Peculiarities of Phonetic Adaptation of Patients after Oral Rehabilitation with Conventional Removable Dentures (Evidence-based Literature Review)

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Abstract

Speech distortions often appear after oral rehabilitation with removable dentures, in the course of time these changes become less evident or disappear completely. Adaptation potential in elderly patients is usually diminished and speech function restoration could be compromised. This phenomenon is not fully reflected in literature.

The aim of the study was to analyse the present knowledge on phonetic adaptation in patients with removable dentures.

Literature for the study was selected through search in PubMed and other databases, including papers published in the period of 1990–2015. All in all, 104 articles were identified, out of which 50 were selected for detailed assessment.

Removable dentures are perceived as irritants causing responsive reaction of compensatory-adaptive nature. The following review attempts to summarise and systematise possible factors contributing to patients' phonetics adaptation to removable dentures.

Phonetic adaptation to removable dentures is a complicated process depending on various factors, the most significant of which are the functional quality of denture and patient's motivation to use prosthesis. Denture adhesives should be used to improve retention of the denture thus facilitating patients' phonetic adaptation. While planning the design of complete removable or partial denture with acrylic base, special attention should be given to anterior palatal region; there is scientific evidence that incorporation of rugae improves patients' phonetic performance. In case of conventional partial dentures with metal connector the middle type of the major connector should be used whenever it is possible, avoiding coverage of the frontal and distal areas of the palate with artificial base. Mechanical or psychological trauma caused by removable dentures may prevent successful phonetic adaptation. Patients with removable dentures should be invited for check up on regular basis.

Keywords: speech, dental prosthesis, removable denture, phonetic, adaptation, ageing.

Introduction

Speech is a unique phenomenon which only human beings possess. It is an important form of communication in society which directly or indirectly affects patients' quality of life (Scott, 2001; Jindra, 2002; Ozbek, 2003; Papadaki, 2012). After tooth loss, patients undergo chronic limitations in fulfilling common function – especially mastication, speech functions as well as aesthetics are influenced. It can cause psychological and social problems (Fiske, 1998; Scott, 2001; Jindra, 2002; Papadaki, 2012). The goal of prosthetic rehabilitation is to replace missing teeth thus improving aesthetics and restoring impaired functions. In case of extensive or total tooth loss, it is possible to fabricate soft tissue supported conventional removable dentures (Bilhan, 2013).

For a long time conventional removable dentures presented the only means of compensation for tooth loss and restoring function in patients with extensive or total edentulism. Appearance of implant supported constructions considerably improved stability and retention of the dentures. However, there are many patients whose circumstances (medical, psychological or financial) make them keep to the conventional means of prosthetic modalities (Critchlow, 2009; Carlsson, 2010). In Latvia 60.4% of patients in the age group 65–74 years require at least one removable denture (Vidzis, 2012). Taking into account the amount of lost teeth and considering every patient's financial possibilities, 25% of patients are provided with conventional partial-prosthesis with acrylic base (Soboleva, 2006; Vidzis, 2012).

These constructions are known to have certain drawbacks – they are massive and take much space in oral cavity, their functional value is connected with the condition of denture bearing area. It has been established that grinding ability of a removable prosthesis is restored to only 25%, as compared to that of people with natural teeth (Roumanas, 2009; Carlsson, 2010). Despite the above-mentioned shortcomings, the degree of patient satisfaction with removable dentures is high (Carlsson, 2010; Critchlow, 2010; Vidzis, 2012).

It is a fact that insertion of removable dentures substantially changes oral cavity volume, interfering with exhaled air flow, as well as with articulation contacts between tongue and teeth, hard palate and alveolar ridge mucosa during speech sound production. It is well known that at the initial stage of patients' adaptation to removable denture speech distortions which decrease over time are often observed; however, in some cases they may become permanent (Dragobetskii, 1992; Ozbek, 2003; Rogrigues, 2010; Van Lierde, 2012; Knipfer 2012).

It should be taken into consideration that in elderly patients the ability for adaptation diminishes. It could be explained by age related alterations in both nervous system and muscular coordination and other ageing processes (Muller, 1995a; Helgeson, 2002; Critchlow, 2010; Mysore, 2012). With increasing life expectancy, demand for prosthetic rehabilitation for ageing population is growing. Muller studied different aspects of patients' physiological ageing process and their connection with the success of prosthetic rehabilitation. It was stressed that elderly patients present a heterogenic group where each person requires individual approach and dentists should be well acquainted with gerontological peculiaries of dental treatment (Muller, 1993; Muller, 1995a; Muller, 1995b). Fiske and coworkers studied the emotional aspect of tooth loss and its influence on a patients' adaptation process to prostheses (Fiske, 1998; Scott, 2001).

