

ИННОВАЦИОННЫЕ МЕТОДЫ ИССЛЕДОВАНИЯ ЖЕВАТЕЛЬНОЙ ЭФФЕКТИВНОСТИ ПРИ ЗАБОЛЕВАНИЯХ ПАРОДОНТА В МОЛОДОМ ВОЗРАСТЕ

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АННОТАЦИЯ

В современной стоматологии предъявляются все более высокие требования к качеству протезных конструкций. Качество и функциональность изготовленного протеза тесно связаны с восстановлением окклюзионной поверхности зуба, которая обеспечивает основную функцию зубочелюстной системы - жевательную. Площадь и рельеф жевательной поверхности зубов определяют эффективность жевания. окклюзионная регистрация один из методов, используемых для регистрации изменений окклюзии на этапах ортопедического лечения. окклюзионная регистрация — это метод выявления и регистрации окклюзии.

Основным методом исследования для определения жевательной эффективности в молодом возрасте является цифровой окклюзионный анализ, который позволяет оценить функциональную окклюзию, временную последовательность контактов, давление на окклюзионную поверхность в результате контакта верхней и нижней челюстей, а также рассчитать нагрузку, приходящую на каждый зуб или сегмент.

Ключевые слова: T – scan, пародонтит, жевательная эффективность, цифровая стоматология.

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INNOVATIVE METHODS FOR ASSESSING CHEWING PERFORMANCE OF PERIODONTAL DISEASE AT A YOUNG AGE

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ABSTRACT

In modern dentistry, there are increasing demands on the quality of prosthetic constructions. The quality and functionality of the fabricated prosthesis are closely related to the restoration of the occlusal surface of the tooth, which provides the main function of the dento-mandibular system - mastication. The area and relief of the chewing surface of the teeth determine the efficiency of mastication. occlusion registrations one of the methods used to record changes in the occlusal at the stages of prosthetic treatment. occlusion registrations is a method of detection and registration of occlusal.

The main research method for determining masticatory efficiency at a young age is digital occlusion analysis, which allows the assessment of functional occlusion, the temporal sequence of contacts, the pressure on the occlusal surface resulting from contact between the maxilla and mandible, and the calculation of the load that falls on each tooth or segment.

Key words: T - scan, periodontitis, chewing efficiency, digital dentistry.

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RELEVANCE

In modern society, the requirements for dental treatment are increasing. One of the most important components of restoring the quality of life of a dental patient is the restoration of the chewing function under the conditions of the patient's physiological norm and adaptation in society [1]. According to WHO data, up to 94% of the world's population suffers from one or another dental diseases. Such diseases as neoplastic, nonspecific infections, and traumas can lead to extensive defects of the maxillofacial region, resulting in severe deformities [2]. Even in its early stages, maxillofacial diseases affect the quality of mastication and chewing efficiency [3].

There are a number of methods for the direct measurement of chewing efficiency that include a chewing test [4-6]. Obviously, the use of such direct methods is time-consuming and not always justified. This has led to the creation of indirect methods for assessing chewing efficiency, among which the determination of chewing efficiency using computer data analysis is well known. Some of these methods are based on the analysis of occlusiograms processed in a certain way in computer programmes - graphical editors [7].

As a rule, these methods are labour-intensive and do not always lead to an accurate result because they estimate only the contact area [8]. Currently, there is no clearly expressed reliable correlation between the area of occlusal contacts and the magnitude of masticatory efficiency. A relevant solution to these issues is the development and implementation of a program that clarifies and facilitates the process

of measuring a patient's masticatory efficiency. The aim of the study is the clinical testing and calibration of a program that systematises, groups and analyses a variety of data affecting chewing efficiency, automating, clarifying and facilitating the process of measuring masticatory efficiency.

