

DOI: 10.21802/artm.2023.1.25.33
UDC 616.314-085+616.314-77

ASSESSMENT OF ORTHOPEDIC TREATMENT LATE RESULTS OF PATIENTS WITH FIXED PARTIAL DENTURES DUE TO THE FUNCTIONAL STATE OF ABUTMENT TEETH

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Abstract. The scientific work highlights the results of an index assessment of the periodontal condition of patients abutment teeth with dentition defects which were replaced with metal-ceramic fixed partial dentures due to partial teeth loss. Since during the preparation of abutment teeth there is sometimes a need for endodontic treatment of them due to medical indications, we investigated the state of the periodontium before, during and after treatment and compared index indicators of pulpless teeth with teeth in which the vascular-nerve bundle was preserved. It was established that the periodontium of the vital tooth recovers and functions much better in comparison with the surrounding dental tissues of a nonvital tooth. Where there are inflammatory changes, which are objectively caused by pronounced swelling and bleeding of the gingival papilla. It is caused due to rubber dam pressure, which in turn is confirmed by reliable data of index indicators determined in various the terms of the treatment.

After conducting a detailed examination of patients with vital abutment teeth with defects in the hard tissues of the teeth, we found that in the age group of 30-39 years, the most common defect in the hard tissues of the teeth was caries damage, which was observed in 8 patients (72.7%), damage due to injuries was found in 2 patients (18.2%), enamel hypoplasia was found in 2 patients (18.2%).

Treatment of partial adentia involves the preparation of abutment teeth followed by the manufacture of fixed bridge prostheses. However, the vitality of the abutment tooth should be taken into account and the reserve forces of the periodontium should be taken into account in order to prevent functional overload. It is also necessary to monitor the hygienic condition of the oral cavity during the treatment and at various times after its completion.

The peculiarity of the proposed method of preparation of vital upper and lower abutment teeth consists in the creation of a chamfer on the vestibular surface with the transition to an imitation of a chamfer on the oral surface, under constant control of the thickness of the peripulpal dentin using a dentometer with the use of full water cooling and subsequent fixation of provisional crowns. The use of a complex of diagnostic techniques for full control of the effectiveness of treatment during and after prosthetics at different times is substantiated and proposed.

The gnathodynamometric study was carried out using an advanced device, the VIZIR E1000 gnathodynamometer: the plates placed between the opposing teeth were bitten, as a result of which the load was digitized using a flexible connection through an analog-digital converter and displayed on the display of a computer program, displayed graphically in newtons (N), the time of the masticatory load was also recorded in seconds.

Using data from clinical indices, it was determined that the preservation of vital teeth is a reliable criterion of the effectiveness of the use of partial fixed prostheses than the use of pulpless teeth. The absence of periapical trauma in vital teeth, which occurs in pulpless teeth due to extirpation of the neurovascular bundle, is demonstrated by the Russel index, and other indices also demonstrate mucosal irritation caused by the use of rubber dams due to the need for quality endodontic treatment.

Keywords: vital tooth, pulpless tooth, dental indexes, periodontium.

Introduction. The need to replace the destruction of the crown part of the tooth and partial included defects of the dentition with fixed prostheses today allows the use of unremovable aesthetic structures, which necessitates the preparation of the crown part of abutment teeth [1]. However, there is a question of the need to perform both root canal resealing and pulp extirpation of abutment teeth in the case of available indications [2]. In such cases, the dentist may encounter the following problems: the impossibility of unsealing the root canal, which may be caused by the presence of a broken instrument during the previous endodontic treatment, the presence of additional root canals, which are sometimes difficult to reveal without the use of special optic device, which over time results in the

development infection followed by the formation of periapical inflammatory processes of infectious origin [3,4].

However, in the absence of their inclination of more than 15 degrees, pathological abrasion, and in the presence of sufficient thickness of the hard tissues of the teeth, it is possible to preserve the vascular-nerve bundle of the abutment teeth, preserving them vital [5].

Used methods such as electroodontometry, dentinometry, and gnathodynamometry by the advanced device the VIZIR E1000 gnathodynamometer allows to assess the functional state and reserve forces of the abutment teeth periodontium, and the effectiveness of the treatment in view of the condition of the mucous membrane of the gums can be confirmed by evaluating the oral cavity using hygienic indices in patients with both vital and with

pulpless abutment teeth [6,7]. This will help justify the choice of an effective and rational method of treatment.