It should be pointed out that the factors influencing patients' phonetic adaptation are not fully reflected in literature and therefore practical recommendations for improvement of prosthetic rehabilitation results have not been elaborated yet.

Aim

The aim of the study was to analyse literature on phonetic adaptation in patients with removable dentures, to identify the factors contributing to the degree of speech adaptation.

Material and Methods

Literature was selected through search in PubMed (Medline), Science Direct, EBSCO, DynaMed and Cochrane Library. The search was restricted to papers published in English, Latvian and Russian, in the period 1990–2015.

Keywords used for search were speech, dental prosthesis, removable denture, phonetics, adaptation and ageing.

Additionally, a manual search in the major prosthetic journals was performed. In order to be precise in data collection and to obtain all available information, references to all selected articles were screened and, in case of relevance, included in current review.

Within the context of the aim of this review, the following questions were formulated:

- What is phonetic adaptation, its definition and what methods of its assessment are available in modern dentistry?
- What factors contribute to patients' phonetic adaptation after oral rehabilitation with conventional removable dentures?

Full text papers were obtained and assessed for the inclusion or exclusion criteria. Only articles on adult patients with partial or total tooth loss, rehabilitated with different kind of conventional removable dentures were included in the review. Papers dealing with rehabilitation of patients with congenital or acquired maxillary defects were excluded from the research due to difference in speech quality determining parameters. Papers on speech performance of patients with dental implants were also excluded due to difference in biomechanical properties of implants and soft tissue supported constructions.

Results

The digital literature search revealed 104 papers in English and Russian. After evaluation of inclusion criteria, only 28 papers were included in the review, out of which 3 were literature reviews. The remaining 76 papers did not suit the pre-established inclusion criteria. Manual search resulted in adding 23 papers, out of which 5 were literature reviews.

All in all, 50 scientific papers were included in the review: 7 literature reviews and 43 clinical researches.

Discussion

What is phonetic adaptation, its definition and what means of its evaluation are available in modern dentistry?

Removable dentures are perceived as irritants causing responsive reactions of compensatory-adaptive nature. Adaptation in general is a complex biological process with a very individual pace (Dragobetskii, 1992). This process is described and classified differently; most often three main stages are distinguished – straight after insertion of the removable dentures the first reaction appears, which is characterised by patients focusing attention on the new object in the mouth, physiologically it is manifested in hyper salivation, speech and chewing function transient disturbance and in some cases appearance of gagging reflex (Dragobetskii, 1992; Leles, 2003). After transitory period, patients acquire a neuromuscular control that compensates alterations in oral cavity (Leles, 2003). This stage is the so-called partial suppression stage during which salivation becomes physiological, speech function is gradually restored and the gagging reflex disappears (Dragobetskii, 1992). It is mentioned that patients' complete adaptation to removable dentures including speech quality improvement takes place in the total suppression stage (Dragobetskii, 1992; Muller, 1995a).

The term phonetic adaptation denotes the degree of restoration of speech, articulation and diction in patients after prosthetic rehabilitation; be it biological, psychological, physiological and neurological processes unity (Wada, 2011; Luraschi, 2013). Patients have to adapt themselves to the altered environment of oral cavity and to develop new stereotypes of speech sound production (Muller, 1995).

So far there is no universal methodology of speech quality evaluation after prosthetic treatment. In some papers, patients' speech analysis was performed by means of acoustic phonetic methods (Runte, 2001; Runte, 2002; Jindra, 2002; Stojcevic, 2004; Zaki Mahross, 2015) (spectrograms, spectral analysis were assessed).

In other researches experienced speech therapists were invited for cooperation (Ozbek, 2003; Rodrigues, 2010), whereas other authors recommend the use of palatogrammas for assessment of speech process and for further personalisation of removable dentures, resulting in improvement of phonetic adaptation (Farley, 1998; Kong, 2008).

