

Acoustic Speech Evaluation of Patients after Repeated Oral Rehabilitation with Complete Dentures

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Introduction. Each phoneme has certain acoustic characteristics that should be taken into consideration when evaluating patients' speech quality by means of acoustic analysis. The most complicated sound to be restored after prosthetic rehabilitation is the phoneme /s/. The arrangement of artificial teeth and the degree of reconstruction of lost alveolar bone with prosthesis base has significant impact on patients' speech quality and satisfaction with the result of prosthetic rehabilitation.

Aim, Materials and Methods. The aim of the study was to evaluate the connection of the acoustic quality of the phoneme /s/ and the functional value of removable dentures.

The total number of 225 speech samples has been analyzed. Diagnostic casts were obtained from the prosthetic field and from existing and newly fabricated dentures placed in oral cavity (n = 21). The functional value of each removable denture was assessed (Stelzle, 2010; Knipfer, 2012). By means of digital scanner Zirkonahn, the correspondence of artificial teeth to the anatomic landmarks was evaluated (Korholz, 1999; Goodacre, 2012; Solomon, 2012).

The questionnaires (n = 50) were used to assess a patient's subjective evaluation. The study was performed in Riga dental clinic "Medasko" (from 01.16 till 02.17). The approval of the Committee on Research Ethics (protocol number RSU/29.03.2012) has been received. Acoustic analysis was performed by Magix Samplitude 10 software. The noise band (defined by upper and lower limits of the most intensively coloured frequency area) (KHz) was obtained in Samplitude spectral editor cleaner, first highest peak of /s/ sound was obtained from the Voxengo Span Analyser (SPAN is a real-time "fast Fourier transform" audio spectrum analyser.) For statistical analysis Mann-Whitney test was used.

Results. There was statistically significant difference between the range of high intensity noise band of energy spectrum for the phoneme /s/ among male and female. In the control group of male speakers it was 4.83 KHz, and for female speakers - 6.18 KHz. For male patients speaking without dentures in place this parameter was 2.16 KHz, and for patients with functionally acceptable dentures 6.6 KHz, whereas for patients with dentures with reduced functional value this parameter was found to be only 4.1 KHz.

The mean value for the first highest peak was also statistically significant among male and female. In the study group of male speakers the lowest value of this parameter was found when speaking without dentures (3.79), followed by subjects speaking with removable dentures with reduced functional value (5.2), and the highest value was found for patients speaking with newly fabricated dentures after adaptation period (6.0). In the study group of female speakers' similar tendency was noted, only the values of parameters were higher and appeared to be 4.9, 5.9 and 7.9, correspondingly.

Conclusions. The spectral analysis of the quality of patient's speech can be used at any stage of prosthetic oral rehabilitation for the evaluation of existing alterations in speech production and for the assessment of the degree of patient's phonetic adaptation in both primary and repeated prosthetic treatment using conventional prostheses. The mean value of noise band's range and the frequency of highest peak of the phoneme /s/ are closely related to the functional value of the removable dentures. However, informants' gender should be taken into consideration.