The purpose of the research: to assess the state of oral hygiene using dental indices in patients with vital and pulpless teeth, followed by a comparison of the effectiveness of the selected treatment methods depending on the functional state of the abutment teeth.

Research materials and methods. The index assessment was carried out for patients of all age groups who underwent prosthetics by our proposed method. A total of 80 patients of the main and 60 patients of the control group of three age groups were examined during the work: 26 patients aged 30-39 years, 29 patients - 40-49 years and 28 patients - 50-59 years, respectively. Patients of the control group were examined only once. Patients from the main group for index evaluation were divided into two sub-groups, respectively: with vital teeth - 33 patients, and pulpless - 47 patients. In total, in the main group, where treatment was carried out for persons with vital and nonvital abutment teeth, there were: 26 patients aged 30-39 years, 29 patients - 40-49 years and 28 patients - 50-59 years, respectively. All the mentioned patients of the main group with vital abutment teeth with partially included defects of the dentition and the presence of defects of the crown part were prepared by our proposed method and one-piece metal-ceramic fixed prostheses were made.

We determined the degree of activity of the inflammatory process using the Schiller-Pysarev test. Papillary bleeding index (PBI) was calculated according to the method of Saxer and Milleman. The condition of the gums and alveolar bone was determined using the periodontal index PI (Russell). The severity of gingivitis was calculated using the Sillness Loe gingivitis index. Statistical processing was carried out with the help of non-parametric Mann-Whitney and Wilcoxon methods using the Statistica 64 10 computer program.

Research results and their discussion. Determination of such hygienic indicators, the Schiller-Pysarev test, and papilla bleeding index (PBI), periodontal index PI (Russell) and gingivitis index Silness-Loewere performed once for patients in the control group. For patients in the group where the abutment teeth were kept vital, and in the group where, according to the indications, it was necessary to perform pulp extraction, the specified indicators were determined before treatment, the day after the treatment and at different times after fixation of the fixed structure.

Schiller-Pysarev test in the control group in patients aged 30-39 was 0.94 ± 0.06 , in the age group 40-49 - 0.86 ± 0.07 , in the group 50-59 1.13 ± 0.08 , which indicates a good level of hygiene.

The Silness Loe gingivitis index in the control group also remained within the normal range, as indicated by its values. So, in patients aged 30-39, it was 0.16 ± 0.02 , in the age group 40-49 - 0.28 ± 0.03 , in the group 50-59 - 0.47 ± 0.03 , which indicated the absence of inflammation.

Taking into account the prevalence and intensity of periodontal tissue damage, we determined the periodontal index PI (Russell). Its indicators in the control group of patients in the age group of 30-39 years showed a value of 0.08 ± 0.02 , in the age group of 40-49 years - 0.25 ± 0.03 , in the group of 50-59 years - 0.38 ± 0.05 , which also indicated the absence of inflammatory processes in gum and bone tissues.

The papillary bleeding index (PBI) in the control group also indicated the absence of inflammation in the periodontal tissues, as evidenced by the values obtained in all age groups. Thus, in patients aged 30-39 years, the indicative was 0.34 ± 0.03 , in the age group 40-49 years - 0.41 ± 0.02 , and in the 50-59 years group - 0.56 ± 0.05 respectively.

Comparing index data before treatment in patients with vital and pulpless abutment teeth, we found that in the age group of 30-39 and 40-49 years, there was a significant difference only in the Russel index indicator, which was due to the course of inflammatory processes of the periapical tissues of the teeth, where it was shown endodontic treatment. A significant difference in the indices of the Schiller-Pysarev index (1.56 ± 0.08), the Silness-Loe index (0.91 ± 0.09), the Russell index (0.93 ± 0.06) and the PBI index (0.94 ± 0.1) in patients with pulpless teeth in the age group of 50-59 years is caused both by the periapical processes of the abutment teeth, age-old changes in the bone tissue, and by the insufficient level of hygiene and the presence of hard dental deposits that cause destructive changes in the marginal periodontium. All other indicators in patients with healthy and pulpless teeth also differed from each other, but their difference was not significant (Table 1).