Each of these methods has a certain drawback that is why other objective and rather independent methods of speech evaluation are needed. Lately there appeared several scientific papers where patients' speech quality was analysed with the help of autonomic, computer-based speech recognition systems usage (Inukai, 2006; Ando, 2006; Stelzle, 2010; Wada, 2011; Knipfer, 2012; Wada, 2014). These methods proved to be objective and rather simple to perform. However, due to technical limitations this kind of analysis is only available for certain languages – namely German (Stelzle, 2010; Knipfer, 2012) and Japanese (Ando, 2006; Inukai, 2006; Wada, 2011; Wada, 2014).

In several articles more than one method of speech quality evaluation was used; for example, in the study performed in the University of Cairo, Egypt, the effect of different denture adhesives on phonetic function of 15 patients was assessed using both perceptual and acoustic techniques (Aziz, 2010). In the research held in King Saud University, the influence of setting of artificial teeth in the neutral zone and its effect on speech was evaluated both with the help of objective methods, such as acoustic analysis and duration taken for recitation of certain religious text, as well as patients subjective evaluation was assessed (Adaki, 2013). Yet as it has been stressed by Knipfer et al, there is no universal method that allows for objective and independent assessment of speech worldwide. That is why the comparison of different studies is somehow complicated (Knipfer, 2012).

What factors contribute to patients' phonetic adaptation after oral rehabilitation with conventional removable dentures?

The main requirement for restoration of speech function is total completion of patients' adaptation process to the removable denture (Muller, 1995a). According to the data found in literature, between 10% and 16% of all edentulous patients cannot achieve complete adaptation to conventional dentures (Laurina, 2006; Critchlow, 2009). Critchlow performed an extensive literature review, aimed at identification of possible prognostic indicators for predicting the success of oral rehabilitation of patients with conventional dentures (Critchlow, 2009). But we could not find any literature review on predictive indicators of patients' phonetic adaptive ability to conventional prostheses published in scientific literature.

There are certain contradictory points of view on patients' phonetic adaptation (Critchlow, 2009; Carlsson, 2010). Many authors consider that restoration of speech function plays an important role in a patients' satisfaction with prosthetic rehabilitation (Celebić, 2003; Zlatarić, 2008). However, it is a fact that during denture fabrication speech function restoration is not paid much attention to as a rule (Kong, 2008). Another contradiction is related to the functional quality and technical characteristic of removable dentures. While some authors do not find any correlation between speech alterations and the technical quality of prosthesis (Rodrigues, 2010), others stress that even minimal changes in removable dentures construction will inevitably lead to alteration in speech performance (Ichikawa, 1995; Runte, 2001; Runte, 2002, Inukai, 2006; Wada, 2011; Adaki, 2013, Zaki Mahross, 2015).

A review of data found in literature made it possible to come to the conclusion that the factors contributing to patients' phonetic adaptation are closely interrelated. For convenience reasons, we attempted to divide them into two major groups – local factors related to the prosthetic field and removable denture itself and general factors, which are related to patients' psychoemotional state, motivation to use dentures and the degree of individual adaptive capacity.

Local factors

In their turn local factors can be divided into two main groups: biological factors such as anatomical and physiological conditions of the prosthetic field and the second group which could be defined as biotechnical factors, describing specific features of the removable dentures, their technical quality and functional value.

Biological factors describe anatomical and physiological condition of the prosthetic field. This factor should be taken into consideration as one of important prognostic indicators for the success of conventional removable dentures, but in most cases it cannot be improved, unless implant supported prosthesis are planned (Critchlow, 2009; van Lierde, 2012).

The degree of atrophy of alveolar ridge and the clinical conditions of denture supporting soft tissues are of great importance for patients' phonetic adaptation. The retention and stability of the conventional removable dentures to a great extent depends on the amount and condition of its supporting structures. A proper amount and quality of saliva is an important prerequisite for successful retention of the conventional dentures. It is considered that well formed alveolar ridge and technically correct dentures with good denture retention facilitate the adaptation process (Muller, 1995b; Critchlow, 2009). However, poorly formed alveolar ridge, namely in lower jaw is a negative factor for denture retention (Critchlow, 2009). Geriatric patients often have chronic diseases, in most cases they use some prescribed medicines and in some cases the side effect of medication could influence the condition of denture bearing mucosa and/or alter the salivation function (Dragobetskii, 1992; Helgeson, 2002). In this case dental implants could improve denture stability. Nevertheless, osseointegration significantly improves denture retention and stability, phonetic function and adaptation remain in the focus of scientific attention both for fixed and removable prosthesis based on dental implants (Van Lierde, 2012). If due to different circumstances dental implants are not an option for treatment planning, then it is recommended to use dental adhesive in order to improve retention and facilitate patients' phonetic adaptation. Fifteen completely edentulous patients with flat mandibular ridge were recruited in the study performed in Cairo University, the effect of three different denture adhesives on speech performance were assessed both with the help of perceptual and acoustic techniques, it was concluded that whenever possible denture adhesive should be used to improve denture retention and facilitate speech sound articulation process (Aziz, 2010).

