be against the palatal soft tissues assuming a class -2 relation. If there is no distal movement from the “S” position the incisal edge of lower anteriors will be positioned in edge to edge relation, therefore assuming a class -3 relation.^{4,5}

Using Phonetics to Record the Maxillo-mandibular Relationship:

Speech is used as an aid in the various ways to record maxilla-mandibular relation. Silverman's closest speaking space measures vertical relation of the mandible in the phonetic method.^{13,14} The closest speaking space calculates the vertical relation when the mandible and its muscles are involve in physiologic function of speech. The occlusal rims are located in the mouth and the height is adjusted until the minimum space exists between the maxillary and mandibular occlusal rims when the patient pronounces the letter “S”. Vertical dimension can also be quantified in the physiologic relax mode, by asking the patient to pronounce letters “P”, “B”, or “M”, but with “P” and “B”, lips part quite effectively that the resultant sound is produced with an explosive effect, while in the “M” sound, the lip contact is passive. Due to this, “M” can be used as an aid to obtain correct vertical height by guiding the patient's mandible to the rest position.⁶ In an added technique, we have to engage the patient in a conversation that will divert his concentration from conscious participation in the procedure. A gap in speech followed by

relaxation will automatically guide the mandible to its relax position. At this prompt, we measure the distance between two formerly marked points that will provide an amount of vertical dimension at relax.³

Using Phonetics during a Try-in Appointment:

The use of phonetics in a try-in appointment is more cherished, since teeth have been arranged and wax has been contoured appropriately. Looking for the correct placement of the teeth assists in classifying errors before final acrylization. Instruct the patient to say “33”; there should be space between the anterior teeth to allow for the thrust of tongue. When the patient pronounces the word “Emma”, there should be no contact of the teeth. When the patient pronounces “55”, incisal edge of the maxillary central incisor should contact the vermilion border of the lower lip at the junction of the dry and wet mucosa without tooth meddling posteriorly. When “Mississippi” is pronounced, there should not be any contact of teeth.¹³

Phonetics as it is Related to Denture Thickness:

One of the reasons for inappropriate articulation of speech is decreased air volume and loss of tongue space in the oral cavity, which occurs usually due to thick dentures. Most significant is the thickness of denture base covering centre of the palate, since creation of palatolingual sounds involves contact of tongue with palate and alveolar process of teeth. With the consonants “T” and “D”, tongue makes firm contact with the anterior part of the hard palate and suddenly drawn downwards to produce an explosive sound. When pronouncing letters “S”, “C”, “Z”, “R” and “L” sounds, contact occurs

between tongue and most anterior part of hard palate. In case of “S”, “C” and “Z” sounds a slit like channel is formed between tongue and palate through which air escapes. If denture base is made too thick in these areas, the air flow will be obstructed that eventually causing impairment in the sounds.⁶ According to laughter, smoothness of the denture gets disturbed and without producing rugae at anterior part of the hard palate, the tongue loses its capacity for positioning.¹⁵ This is because of while pronouncing palatolingual sounds, tongue must be placed firmly against anterior part of the palate. A denture, which has a thick border at posterior palatal seal area, or posterior edge finished in square instead of chamfered, will be irritate the dorsum of the tongue resulting in faulty articulation of speech. In some cases, the denture may become unseated further blighting the speech. Careful evaluation in these situations will be reveal the dentures rise and fall with the tongue movements during speech.⁶

Speech Problems at the Time of Denture Delivery:

In spite of taking enormous care in recording maxilla-mandibular jaw relations, proper placement of occlusal plane and arranging anterior and posterior teeth in their accurate positions, speech problems do exist at times of final denture delivery. This is due to the manner in which speech problems are assessed during the trial stage, because the tongue and lips interact in a different manner with wax (used during the trial stage) associated with the finished dentures. Another reason is the copious salivary flow often associated with insertion of new dentures, which alters the speech. Usually, adaptableness of the patient is sufficient to attain adequate speech.^{6,7,16} The most common phonetic problems come across during denture insertion and their causes are:

- Whistling when “S” is pronounced: The anterior part of the tongue is obstructed by the upper premolars making a groove too large for the escape of air.
- Lipping when “S” is pronounced: The air space is too small thus the palatal part of the denture must be made thinner.
- TH and T sounds undistinguished: There is inadequate inter-occlusal space, or the anterior teeth are too far lingual and must be moved labially.
- In the normal F and V sounds; the upper anterior teeth contact the lower lip at its highest point: If these sounds are undistinguished, the upper incisors must be moved either vertically or horizontally to the proper position.³⁻⁵

Phonetics Considerations in Esthetic Dentistry:

In our modern competitive society, a pleasing appearance often means the difference between success and failure in both personal as well as professional lives. Since the mouth is one of the focal points of the face; smile plays a major role to indicate, how we perceive ourselves as well as the impress people around us. The smile depends on the oral musculature and the existence of teeth, but every person is not blessed with a beautiful smile. The solution for preceding problem is esthetic dentistry which has developed the latest technologies and materials. The dentist is the best individual to evaluate the smile and is capable of altering the quality of the smile with available advanced techniques and materials. So before we proceed to change the smile, we need to analysis of its quality. Moreover, analysis of the smile includes a study of facial features and lip movements in line with the tooth using facial, dento-labial and phonetic parameters, in order

to achieve the optimal and final esthetics. Successively dental and gingival aspect completes esthetic analysis. Careful evaluations of these parameters allow clinicians to create the restorations that are integrated not only in the oral cavity, but also in relation with patient's facial look.¹⁷ Tooth visibility in relax position and mouth slightly opened and lips relaxed varies with age. Facial esthetic value depends to a great extent on tooth display in vertical dimension of the rest, which can be observed during speech; with ease. According to the degree of muscle slackness and level of lower frontal plane, one will notice either maxillary teeth a characteristic of youth, or mandibular anterior segment, which by loading the facial third and suggests the age and disdain. It is compulsory to understand these parameters such as tooth visibility before any restorative processes, from full mouth rehabilitation to one limited to anterior segments are carried out. The preliminary determination of the level of the lower frontal plane and its coordination with the horizontal restraints of the vestibular frame represents a necessary step in any esthetic restorative procedure. It will reveal the key of esthetic elements for future reconstruction aimed at promoting a rhythmic symmetry in the dento-facial composition.^{18,19}

CONCLUSION

With the increased tendency to arrange the anterior teeth in an irregular mode, dentist must be aware of the consequences to phonetic impairment. Therefore, the appropriate measures must be taken to correct phonetic problems. Finally, if speech problem persists in spite of providing the patient with phonetically correct dentures, then dentist must contemplate the patient's level of education.

REFERENCES

1. Kessler HE. Study of tongue patterns is clue to better speaking dentures, *Dental Survey* 1958;34: 1015-1017.
2. Herbert S. Phonetic capability as a function of vertical dimension in complete denture wearers – a preliminary report. *Journal of Prosthetic Dentistry* 1970;23(6): 621-632.
3. Moustafa AH. *Clinical Complete Denture Prosthodontics, Post Insertion Denture Problems*, 1st edition. King Saud University 2004;388.
4. Pound E. Utilizing speech to simplify a personalized denture service. *Journal of Prosthetic Dentistry* 1970;24(6): 586-600.
5. Murrell GA. Phonetics, Function and anterior occlusion, *Journal of Prosthetic Dentistry* 1974;32(1): 23-31.
6. Liddel FG. *Clinical dental prosthodontics: Phonetics*. Butterworth and Co, Ltd. Publishers 1989; 136-139.
7. Rothman R. Phonetic considerations in denture prosthesis. *Journal of Prosthetic Dentistry* 1961;11(2): 214-223.
8. Kessler H.E. *Speech Considerations in Denture Construction*, *Dental Survey* 1954 ;30: 1570-1572.
9. Kessler H.E., 1957. Phonetics in denture construction, *Journal of American Dental Association*, 54: 347-351.
10. Landa JS. *Practical full denture prosthesis*. London: Dental Items of Interest Publishing Co 1954;311-329.

11. Allen LR.Improved phonetics in denture construction.Journal of Prosthetic Dentistry 1958;8: 753-763.
12. Robinson SC.Physiological Placement of Artificial Anterior Teeth.Canadian Dental Journal 1969;35: 260-266.
13. Heartwell CH, Rahn AO.Syllabus of Complete Denture, Recording Maxillomandibular.4 th Edition: 279.
14. Silverman MM.Determination of Vertical Dimension by Phonetics.Journal of Prosthetic Dentistry 1956;6: 465-471.
15. Slaughter MD.Speech correction in full denture prosthesis.Dental Digest 1954;51: 242-246.
16. Pound E. Esthetic dentures and their phonetic values.Journal of Prosthetic Dentistry 1951;1(2): 98-111.
17. Goldstein RE.Change your Smile.3rd edition.Chicago:Quintessence 1997
18. Chiche GJ,Pinault A. Artistic and scientific principles applied to Esthetic Dentistry, Esthetics of anterior fixed prosthodontics;Quintessence Publishing Co. Inc 1994:21-22.
19. Rufenacht CR.Principles of Esthetic Integration.Principles of Esthetic Setup;Quintessence Publishing Co. Inc 2000: 217-218.