Analyzing the indicators of the index assessment of the state of the oral cavity in patients with vital and pulpless abutment teeth on the day after treatment, it was noted that absolutely all patients of three age groups with vital teeth showed a significantly faster improvement ($p > 0.05$) of the indicated data. This is explained by the use of a rubber dam to isolate the abutment tooth for its depulping and the presence of an inflammatory process in the periapical tissues as a result of the traumatic separation of the vascular-nerve bundle, which indicates the advantage of preserving the vitality of the abutment teeth. In addition, inflammation was accompanied by the presence of swelling, bleeding, and hyperemia (Table 2).

After performing the preparation of the abutment teeth and determining the index assessment after 1 month compared to the first day, there is a significant improvement ($p > 0.05$) in all indices, except the Russell index (1.54 ± 0.05) in the age group of 50-60 years. Patients who underwent depulping of abutment teeth compared to a similar indicator (1.33 ± 0.1) of vital teeth, which is explained by the slowing down of reparative processes in older patients (Table 3).

Conclusions:

1. Carrying out a comprehensive examination of patients allows you to monitor the dynamics of the treatment process and helps to choose the optimal method of treatment.
2. Preparation of abutment teeth while preserving their vitality has significant advantages over pulpless, as evidenced by the obtained results of the obtained hygienic and periodontological indices. Nevertheless, all indicators, except the Russel index (1.54 ± 0.05), age group 50-60 years, are significantly better in patients with vital abutment teeth.
3. The analysis of the index assessment at various stages after prosthetics allows predicting the long-term consequences of treatment with our proposed method, depending on the functional state of the abutment teeth.

Table 1
Data of indexes of vital teeth in comparison to vital teeth before treatment

Age group	Control group with intact teeth					The main group, vital teeth, before treatment					The main group, pulpless teeth, before treatment					
	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index
30-39	0.94±0.06	0.16±0.02	0.08±0.02	0.34±0.03	1.06±0.05	0.38±0.04	0.22±0.02	0.44±0.03	1.21±0.08	0.42±0.04	0.53±0.06*	0.47±0.03	1.39±0.09	0.54±0.05	0.8±0.07*	0.63±0.06
40-49	0.86±0.07	0.28±0.03	0.25±0.03	0.41±0.02	1.26±0.04	0.58±0.06	0.26±0.03	0.47±0.03	1.56±0.08*	0.91±0.09*	0.93±0.06*	0.94±0.1*	1.39±0.09	0.54±0.05	0.8±0.07*	0.63±0.06
50-59	1.13±0.08	0.47±0.03	0.38±0.5	0.56±0.05	1.34±0.06	0.63±0.07	0.32±0.04	0.64±0.06	1.56±0.08*	0.91±0.09*	0.93±0.06*	0.94±0.1*	1.56±0.08*	0.91±0.09*	0.93±0.06*	0.94±0.1*

Note: * – p < 0.05, compared with similar data of the vital teeth before treatment

Table 2
Data of indexes of vital teeth in comparison to vital teeth, 1 day after treatment

Age group	Control group with intact teeth					The main group, vital teeth, the day after preparation					The main group, pulpless teeth, the day after preparation					
	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index
30-39	0.94±0.06	0.16±0.02	0.08±0.02	0.34±0.03	2.32±0.09	2.1±0.04	1.00±0.07	1.6±0.05	3.86±0.08*	2.91±0.06*	1.51±0.05*	2.1±0.11*	3.9±0.07*	3.03±0.07*	1.46±0.03*	2.39±0.13*
40-49	0.86±0.07	0.28±0.03	0.25±0.03	0.41±0.02	2.28±0.07	2.22±0.06	1.3±0.09	1.77±0.05	3.9±0.07*	3.03±0.07*	1.46±0.03*	2.39±0.13*	4.01±0.08*	3.19±0.07*	1.59±0.07*	2.31±0.24*
50-59	1.13±0.08	0.47±0.03	0.38±0.5	0.56±0.05	2.53±0.09	2.34±0.06	1.35±0.08	1.79±0.05	4.01±0.08*	3.19±0.07*	1.59±0.07*	2.31±0.24*	4.01±0.08*	3.19±0.07*	1.59±0.07*	2.31±0.24*

