The speech ability on maxillary denture wearer: a systematic review

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Abstract

Objective: Getting information about on influence of denture bases design on speech ability on maxillary denture wearer.

Methods: Electronic search in PubMed and Wiley online library databases to find articles that were published in last 20 years; between January 1998 to December 2017 with keywords "denture bases" and "speech". The articles were then selected by reviewing the title and abstract.

Result: The initial search obtained 52 articles. Then selected by involving the inclusion criteria. Finally, it gain 2 articles only that suitable with the inclusion criteria.

Conclusion: Speech ability is usually not the main complain of denture wearer. Subjects with inappropriate design of the prosthetic base, disposition of artificial teeth and functional quality (retention, support, stability) have dyslalia when pronunciation of separate phonemes is changed.

Keywords: Denture bases, Speech

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Introduction

Human speech is a result of the following physiological processes: respiration, phonation, resonance, speech articulation, audition, neurological function, emotional behavior.¹⁻³ The voice of each person is unique and is generally determined by the size of the resonator system (oral cavity, larynx, pharynx, vocal folds, nasal sinus), which vibrates at different frequencies, producing various sounds.^{1,4} The voice quality is characterized by speech intelligibility (relationship between the voice pitch, volume, timbre and speech speed). Changes in the oral cavity resulting from the loss of teeth and the resorption of the processus alveolaris maxillae or the processus alveolaris mandibulae, may cause defects in the patient's voice and speech. One of the most frequent phonetic distortions is lisping.⁵ Omission, substitution, distortion, addition and nasality are also possible when improper and functionally low quality dentures are used.^{5,6} Restrictions or alterations of the normal mandibular movement may impede the transmission of acoustic energy through the oral cavity, thereby affecting both oral resonatory characteristics and oral/nasal resonance balance.⁶ The phonetic adaptation of the patients with complete dentures depends on selection and placing of the artificial teeth, the thickness, size and placement of the maxillary prosthetic base, the optimal space of the tongue, individual adaptation capacity, patients sound recognizing capacity, Effective

speech requires teeth. Proper positioning of the artificial teeth, appropriate design and functional quality of dental prostheses, small changes in the prosthetic field and full adaptation to the foreign body, the dental prosthesis in the oral cavity, are important factors speech intelligibility.^{2,4,5-9}

The position of artificial teeth is a very important factor influencing the voice quality after the insertion of dental prostheses. It is proved (1 that the dental consonant /s/ is mispronounced phonetic articulators as tongue position and a narrow stream of air across the incisal edges. Therefore, this phoneme is often used for phonetic tests when the front artificial teeth are mounted.^{2,4,5}

The anatomical orientators of the location of natural teeth is a very important factor when setting up the anterior teeth. Many authors believe that the incisal papilla and the rugae palatina are the most reliable orientators because resorption of the alveolar bone does not affect them.^{1,4,6}

Resonance is one of the most important characteristics of the human speech. The resonance depends on the age, gender, spoken language, phonetic environment of the pronounced sounds, models and speech conventions.^{8,9}

Tooth loss affects multiple parameters. In particular, prosthetic dentistry has put special emphasis on patient-centered assessments such as quality of life and satisfaction with dentures. Therefore, the outcome of dental rehabilitation is strongly influenced by the patients satisfaction with the

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dental situation in everyday life with oral function related such as the ability to properly articulate.⁹

Methods

This systematic review was written according to the guidelines of Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) for reporting studies evaluating healthcare interventions. Population, Intervention, Control, Outcome question (PICO) of the present systematic review was: influence of denture bases design on speech ability on maxillary denture wearer.

Inclusion Criteria: articles in English, any research study published between January 1998 to December 2017, research on maxillary full denture wearer, research focused on patient with normal

condition, comply the criteria in PICO questions, the author gets a full text journal, keywords used relate to temporomandibular disorders. Eksclusion criteria: all of which are not included in the inclusion criteria, journals that by systematic review method [table 1](#).

Results

Search using the “denture bases” and “speech” keywords on pubmed and wiley search engines. As shown in [figure 1](#), there are 52 journals in pubmed and 10 journals on wiley totaling 62 journals. After screening on title and abstract there are 10 journals with expected inclusion criteria and 52 journals with exclusion criteria. There are 5 relevant journals that do not have full text. finally the authors got 5 journals accordingly.