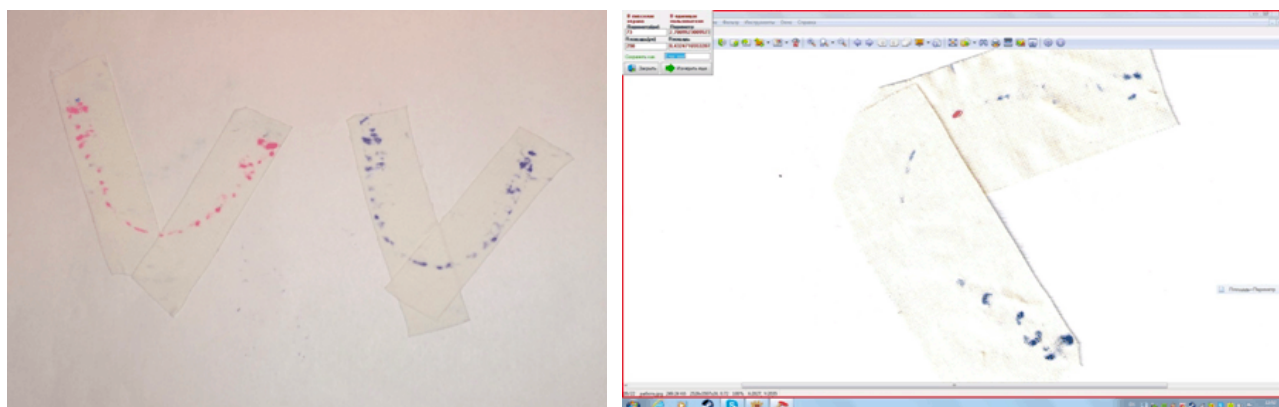
RESEARCH METHODS

The study sample included a control group and an orthopedic treatment group. The control group included 40 of them 19 (40,4%) girls and 28 (59,5%) boys, among patients 17 had partial adentia, 15 had orthognathic bite, 8 patients had bridge prosthesis, 7 patients had dysocclusion. To investigate the occlusion of the dentition we used two methods of occlusion analysis. Clinical examination, occlusion analysis according to the method of A. Dolgalev using articulation paper and the 2nd method using T-Scan III strain gauges of healthy adults with normal occlusion (angular class I with normal occlusal line without malposition or rotation of teeth) recruited in orthopedic dentistry were performed [6,9,14].

Additional inclusion criteria were a full bite and no history of previous orthopedic treatment. Exclusion criteria were the presence of TMJ problems limiting mouth opening and malocclusion such as open bite, enlarged or reverse misalignment, crossbite with occlusal abnormalities. The orthopedic treatment group consisted of 40 patients who received orthopedic treatment at Samarkand State Medical University. This group included patients with skeletal anomalies with occlusal disorders [9,11,15,17].



Fig 1-2. Preparation of the base and placement of the articulating paper (BAUSCH OCCLUSIONS PAPER) in the oral cavity



**Fig 3-4. Occlusograms obtained on a leukoplasty with BAUSCH OCCLUSONS PAPER 40 µm articulating paper
Calculation of the occlusal contact area of the teeth using a computer ruler in Universal Desktop Ruler**