Note: * – p < 0.05, compared with the same data of vital teeth on the next day after treatment

Table 3
Data of indexes of vital teeth in comparison to vital teeth, 1 month after treatment

Age group	Control group with intact teeth					The main group, vital teeth, for 1 month after fixation					The main group, pulpless teeth, 1 month after fixation					
	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index	Schiller-Pysarev	Silness-Loe	Russell index	PBI index
30-39	0.94±0.06	0.16±0.02	0.08±0.02	0.34±0.03	1.58±0.08	1.27±0.06	0.81±0.03	1.23±0.04	3.47±0.07	1.83±0.04	1.4±0.06	1.83±0.06	3.47±0.07	1.83±0.04	1.4±0.06	1.83±0.06
40-49	0.86±0.07	0.28±0.03	0.25±0.03	0.41±0.02	1.65±0.05	1.53±0.04	1.21±0.08	1.37±0.04	3.41±0.07	2.06±0.05	1.35±0.04	1.92±0.09	3.41±0.07	2.06±0.05	1.35±0.04	1.92±0.09
50-59	1.13±0.08	0.47±0.03	0.38±0.5	0.56±0.05	1.93±0.04	1.64±0.05	1.33±0.1	1.45±0.05	3.56±0.05	2.11±0.04	1.54±0.05*	1.96±0.05	3.56±0.05	2.11±0.04	1.54±0.05*	1.96±0.05

Note: * – p > 0.05, compared with the same data of the same teeth on the next day after treatment

The perspective of further scientific research.

A further study of the effectiveness of the performed prosthetics is planned using articulating paper and the hardware-computer complex T – Scan.

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УДК 616.314-085+616.314-77

**ОЦІНКА ВІДАЛЕНИХ РЕЗУЛЬТАТІВ
ОРТОПЕДИЧНОГО ЛІКУВАННЯ ХВОРИХ З
НЕЗНІМНИМИ ЧАСТКОВИМИ ПРОТЕЗАМИ
ЗА ФУНКЦІОНАЛЬНИМ СТАНОМ ОПОРНИХ
ЗУБІВ**

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Резюме. Лікування часткової адентії передбачає препарування опорних зубів з подальшим виготовленням незнімних мостоподібних протезів. Проте слід брати до уваги вітальність опорного зуба та враховувати резервні сили пародонту з метою запобігання функціонального перевантаження. Також необхідно відстежувати протягом лікування та в різні терміни після його проведення гігієнічний стан ротової порожнини.

Не викликає будь-яких сумнівів необхідність використання вітальних опорних зубів, оскільки значна кількість ускладнень з'являється в пацієнтів унаслідок депульпування зубів. На сьогоднішній день здійснення ощадливого препарування твердих тканин з подальшим використанням вітальних опорних зубів, знання зон безпеки коронкових частин зубів та враховування рентгенологічних даних при вивчанні топографо-анатомічних особливостей пульпової камери зубів пацієнтів різних вікових категорій є найбільш оптимальним у науковому та практичному підході до протезування незнімними конструкціями мостоподібних протезів.

Гнатодинамометричне дослідження проводилося з використанням приладу гнатодинамометр ВІ-ЗИР Э1000: здійснювалося накушування пластинок, які розміщені між зубами-антагоністами, унаслідок чого навантаження через гнучке з'єднання через аналогово-цифровий перетворювач оцифровувалося та виводилося на дисплей комп'ютерної програми.

Використовуючи дані клінічних індексів було встановлено, що збереження вітальних зубів є достовірним критерієм ефективності використання для часткових незнімних протезів, ніж використання депульпованих зубів. Відсутність периапікальної травми у вітальних зубах, яка відбувається в депульпованих зубах унаслідок екстирпації судинно-нервового пучка, демонструє показник індексу Russel, також інші індекси продемонстрували подразнення слизової оболонки.

Ключові слова: вітальний зуб, депульпований зуб, стоматологічні індекси, пародонт.

Стаття надійшла в редакцію 09.02.2023 р.

Стаття прийнята до друку 15.03.2023 р.