Clinical study of a method for the receptor apparatus of the teeth protection at the stages of treatment with non-removable prosthesis designs

O. V. Voznyi*, I. V. Yanishen, I. L. Diudina, V. H. Tomilin, A. V. Pohorila

1Zaporizhzhia State Medical University, Ukraine; 2Kharkiv National Medical University, Ukraine

Key words: receptor apparatus, intact teeth, electroodontometry, mastication, protection technique, light-curing adhesive, antihomotoxic drug.

This article presents the results of clinical approbation of our proposed method for protecting the receptor apparatus of the teeth through a complex of domestic light-curing adhesive preparations and antihomotoxic drug “Traumeel”, the application of which was substantiated by experimental studies in laboratory animals.

The purpose of the study was to confirm clinically the experimentally obtained results to protect the receptor apparatus of the teeth by using the antihomotoxic drug combined with the domestic light-curing adhesive.

Materials and methods. The method was tested in 72 patients, of whom 57 were the main group and 15 were controls. They were divided into 3 subgroups by age. A total of 200 teeth were prepared for one-piece cast fixed implant-supported prostheses. Electro-odontometry (EO) was performed and masticatory force (MF) was measured by the proposed method (patent number 99095142 dated September 16, 1999) before the preparation, when an anesthetic was worn off and one month after preparation.

Results. The positive results of our method were clinically confirmed by the EO data analysis and the MF values measured by proposed by us method on the day of the study, the next day, in a month after the intact teeth were coated with the proposed complex of preparations. When assessing the data obtained, it was found that there were no significant changes in the EO indices as well as MF indicators on the day of the examination, the next day, in a month after the examination in the study group compared with the control.

Conclusions. Analyzing the results obtained, it can be noted that our method has a significant advantage in protecting the stumps during teeth preparation at the stages of treatment with non-removable prosthesis design and contributes to preventing complications of the hard dental tissue preparation.

Ключові слова: рецепторний апарат, інтаційні зуби, електродонтометрія, жування, методика захисту, світлотвердий адгезив, антитоксичний препарат.

Клінічне випробування методу захисту рецепторного апарату зубів на етапах лікування незвільненими конструкціями протезів

О. В. Возний, І. В. Янишен, І. Л. Дюдіна, В. Г. Томілін, А. В. Погоріла

Мета роботи – кількісне підтвердження експериментально отриманих результатів щодо захисту рецепторів жувального тиску зубами шляхом застосування антитоксичного препарату разом з вітчизняним світлотвердим адгезивом.

Матеріали та методи. Метод апробований на 72 пацієнтах, з них 57 утворили основну, а 15 – контрольну групу, яких поділили на 3 підгрупи за віковими ознаками. Препарували під опорні елементи незнімних суцільнолитих протезів 200 зубів. Вимірювали показники електроodontометрії (ЕО) та жувального тиску (ЖТ), застосовуючи метод, який запропонували (патент № 99095142 від 16.09.1999), до операції препарування, після завершення дії анестезії та через місяць після препарування.

Результати. Позитивні результати розробленого методу в клініці підтверджуються аналізом даних електродонтометрії та значення жувального тиску, що вимірювали за методикою, яку запропонували, в день дослідження, наступного дня, через місяць і через рік після того, як інтаційні зуби були покриті комплексом препаратів за допомогою методу, який запропонували. Оцінюючи результати, установили: в основній групі порівняно з контрольною показники електродонтометрії в день дослідження, через день, через місяць після дослідження не мали значущих змін, те саме стосується показників жувального тиску в названих періодах дослідження.

Висновки. Аналізуючи отримані результати, визначили, що метод має суттєвий перевагу відносно захисту кукси під час підготовки інтаційних зубів на етапах лікування незвільненими конструкціями протезів і сприяє запобіганню ускладнень і підвищенню якості протезування.
Materials and methods. The method was tested in 72 patients, 57 of whom were the main group and 15 were controls. They were divided into 3 subgroups by age. In total, 200 teeth were prepared for one-piece cast fixed implant-supported prostheses. The dental stump was prepared according to our method consisting of the following steps: an infiltration anesthesia giving preference to intraligamental injections using anesthetics of the articaine formulations such as Septanest, Ultracain with 1:100.000 or 1:200.000 epinephrine depending on the clinical case.

The dental hard tissues were ground with a centered and sharp water-cooled abrasive tool at 300,000 revolutions per second. After preparation, the stumps of the teeth were covered with etching gel for 20–30 seconds. This significantly contributes to medicines penetration into the dental tubules. Then the gel was washed away by a water stream, sterile cotton pellet was placed to isolate the stump of the tooth and absorb any oral fluids and, if necessary, a saliva aspirator was used additionally, the stumps were dried with warm air. The anathomotoxic drug “Traumeel” was applied evenly over the dental stump surface with an applicator and a current of warm air. The domestic light-curing adhesive was subsequently applied with the applicator over the anathomotoxic preparation. The current of warm air was used to remove the rest of the drug. Following that, the adhesive was polymerized for 20 seconds. To reduce the environmental effect on the dental stumps of the prepared tooth, temporary crowns that were point-of-care made before the dental preparation, were fixed with the water dentine via material of GNJ Tempo Lux Company according to the standard methods [10, 11].