Evaluating different complications in patients with existing complete dentures, Bilhan came to the conclusion that dentures related sore spots interfere with a patient's speech ability (Bilhan, 2013). Persistent pain and discomfort related to denture wearing are disturbing for a patient's phonetic adaptation. Thus, it is strictly recommended to control denture base border extensions, and to eliminate sharp edges (Dragobetskii, 1992; Muller, 1995; Mysore, 2012; Bilhan, 2013).

Biotechnical factors are related to the removable denture itself and it can be to a great extent influenced both by dentist and by dental technician. It was stated previously that correct technical construction of removable dentures is an important indicator for overall success of the removable denture (Jindra, 2002; Critchlow, 2010). However, we did not manage to find literature review on how different denture constructive solutions effect patients' speech performance.

Conventional removable dentures form a wide group of denture prostheses that differ in form and ways of fixation in oral cavity. Still there are several features that unify this group – first all the dentures are removable – meaning that dentures can be inserted and removed but patients themselves.

Removable denture base and speech production process. In the removable dentures the base is an essential part of the construction; it connects all other elements together, provides retention, support and stability (Ozbek, 2003; Hassel, 2006; Kong, 2008; Wada, 2011; Zakkula, 2014); at the same time it covers the places of articulation of the tongue and alveolar ridge and could cause signifinant phonetic distortions. Therefore, the association between the removable denture base and speech production was studied extensively. One of the main prerequisits of success is that the denture base should be well adapted to oral cavity anatomy (Jindra, 2002; Laurina, 2006).

Due to great difference in biomehanics of various types of dentures, for further analysis we divided literature according to the type of denture evaluated in the research – forming the best evidence available for two main groups of dentures – the first one consisting of complete dentures and extensive partial removable dentures with acrylic base and the second group of different modalities of conventional partial dentures with a metal connector and their effect on speech performance.

Complete denture is the most often evaluated modality of removable denture and its impact on patients' speech production is widely described in literature. One of the most frequently discussed topics is the thickness of the denture base, as after insertion in oral cavity complete removable denture covers all the palate and significantly diminishes the volume of oral cavity. It was concluded that denture base should be as thin as possible in order to minimise alteration of oral cavity, as well as to minimise the distortion of tongue movement during speech sound production and at the same time it should be thick enough to withstand its deformation under function such as masticatory forces (Ichiwaka, 1995). But there is no scientific evidence yet as to exact thickness of complete dentures should be to facilitate patients' phonetic adaptation. A recent experimental study on evaluation of palatal plate thickness of maxillary prosthesis on phonation was performed in Sibar Institute of Dental Sciences in India; twelve subjects were provided with experimental acrylic plates of different thickness and its effect on the phonation of vowels were assessed. The author explained the selection of these sounds by the fact that they are the simplest sounds to be analysed and described acoustically; it was concluded that increasing the thickness of the palatal plate from 1 mm to 3 mm has not shown any significant effect on phonation. This conclusion is somehow very predictable, but it is possible that other research will follow from the same group of authors that could clarify the mechanism of patients' phonetic adaptation to the conventional removable dentures (Zakkula, 2014). Whereas research performed in Japan showed that for correct pronunciation of speech sounds the curvature of the palatal contour in complete dentures should be from 2–4 mm (Ando, 2006).

Another topic of interest in connection with phonetic dentistry is different ways of personalisation of palatal surface of complete dentures and of extensive partial removable dentures, which covers the anterior region of the alveolar ridge. In order to facilitate quicker phonetic adaptation different methodologies of palatogram were described. Actually a palatogram is a record of exact contact made between the hard palate, natural and artificial teeth during speech sound production. This method can be used both in wax try in stage or after delivery of the denture, as the assessment of phonetic function (Farley, 1998; Ando, 2006; Kong, 2008).

