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ASSESSMENT OF DENTAL MOBILITY IN ELDERLY AND SENILE PATIENTS WITH VARIOUS TYPES OF DENTITION DEFECTS

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ОЦЕНКА ПОДВИЖНОСТИ ЗУБОВ У ПАЦИЕНТОВ ПОЖИЛОГО И СТАРЧЕСКОГО ВОЗРАСТА С РАЗЛИЧНЫМ ТИПОМ ДЕФЕКТОВ ЗУБНЫХ РЯДОВ

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Objective. To determine the differences in the degree of tooth mobility in elderly patients with various types of dentition defects. To establish and differentiate the degree of tooth mobility in relation to the type of dentition defect in elderly and senile patients.
Materials and methods. 500 patients aged 60 to 75 divided into 4 groups were examined. In the first group of patients, terminal defects were revealed (on one or both sides). The second group consisted of patients with included defects (on one or both sides). The third group was presented by combined defects (included and not included). Patients with single standing teeth constituted the fourth group. Patients with complete absence of teeth were excluded from the study. The assessment of dental mobility was carried out using the Periodotest device. All studies on dental mobility were conducted as part of the initial examination of the patient. To obtain objective data, periotestometry was performed 2 times in each patient. Average periotestometry data were calculated for each patient. The average readings of periotestometry for different groups of patients were determined.
Results. On the basis of the data obtained while comparing the results of periotestometry, in relation to the type of dentition defect, statistically significant differences were established ($p < 0.001$) (method used: the Kraskel – Wallis criteria). The results of periotestometry obtained in patients of group 4 were significantly higher than in representatives of other examined groups. The least mobility according to the results of periotestometry was observed in groups 2 and 3.
Conclusions. The study revealed significant differences in the degree of tooth mobility in relation to the type of dentition defect. In patients with single standing teeth, 2–3 degree of their mobility was determined, while patients with included defects had 1–2 degree of the mobility of existing teeth. The obtained data of periotestometry indicate the need to use unloading dentures in elderly patients, in order to preserve the remaining teeth in patients with single-standing teeth, as well as in patients with terminal defects of the dentition.
Keywords. Geriatric dentistry, dentition defects, tooth mobility, dental prosthetics.

Цель. Выявить различия в степени подвижности зубов у пациентов пожилого возраста с различными типами дефектов зубных рядов. Установить и дифференцировать степень подвижности зубов в зависимости от типа дефекта зубного ряда у пациентов пожилого и старческого возраста.
Материалы и методы. Обследовали 500 пациентов в возрасте от 60 до 75 лет, которых разделили на четыре группы. В первой группе пациентов представлены концевые дефекты (с одной или двух сторон). Вторая группа была представлена пациентами с включенными дефектами (с одной или двух сторон). В третьей группе – сочетанные дефекты (включенные и не включенные). Четвертая группа – это пациенты с одиночно стоящими зубами. Полное отсутствие зубов являлось критерием исключения из исследования. Оценку подвижности зубов проводили при помощи аппарата Periotest. Все исследования по подвижности зубов осуществляли в рамках первичного осмотра пациента. Для объективизации данных периотестометрию проводили 2 раза у одного и того же пациента. Каждому пациенту были рассчитаны средние данные периотестометрии. Были определены средние показатели периотестометрии для разных групп пациентов.
Результаты. Исходя из полученных данных при сопоставлении результатов периотестометрии в зависимости от типа дефекта зубного ряда, были установлены статистически значимые различия ($p < 0{,}001$) (используемый метод: критерий Краскела – Уоллиса). Результаты периотестометрии, полученные у пациентов группы 4, оказались значительно выше, чем у представителей других обследованных групп. Наименьшая подвижность по результатам периотестометрии наблюдалась в группах 2 и 3.
Выводы. В ходе исследования были выявлены достоверные различия в степени подвижности зубов в зависимости от типа дефекта зубного ряда. Выявлено, что у пациентов с одиночно стоящими зубами определяется 2–3-я степень их подвижности, в то время как у пациентов с включенными дефектами подвижность имеющихся зубов соответствует 1–2-й степени. Полученные показатели периотестометрии указывают на необходимость использования разгружающих зубных протезов у пациентов пожилого возраста с целью сохранения оставшихся зубов при одиночно стоящих зубах, а также у пациентов с концевыми дефектами зубного ряда.
Ключевые слова. Гериатрическая стоматология, дефекты зубных рядов, подвижность зубов, зубное протезирование.