Table 1 The reviewed studies based on PICO-like structured reading

No.	Study first author, year	Population	Intervention	Comparasion	Outcome
1.	Bortun Cristina, 2004	n = 10 male : 5 female : 5 Two female patients had a low voice - after smoking and the other three had a normal voice for females.	This research investigate patients with complete dentures and recorded the vocal alterations caused by position, size, various materials (resin or ceramics) of upper frontal artificial teeth. For the investigation researchers used the existent complete denture for the lower jaw. The vertical dimension of occlusion from the old dentures was correct and therefore they maintained it in their study.	none	Some patients had a remarkable adaptative capacity after repeating 5 - 6 keywords, mainly the females. The acoustic alterations appeared in 70% of the cases of patients with ceramic teeth. A thin layer of impression material could be seen on palatogram in the zone of junction of oral facets of teeth with palatal plate and parallel with the line of first rugae palatine. This results from the crampoms covering of ceramic teeth with resin. The most obvious phonetic alteration visible on both spectrogram and palatogram appeared in the condition of oralized position of frontal upper teeth
2.	F. Ztelzle, 2010	n = 28 patients with complete denture. All patients were native German speakers, using a local dialect. None of the patients had speech disorders caused by medical problems other than dental, psychological problems or any reported hearing impairment.	Twenty-eight patients reading a standardized text were recorded twice – with and without their complete dentures in situ. A control group of 40 healthy subjects with natural dentition was recorded under the same conditions. Speech quality was evaluated by means of a poly- phone-based ASR according to the percentage of the word accuracy (WA).	40 German native speakers without speech disorders and no alter ation of the oral cavity or the dental arch, speaking the same local dialect as the patient group	The WA of edentulous patients without complete dentures in situ was significantly reduced compared to the subjects with complete dental arches. The WA improved to a significantly higher level by wearing complete dentures but did not reach that of the control group. Still, there was a significant difference. Ten of 28 complete dentures were found to be insufficient. That caused a lowering of the WA and showed significance compared to the WA of patients with sufficient complete dentures. Speaking with insufficient complete dentures turned out to produce an insignificantly higher WA than edentulous speech production
3.	Giovanetti M, 2011	n = 6 male : 3 female : 3	A silicon key was used to fixed the position of central incisor. This procedure enabled the anterior teeth to moved palatally, or closer to the crest of alveolar ridge.	none	There are more several causes of misarticulation in complete denture wearer both male and female wearing prosthesis with a more palatal tooth position have more speaking difficulties as the dentures reduce the oral cavity volume.

Table 1 Continued

No.	Study first author, year	Population	Intervention	Comparasion	Outcome
4.	Wafa'a Radwan Al-Magaleh, 2012	n = 30 patients were divided into 3 group.	group II included 10 completely edentulous patients with conventional dentures, and group III included the same 10 edentulous patients with neutral zone dentures.	Group 1 : full edentulous	All patients, without exception, reported being more comfortable with their NZ dentures. For Al-Fateha recita- tion, there were significant differences between both denture groups and the control group at immediate inser- tion. However, 3 weeks later, there was still a significant difference between groups I and II, while the difference was statistically insignificant between groups I and III.
5.	Christian Knipfer, 2014	n = 28 patients	Speech was recorded in patients 1 week prior to fabrication of new complete maxillary dentures and 6 months thereafter	40 subjects with mean age 59 ± 12 years without any speech disorders or oral diseases and with a complete maxilla anda mandible without prosthetic treatment.	Speech intelligibility improved significantly after 6 months. Subject reported a significantly higher OHRQoL (Oral Health-Related Quality of Life) after maxillary rehabilitation with complete dentures.

Figure 1 Article selection flow chart

The results of systemic analysis showed that of the 5 studies conducted, 3 studies (60 percent) of wich measure speech ability, 1 study (20 percent) that measure adaptive capacity, 1 study (20 percent) that measure patients satisfaction, showed in figure 2. Some patients had a remarkable adaptative capacity after repeating 5-6 keywords, mainly the

females. Speech intelligibility improved significantly after 6 months.

The intervention used in studies by using complete denture is 3 studies (60 percent) and 2 studies (40 percent) by setting artificial teeth, showed in figure 3. The acoustic alterations appeared in 70% of the cases of patients with ceramic teeth. The Word Accuracy (WA) improved to a significantly higher level by wearing complete dentures. There are more several causes of misarticulation in complete denture wearer both male and female wearing prosthesis with a more palatal tooth position have more speaking difficulties as the dentures reduce the oral cavity volume. Patients reported being more comfortable with Neutral Zone dentures.

Discussion

The basis of maxillary dentures is a very important component in the construction of dental prostheses. The basis of maxillary dentures provides stability of dentures and it is necessary for speech formation and intelligibility. The basis of maxillary dentures change articulation areas of phonemes in the oral cavity and may impair tongue movements. It is necessary to make dental prostheses as thin as possible for the right formation of phonemes and speech intelligibility. The thickness of the basis of maxillary dentures should be approximately 1, 4-2 mm in order to ensure good speech.

Subjects with inappropriate design of the prosthetic base, disposition of artifical teeth and functional quality (retention, support, stability) have dyslalia when pronunciation of separate

■ adaptive capacity ■ speech ability ■ patient satisfaction ■

Figure 2 Measured in studies

Figure 3 Intervention used in reviewed studies

phonemes is changed. The most frequent articulation defects can be classified as omission, substitution, distortion, addition and lispings. If dentures are badly constructed and they are too loose, the tongue would compensate the lack of stability of dentures and thus, the speech intelligibility would decrease.

Conclusion

When designing removable dental prostheses it is important to evaluate the disposition of artificial teeth (taking into account phonetic pronunciation), and to make a phonetically beneficial construction of the base of dental prostheses. It is necessary to make the base of prostheses as thin as possible to improve good sound pronunciation, however it is important not to change the resistance ability of dentures.

Spectrograms and palatograms are suitable methods of investigation to evaluate phonetic quality of removable dental prostheses.

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Conflict of Interest

The authors report no conflict of interest.

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