In his turn Hassel proposed an easy and quick way of personalisation of complete denture. In his pilot study fourteen patients with conventional complete maxillary dentures participated, and in order to improve the patients' phonetic adaptation the anterior part of palatal surface was sandblasted. This study revealed that the above mentioned alterations to some extent improved patients' speech performance. As it was stated by the author, this method is easy and effective, but if the desired outcome is not achieved, then it is always possible to polish denture's surface as no irreversible alterations to the denture took place (Hassel, 2006).

Rugae reproduction on the conventional removable denture with acrylic base is a subject of significant controversies (Krishna, 2012; Adaki, 2013; Zaki Mahross, 2015). On the one hand, adding rugae increases denture thinkness, but on the other hand anatomical structures such as rugae and papillae incisive are definitive landmarks for the tongue during speech sound production. A positive effect of additional rugae was proved by spectral analysis (Zaki Mahross, 2015). Adaki performed the study in order to evaluate the impact of rugae on phonetics. The effect of arbitrary rugae and customised rugae on patients' phonetic adaptation was compared and as a result of this study they also came to the conclusion that addition of personalised rugae to the palatal surface of the denture facilitates the patient's phonetic adaptation (Adaki, 2013). The authors proposed that slight modification in anterior part of palate, which requires minimal amount of time, gives a better result regarding pronunciation of speech sounds and as a result enhances patient's ability and willingness to communicate.

The same facts of personalisation and modification of palatal surface of the denture base that are discussed in connection with complete dentures could be used in case of extensive partial removable dentures with acrylic base. Researches came to conclusion that rationally fabricated prostheses do not

interfere with patients' phonetic adaptation. In case of comparison of speech performance of edentulous patients without conventional dentures and after adpatation to the removable prosthesis it could be concluded that technically correctly fabricated dentures increase the quality of speech performance (Stelzle, 2010).

Conventional partial removable denture with maxillary connector. It is logical to assume that conventional partial removable dentures with maxillary connector are more useful from the phonetic adaptation point of view, as in most cases where this type of prosthetic modalities is recommended, there is still a significant amount of natural teeth. As well as the constructional solution of this prosthesis requires less coverige of oral mucosa. We have found the scientific evidence on this topic. Two studies were performed by the same researcher in Japan, with the help of originally developed speech recognition system two types of experimental connectors were evaluated from the phonetic point of view. The effect of narrow (8 mm width) and wide (20 mm width) metal connectors were assessed, as well as different cross sectional shapes were analysed and it was concluded that the width and shape of the connectors have a limited effect on the articulation of consonants (Wada, 2014). In a previous study the same speech evaluation method was used in order to evaluate the effect of different location of the experimental metal connector on speech performance, and it was found that locating the major connector in the middle area of the palate resulted in smaller distubance than in other areas from the point of view of accuracy of speech sound production (Wada, 2011).

Two following topics relating to the phonetic adaptation after oral rehabilitation are in common for all kinds of conventional removable dentures, namely the position of artificial teeth and the functional value of removable dentures and will be discussed without dividing in to smaller groups.

Tooth loss and position of artificial teeth. The degree of the patient's speech distortions following tooth loss and consequent prosthetic rehabilitation depends on location and extent of edentulous span. In particular the changes in the maxillary front region could influence the mechanism of speech production. In this area 90% of Latvian consonants are formed. Stojcevic analysed formation mechanisms of Croatian dental and postalveolar group of sounds and removable denture impact on sound pronunciation accuracy, using spectral analysis method. The study showed that patients with conventional partial removable prosthesis have 50% less distortions as compared to the same patients' speech without dentures (Stojcevic, 2004). In his turn Ozbek studied formation of Turkish sounds after prosthetic rehabilitation. The speech quality of 15 patients was evaluated by three experienced speech pathologists. They came to the conclusion that some sound groups are influenced to a greater extent as compared to others. However, after a week of adaptation, all sound production was improved (Ozbek, 2003). Using the spectral analysis method Runte indicated that even minimal displacement of maxillary incisors causes sound /s/ distortion (Runte, 2001; Runte, 2002). It was also concluded that neuromuscular adaptation plays a more significant role as compared to simple aerodynamic changes (Runte, 2002; Cagna, 2010). It is recommended to place artificial teeth in the original position of the lost natural dentition (Runte, 2001; Runte, 2002). For artificial teeth arrangement, it is recommended to use anatomical landmarks – incisive papilla and first prominent rugae palatinae – this will ensure the position of teeth in agreement with phonetic and esthetic requirements (Runte, 2001; Runte, 2002; Laurina, 2006). It was suggested that assessment of quality of /s/ sound pronunciation during fabrication of the denture, namely in wax denture try in stage, would decrease the amount of adaptation required from patient, thus facilitating the phonetic adaptation process (Inukai, 2006). Production of /s/ sound is of great interest in phonetic dentistry. It is mentioned in literature that the /s/ sound phonetic test can be used in determining the vertical dimension of occlusion, this method was already described in 1952, but so far it has not lost its relevance, and these articles were recently republished (Silverman, 2001; Pound, 2006). During production of sibilant sound /s/ the lower jaw protrudes and takes the so-called "closest speaking space (CSS)", which means that a 1–2 mm gap is formed between the upper and lower incisors. With the advance of technology, new possibilities in assessment of phonetic adaptation arise. The use of kinesiographic instruments and jaw tracking software program gives objective data on patients' adaptation mechanism to removable dentures (Leles 2003).