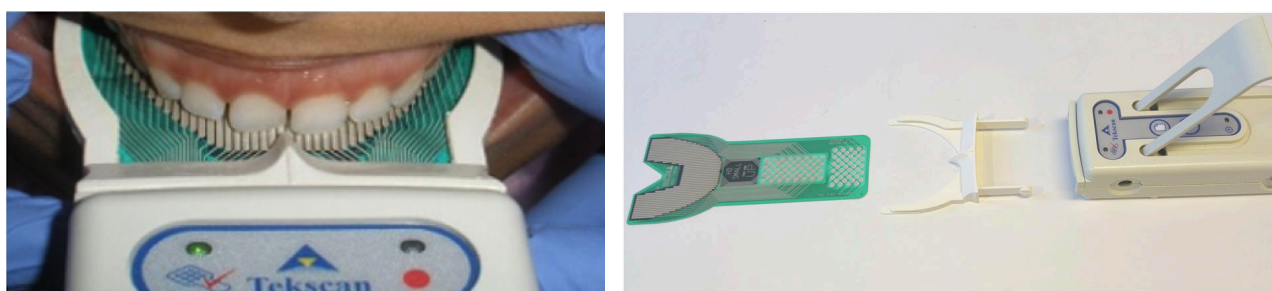


Fig. 5-6. Occlusogram T-Scan III device . T-Scan system

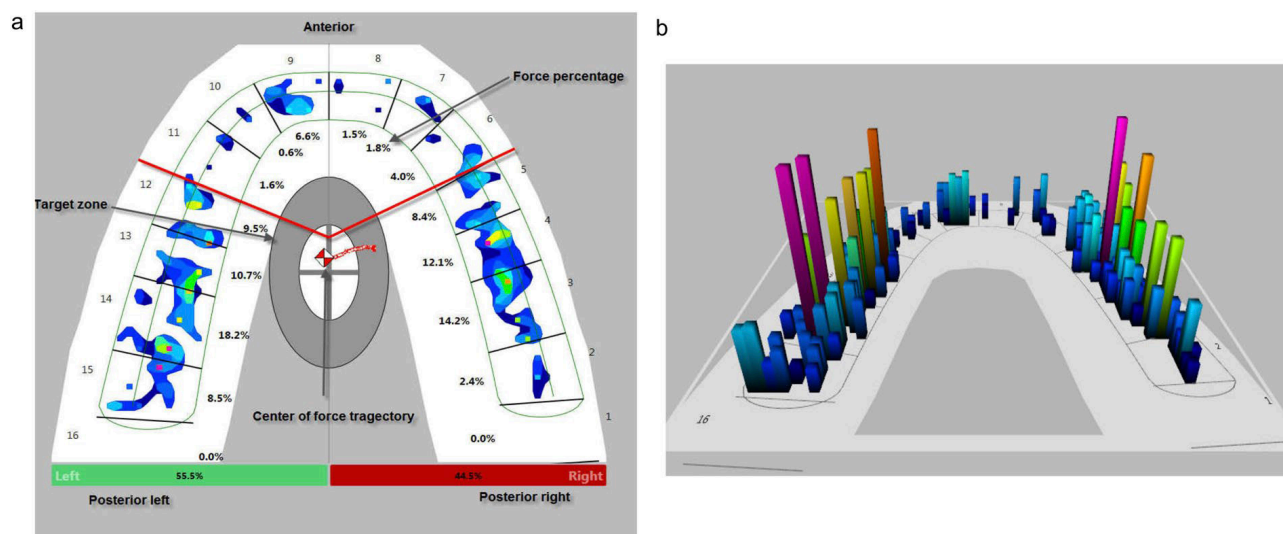


Fig 7. Occlusal force distribution using T-Scan III, Software version 8.0.1. (a) Two-dimensional and (b) three-dimensional images of a healthy participant

RESEARCH RESULTS

The value of chewing efficiency measured with the help of the developed computer programme was 95-100% in 60% of subjects, 90-93% in 30%, and 86-89% in 10%. Comparison of the results of chewing efficiency assessment obtained with the help of the described computer programme with the data obtained by the method of chewing test allows us to

suggest that: - the use of multidimensional data analysis methods in relation to occlusogram scans for chewing efficiency assessment can be considered justified, since the analysis results correlate well with the results obtained by the method of functional chewing test [5,8,10,14].

At the pre-testing stage, it is found out how representative the training set of occlusogram scans is, and this set is supplemented with new

scans if necessary to improve the accuracy. The value of the mean-square error of the masticatory efficiency estimation when tested by the cross-validation method using 122 samples was about 1%, which made it possible to consider the calculation method to be workable and the training set used to be sufficiently representative. Further, the optimal number of principal components of the mathematical analysis was determined according to the best accuracy of chewing efficiency estimation, which ranged from 19 to 22. After that, 18 "unknown" scans of occlusiograms i.e. never included in the training set, were offered to the programme to calculate chewing efficiency. The error in the calculation of chewing efficiency in this case compared to that determined by the direct method of the chewing test ranged from 0.87 to 2.56%, which, in our opinion, is an acceptable result [12,15,17,19].

CONCLUSION

At the pre-testing stage, it is found out how representative the training set of occlusiogram scans is, and this set is supplemented with new scans if necessary to improve the accuracy. The value of the mean-square error of the masticatory efficiency estimation when tested by the cross-validation method using 122 samples was about 1%, which made it possible to consider the calculation method to be workable and the training set used to be sufficiently representative. Further, the optimal number of principal components of the mathematical analysis was determined according to the best accuracy of chewing efficiency estimation, which ranged from 19 to 22. After that, 18 "unknown" scans of occlusiograms, i.e. never included in the training set, were offered to the programme to calculate chewing efficiency. The error in the calculation of chewing efficiency in this case compared to that determined by the direct method of the chewing test ranged from 0.87 to 2.56%, which, in our opinion, is an acceptable result [12,16,19,20].

CONFLICT OF INTERESTS

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

SOURCES OF FUNDING

The authors state that there is no external funding for the study.

AVAILABILITY OF DATA AND MATERIALS

All data generated or analysed during this study are included in this published article.

AUTHORS' CONTRIBUTIONS

All authors contributed to the design and interpretation of the study and to further drafts. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All applicable international, national and/or institutional ethical guidelines have been followed.

CONSENT FOR PUBLICATION

Not applicable.

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КОНФЛИКТ ИНТЕРЕСОВ

Авторы заявляют, что данная работа, её тема, предмет и содержание не затрагивают конкурирующих интересов.

ИСТОЧНИКИ ФИНАНСИРОВАНИЯ

Авторы заявляют об отсутствии финансирования при проведении исследования.

ДОСТУПНОСТЬ ДАННЫХ И МАТЕРИАЛОВ

Все данные, полученные или проанализированные в ходе этого исследования, включены в настоящую опубликованную статью.

ВКЛАД ОТДЕЛЬНЫХ АВТОРОВ

Все авторы внесли свой вклад в подготовку исследования и толкование его результатов, а также в подготовку последующих редакций. Все авторы прочитали и одобрили итоговый вариант рукописи.

ЭТИЧЕСКОЕ ОДОБРЕНИЕ И СОГЛАСИЕ НА УЧАСТИЕ

Были соблюдены все применимые международные, национальные и/или институциональные руководящие этические принципы.

СОГЛАСИЕ НА ПУБЛИКАЦИЮ

Не применимо.

ПРИМЕЧАНИЕ ИЗДАТЕЛЯ

Журнал "Интегративная стоматология и челюстно-лицевая хирургия" сохраняет

нейтралитет в отношении юрисдикционных претензий по опубликованным картам и указаниям институциональной принадлежности.

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