INTRODUCTION

Currently, the issue of analyzing the effectiveness and restoration of chewing ability does not lose its relevance. The development of various methods, as well as the success of their clinical implementation, do not allow us to make an unambiguous conclusion about the choice of the "ideal approach" to occlusal rehabilitation of dental patients. According to the latest studies by the World Health Organization (WHO), the number of elderly and senile people is growing. Now it is more than 40 % of the population in a number of developed countries. Diseases in the elderly are expressed in non-specific manifestations of illnesses. They are characterized by multiple lesions, unpredictability of their course, frequent complications, which, in turn, leads to an extension of the rehabilitation period [1–3].

Dental health of elderly and senile people is determined by basic criteria, such as maintaining the function of existing teeth and restoring or maintaining the chewing ability with the help of various orthopedic structures [4–6].

Along with the development of modern methods of dental orthopedic rehabilitation of patients, it is necessary to strive for the widespread implementation of an objective, comprehensive approach that allows taking into account the developed joint, muscle and occlusal pathology of patients during the treatment process [7; 8].

According to numerous studies, the unsatisfactory condition of the oral cavity is determined in elderly and senile patients. Tooth loss, dentition defects, and impaired chewing ability occupy one of the leading places among the pathological processes occurring in the oral cavity [8; 10].

Dental specialists pursue the goal of delaying expensive, and in some situations traumatic rehabilitation using dental implants with the tactics of preserving teeth, prolonging the functioning of patient's teeth, including as supports when using various removable and non-removable orthopedic structures, increasing the level of comfort during treatment [11–13].

Conducting a full-fledged diagnosis, allowing for strict differentiation and development of an adequate approach to the implementation of full orthopedic rehabilitation in a patient, makes it possible to prevent not only the development of complications of dental prosthetics, but also indirectly prevent the disruption of innervation and blood supply to the maxillofacial region [14–16].

One of the most important characteristics of a tooth that affects the prognosis of treatment is its mobility. Currently, there are not enough studies that fully cover this issue.

The objective of the study is to determine the differences in the degree of tooth mobility in elderly patients with various types of dentition defects, to establish and differentiate the degree of tooth mobility in relation to the type of dentition defect in elderly and senile patients.

MATERIALS AND METHODS

The study was conducted at the Department of Propaedeutics of Dental Diseases of the E.V. Borovsky Institute of Dentistry, Sechenov University. The study was carried out in accordance with the basic bioethical standards of the Helsinki Declaration of the World Medical Association on Ethical Principles for Medical Research, as amended (2000, as amended in 2008), the Universal Declaration on Bioethics and Human Rights (1997), and the Council of Europe Convention on Human Rights and Biomedicine (1997). The study was approved by the local ethics committee (protocol No. 30–20 dated October 21, 2020). Each patient signed a voluntary informed consent. The study was conducted during the comprehensive rehabilitation of dental patients of this group with various types of partial secondary edentia.

A total of 500 participated in the study. They were divided into 4 groups of 125 people each. In the first group of patients, terminal defects were revealed (on one or both sides). The second group consisted of patients with included defects (on one or both sides). The third group was presented by combined defects (terminal and included). Patients with single standing teeth constituted the fourth group. Patients with complete absence of teeth were excluded from the study.

Attention was paid to the presence / absence, and if present – to the type of orthopedic structure, the frequency of use of certain orthopedic structures (partial removable plate dentures, clasp dentures), the age of their manufacture and installation.

Research in the clinic was carried out using the Periotest device, registered under number 2006/2534 on December 28, 2006). The device is designed to study the ability of the periodontium to return the tooth to its original position after the application of external forces[1].

The Periotest device is equipped with an electronic analyzer and an intraoral sensor with a striker based on the wire connection principle. Data is obtained as follows. The electronic analyzer generates a pulse transmitted to the striker at a frequency of 4 strikes per second. For one measurement, 16 pulses are used. The force of the device is safe for hard and soft tissues of the maxillofacial region, including the periodontium. The place of application of force is the zone between the contour height and the occlusal part of the tooth. The sensor, striker and electronic analyzer take the percussion impact on the tooth based on 16 impacts, which are taken into account as averaged. The electronic analyzer is responsible for the accuracy of the required indicators read during the application of each 16 pulses, displayed by the PT index. The Periotest S user manual provides a gradation of the mobility of the object under study from -8

[1] Periotest Classic, available at: http://www.med-gulden.com/downloads/02_english/02_Operating%20Manual/Periotest_Classic.pdf

to +50. The interpretation of the obtained periostemetry data was made according to the scale:

- –8 – +9 – the tooth is immobile (physiological mobility);
- +10 – +19 – 1st degree mobility;
- +20 – +29 – 2nd degree mobility;
- +30 – +50 – 3rd degree mobility.