For clinical validation of the experimental study results, the parameters of EO and MF were measured according to the method proposed by us (patent No. 99095142 of 16.09.1999) before the preparation, when an anesthetic start. Therefore, the first stage of prosthetic preparation is a start compensatory mechanisms. However, it depends on the volume of tissues prepared, time interval since intervention [1,2,6,9,10,11,14].

Nevertheless, these protective reactions do not always start. Therefore, the first stage of prosthetic preparation is a dental pulp extraction. But some researches have proven that this manipulation significantly reduces the strength of dentin, which is the reason of frequent damage to the tooth stump after prosthetic treatment and a decrease in toughness and resistance to MF during functional loading [3,5,7,8,12].

To preserve intact teeth and prevent negative consequences, various methods of pulp extraction and techniques for preservation of supporting pulp vitality and reduction of their sensitivity after preparation were proposed by many scientists. According to these methods, the stumps of the prepared teeth were covered with various materials, provisional crowns, which were fixed with one-step and multi-step self-etching adhesives. However, none of the proposed methods resulted in restoration of the dental hard tissue and odontoblast processes damage during preparation, which are a part of the mechanoreceptors in the tooth pulp [4,13,15].

In view of the above and taking into account the relevance and practical importance of this issue, we proposed a method that was tested in the clinical practice of orthopedic dentistry.

Purpose
The purpose of the study was to confirm clinically the experimentally obtained results to protect the receptor apparatus of the teeth by using the complex of anathomotoxic drug “Traumeel” and the domestic light-curing adhesive.
The image contains a graph and some text. The graph is a bar chart showing the percentage of uncomplicated and complicated cases before and after treatment. The text contains statistical data and analysis, discussing the trend in masticatory force indicators and indicators of electro-odontometry before and after treatment, with a focus on the control and experimental groups. The text mentions the significance of the changes in these indicators and the independence of these indicators from the group of teeth.

Table 1: Indicators of electro-odontometry, mA

<table>
<thead>
<tr>
<th>Group</th>
<th>Incisors</th>
<th>Canines</th>
<th>Premolars</th>
<th>Molars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>On the next day</td>
<td>In a month</td>
<td>Before</td>
</tr>
<tr>
<td>Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>3.24</td>
<td>2.21</td>
<td>3.34</td>
<td>4.10</td>
</tr>
<tr>
<td>m</td>
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<td>0.09</td>
<td>0.15</td>
<td>0.23</td>
</tr>
<tr>
<td>P1</td>
<td>&lt; 0.001</td>
<td></td>
<td>P1 &lt; 0.001</td>
<td></td>
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<tr>
<td>Control</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>3.22</td>
<td>2.67</td>
<td>6.22</td>
<td>4.75</td>
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<tr>
<td>m</td>
<td>0.15</td>
<td>0.24</td>
<td>0.76</td>
<td>0.48</td>
</tr>
<tr>
<td>P1</td>
<td>&lt; 0.05</td>
<td></td>
<td>P2 &lt; 0.001</td>
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</table>

Table 2: Masticatory force indicators, pF

<table>
<thead>
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<th>Premolars</th>
<th>Molar</th>
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<tr>
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<td>M</td>
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<td>0.26</td>
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<td>0.46</td>
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<tr>
<td>P1</td>
<td>&lt; 0.001</td>
<td>P &gt; 0.05</td>
<td>P &lt; 0.001</td>
<td>P &gt; 0.05</td>
</tr>
<tr>
<td>K</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>m</td>
<td>10.22</td>
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<td>13.44</td>
<td>15.00</td>
</tr>
<tr>
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<td>&lt; 0.01</td>
<td>P &lt; 0.05</td>
<td>P &lt; 0.05</td>
<td>P &lt; 0.05</td>
</tr>
</tbody>
</table>

P1: significance between before the preparation and on the next day after that; P2: significance between before the preparation and in a month after that.
and canines on the next day after processing if compared between the study and control groups, as this increase concerning the premolars and molars was significantly greater in the control group than in the experimental group.

The MF indicators of the experimental group were not increased in 55.64 % of cases in a month after processing. In 42.1 % of cases, this indicator was increased in 1–2 pF and only in 2.26 % of cases – of 4 pF and more that can be understood as complications.

In the control group, the MF indicator was not increased only in 3.33 % of cases and its significant increase (4 pF and more) was observed in 36.66 % of cases that could be considered as complications (Fig. 2).

Discussion

From the analysis of the obtained results, it can be seen that the EO and MF indicators remained at the same level in a month after preparation in more than 50 % of the cases and did not depend on the tooth anatomical orientation in those patients who underwent the proposed by us protective method of stumps supporting during teeth preparation [12]. Nevertheless, in the control group, where our technique was not applied, the same indicators were significantly increased in a month and the anatomical dependence of the tooth was very important. The largest increase in these indicators was observed for incisors, then for canines, premolars and less for all the molars.

Conclusions

Thereby, we can see a significant advantage of our method in protecting the intact stumps during teeth preparation at the stages of treatment with non-removable prosthesis design. This makes it possible to apply our protective method of stumps supporting in the wide orthopedic practice and significantly increase the use of orthopedic non-removable denture helping prevention of complications in the hard dental tissues preparation.

Conflicts of interest: authors have no conflict of interest to declare.

References