Another significant phonetic element is /m/ sound, which could be used both in the fabrication process and as a mean for evaluation of the existing dentures (Rodrigues, 2003). /F/ and /v/ phonetic probes are generally recommended for assessment of the position and length of restored front teeth (Roumanas, 2009).

The aesthetic side of removable dentures plays an important role in the patient's acceptance of the denture and satisfaction with prosthetic result, improvement of dentures visual characteristics will facilitate the patient's phonetic adaptation (Zlatarić, 2008). Tooth loss dramatically influences facial appearance. Removable denture could partially restore both missing teeth and alveolar ridge, thus providing support for facial soft tissues (Laurina, 2006). An extensive literature review was published on historical and modern clinical techniques for physiological registration of artificial tooth position in the so-called neutral zone. It was stated that this position improves dentures stability and also contributes to the patient's facial expression (Cagna, 2010, Al-Magaleh, 2012). A detailed analysis of phonetic characteristics in 30 patients with different approaches to denture manufacturing techniques proved superiority of dentures fabricated within the neutral zone as compared with other methods of artificial teeth arrangement, They appeared to facilitate patients' phonetic adaptation and these findings were assessed both subjectively and objectively (Cagna, 2010; Al-Magaleh, 2012).

Functional value of removable dentures. It has been observed that patients' adaptation may be a reversible process and with a change of oral condition, the patients adaptation to the existing dentures can diminish (Knipfer, 2012; Bilhan, 2013). The most frequent alteration in oral cavity appears due to continuing resorption of residual alveolar bone resulting in decrease in denture stability and retention (Bilhan, 2013). To some extent loss of physiological retention is compensated by muscular control (Muller, 1995a). It is mentioned in literature that the tongue of patients wearing removable denture has multiple functions taking part in speech sound articulation and control of denture stability. Thus, in case of decreasing dentures functional value, the demand for denture control increases and this could possibly interfere with speech production process (Laurina, 2006). From phonetic adaptation point of view, routine recalls for conventional denture wearers seem to be a crucial factor for preventing complications (Dragobetskii, 1992).

General factors contributing to phonetic adaptations

Phonetic adaptation of a patient with removable dentures depends on various factors such as: patient's individual adaptation capacity, acuteness of hearing, psychoemotional characteristics, motivation, social needs and acceptance of removable prosthetic modalities. It is essential for the dentist to find out the patients motives for oral rehabilitation. If a patient has a social need connected with his professional activities, then his phonetic adaptation will be more effective (Dragobetskii, 1992; Papadaki, 2012). The patient should have realistic expectations towards the possible drawbacks of provided dentures. If due to psychological or functional limitations the patient is not able to accept the situation, then another kind of treatment should be used (Mysore, 2012).