In repeated studies, the same impact zone of the examined tooth and the same vector of force application to the tooth were used to obtain objective data. All studies on dental mobility were conducted as part of the initial examination of the patient. To obtain objective data, periotestometry was performed 2 times in each patient. A total of 500 manipulations were performed. Average PT data were calculated for each patient. Average PT values were determined for different groups of patients.

Statistical analysis was performed using the StatTech v. 3.1.10 program (developed by StatTech LLC, Russia). Quantitative indicators were assessed for compliance with the normal distribution using the Kolmogorov-Smirnov criterion. In the absence of a normal distribution, quantitative data were described using the median (*Me*) and the lower and upper quartiles ($Q_1 - Q_3$). Comparison of three or more groups by a quantitative indicator whose distribution differed from normal was performed using the Kruskal-Wallis test, and post hoc comparisons were performed using the Dunn test with Holm's correction.

RESULTS AND DISCUSSION

Based on the obtained data, when comparing the results of periotestometry depending on the type of dentition defect, statistically significant differences were established ($p < 0.001$) (the method used: Kruskal-Wallis criterion).

The obtained data (table) show greater stability of the periotestometry results in the 2nd and 3rd study groups than in the 1st one. This can be explained by the most uniform distribution of the occlusal load in the 3rd study group, which is confirmed by the results of occlusiography and myography of the masticatory muscles. It should be taken into account that the manifestations of age-related changes in periodontal tissues negatively affect the degree of the natural teeth stability. This emphasizes the need to use implant-based orthopedic structures in elderly patients. Due to the ability to compensate for the occlusal load without using natural teeth, it became possible to stabilize natural teeth. In the 4th study group, the periotestometry indicators are significantly higher than in the first three study groups. This is explained by the fact that single teeth do not have the ability to compensate for the chewing load imposed on them, which is aggravated by the lack of approximal contacts and additional vertical loads affecting the tooth.

When comparing the obtained results with previously published studies, it can be noted that there are no publications in domestic and foreign literature devoted to the

Periotestometry results in the study groups

Parameter	Category	Periotestometry result			*p*
		Me	$Q_1 - Q_3$	*n*	
Type of dentition defect	Group 1 (terminal defects (on one or both sides))	25	17–29	125	$p_{1-4} < 0.001$ $p_{2-4} = 0.003$ $p_{3-4} < 0.001$
	Group 2 (included defects (on one or both sides))	26	17–29	125	
	Group 3 (combined defects)	26	17–29	125	
	Group 4 (single standing teeth)	29	25–34	125	

Note: * – the differences in the indicators are statistically significant ($p < 0.05$).

problem of tooth mobility in patients with various dentition defects. Studies of tooth mobility were mainly conducted in patients with various types of periodontal pathologies [12; 15].

The studies note the relationship between alveolar bone resorption and the degree of tooth mobility, which indirectly corresponds to the results we obtained, since elderly and senile patients undoubtedly have bone tissue lysis, especially in the area of teeth located next to dentition defects [9]. A number of foreign publications note a relationship between tooth mobility and changes in the hormonal background of patients [17; 18], for example, during pregnancy or during the menstrual cycle, however, these articles studied patients with intact dentition and a younger age, and this information cannot be unambiguously applied to the patients in our study [19; 20].

Conclusions

The study revealed significant differences in the degree of tooth mobility in relation to the type of dentition defect. In patients with single standing teeth, 2–3 degree of their mobility was determined, while patients with included defects had 1–2 degree of the mobility of existing teeth. The obtained data of periotestometry indicate the need to use unloading dentures in elderly and senile patients, in order to preserve the remaining teeth in patients with single-standing teeth, as well as in patients with terminal defects of the dentition.

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Author contributions:

Dorofeev A.E. – collection and processing of materials, data analysis.

Sevbitov A.V. – concept and design of the study.

Utyuzh A.S. – data analysis.

Mironov S.N. – collection and processing of materials, writing the text.

Emelina E.S. – literature review, writing the text.

Kuznetsova M.Yu. – data analysis, statistical processing of data.

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