It is usually taken for granted that if alterations in oral cavity exceed the patient's individual adaptive capacity, then speech distortion will persist (Laurina, 2006). However, there are no definite criteria for evaluation of patient's individual adaptation potential in prosthetics dentistry as yet (Muller, 1993). Extensive research on a patients' adaptation to conventional dentures was carried out by Muller and coworkers. An attempt was made to predict a patient's adaptation outcome by means of standardised psychological tests, mental concentration capacity evaluation and manual motor ability evaluation by means of the so-called pinhole board test. Additionally, the oral motor ability was tested by asking patients to assemble two halves of test pieces a mouth (Muller, 1993). Adaptation index presented in this paper is a very important contribution to further development of this field of knowledge (Muller, 1993). In consequent studies a more detailed analysis of a patient's adaptation capacity to removable dentures was presented (Muller, 1995a; Muller, 1995b). Tooth loss inevitably leads to reduction of periodontal ligaments and alterations in proprioception. One indicator of a patient's acceptance of removable dentures might be assessment of oral perception. It was assumed that patients with a high level of oral perception should be more sensitive to alterations in oral cavity, and as a result they might be more intolerant to limitations of removable dentures. It was proposed that patients with lower level of oral perception have higher

adaptation potential to removable dentures. However, to produce intelligible speech a very coordinated and precise positioning of the tongue during sound articulation is required (Aken, 1991). Theoretically oral stereognosis might help in everyday practice to identify patients with reduced phonetic adaptation potential. In clinical studies several attempts to use stereognosis were described; however, there is no universal protocol for patients' phonetic adaptation ability evaluation by means of oral stereognosis as yet (van Aken, 1991, Muller, 1995a; Muller, 1995b; Runte, 2001). Jacob and coworkers published an extensive literature review with detailed recommendations on oral stereognosis methodology; however, such approach has not been widely used, and so comparison of the results among different studies is hard to be made (Jacobs, 1998; Runte, 2001).

Acuteness of hearing plays an important role in phonetic adaptation process. In elderly patients, age related hearing weakness is quite common (Ichikawa, 1995; Mysore, 2012). This diminishes the rate and degree of complete speech restoration in this group of patients.

Adaptation to removable denture requires a patient's cooperation, understanding of provided treatment limitations and responsibility for his own health, including fulfilling his dentist's recommendations. Friske and co-authors studied the emotional effect of tooth loss in edentulous people. They compared the emotional effect of extensive tooth loss to the effect of bereavement and distinguished five stages of grief; denial, anger, depression, bargaining and finally acceptance (Friske, 1995; Scott, 2001). Correspondingly only patients who passed through all these stages and accepted the inevitability of removable dentures can successfully adapt themselves to prosthetic treatment, otherwise complete phonetic adaptation is doubtful (Mysore, 2012). Many attempts at classification of dental patients are published in textbooks, for example, classification suggested by House, who divides all patients into four types according to their mind – philosophical mind, exacting mind, hysterical mind and indifferent mind. And the type the patient belongs to allows predicting the patient's possible reaction to the treatment (Mysore, 2012). But according to Friske, it is necessary to conduct a detailed investigation of the patient's emotional state and psychological condition (Friske, 1995; Scott, 2001). Much attention has been paid lately to the analysis of patients' subjective evaluation of their oral health conditions; in order to assess changes in a patient's perception of treatment outcome it is essential to use a unified protocol before and after treatment. Several questionnaires have been suggested, but the most frequently used one is a short version of the so-called OHIP-14 (oral health impact profile). It consists of two items for each of the seven subscales in the source instrument (functional limitation, physical pain, psychological discomfort, physical, psychological and social disabilities and handicap). Each item asks about the presence of a functional or psychosocial impact associated with problems involving teeth, mouth and dentures. Last year the original English version of the OHIP-49 was translated into Latvian and Russian. It was recommended to be used as an instrument for assessing OHRQoL among adults in Latvia (Pugaca, 2014). This instrument gives us a possibility to use validated protocol for patients' subjective evaluation of treatment outcome during phonetic adaptation process.

Conclusion

1. Phonetic adaptation to removable dentures is a complicated process depending on various factors, the most significant of which are the functional quality of denture and patients' motivation to use the prosthesis.
2. In order to facilitate patients' phonetic adaptation to the conventional dentures, denture adhesives should be used to improve retention of the denture and to ease speech sound articulation whenever possible.
3. While planning the removable dentures design, patient's individual phonetic peculiarities should be taken into consideration.
4. While constructing conventional complete removable denture and partial prosthesis with acrylic base, special attention should be given to anterior palatal region of the prosthesis. There is scientific evidence that personalisation such as incorporation of rugae of this area

improves patients' phonetic performance. In case of conventional partial dentures with metal connector the middle type of the major connector should be used whenever it is possible, avoiding coverage of frontal and distal areas of the palate with artificial base.

5. Mechanical or psychological trauma caused by removable dentures may prevent successful phonetic adaptation. Patients with removable dentures should be invited for check up on a regular basis.

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