CONSIDERATIONS OVER THE FEATURES OF THE BONE IN THE MANDIBULAR FIRST MOLAR AREA, EXTRACTED AND UNRESTORED, USING X-RAY COMPUTED TOMOGRAPHY

INTRODUCTION

6-year molars are called such because they are the first permanent molars which erupt at this age, distal to the temporary second molars and they concur at improving the effectiveness of the masticatory function through its occlusal morphology and lead to elevation and stabilization of the dental occlusion. The children affected by dental caries, with active mastication and saliva and through abrasion; consumption sugary products or sweetened drinks; the existence of mineral metabolism imbalances which may accompany the increase in weight gain, when it is not compensated by adequate consumption of foods rich in vitamins and minerals. In the absence of any strategy aiming at the preservation of those molars on the arcade, they get to be very early extracted and the status of the patient tends to the installation of serious occlusal and articular imbalances with the arising of the TMJ pathologies and favouring the installation of periodontal diseases.(2) In this study, there have been executed a series of CT (computed tomography) scans. In the study, there has been used information extracted from dental patient records regarding to the moment in time when this first mandibular molars were extracted. Also, the presence of the present homologous first molar made it possible to appreciate the difference in volume between the two bone areas. Nowadays there are various methods for prosthesis of the edentulous first molar. The choice of one of the many methods depends on several factors. Dental implant is one of the methods most often used for rehabilitation. However, this treatment option is subject to a number of general factors (overall health, chronic diseases, cost price), but also local factors (situation of the neighbouring teeth consecutive to edentation, the quality and quantity of the residual bone, surrounding anatomic elements edentate - such as inferior alveolar canal). One of the most predominant factors

Keywords: molar, mandibular, X-ray computed tomography

Abstract: The lack of a coherent program of dental prevention in recent years led to a multiplication of the patients with edentulous affections of 6-year molar. 6-year molar is the first definitive molar which erupts on the arch. Thus, corroborating also with other local and/or social causes, there comes out an early loss of this tooth. The consequences are both in the short term, but more serious are long-term ones. In this respect, it appears occlusal dysfunctions, changes in remaining teeth positions and last but not least, changes in aesthetics. This article is based on a number of X-ray computed tomography, with which it could establish a range of information about the quantity and quality of bone in the mandibular first molar area, taking into account the patient's age and first molar extraction time. It has been shown that bone offer is inversely proportional to the period elapsed from the moment of the first molar extraction.

Cuvinte cheie: molar, mandibular, tomografii computerizate

Rezumat: Lipsa unui program coerent de prevenție dentară, a dus în ultimii ani la o înmulțire a pacienților cu edenții de molar de 6 ani. Molarul de 6 ani este primul molar definitiv, ce erupte pe arcadă. Astfel, corroborând și cu alte cauze locale și/sau sociale, apare o pierdere timpurie a acestui dinte. Consecințele ce apar sunt adesea pe termen scurt, dar mai grave sunt cele pe termen lung. În acest sens, apar disfuncții occluzale, modificări ale pozițiilor dinților restanții și nu în ultimul rând, modificări de ordin estetic. Lucrarea de față are la bază un număr de tomografii computerizate, cu ajutorul cărora s-au putut stabilii o serie de informații legate de cantitatea și calitatea ososă în zona molarului de 6 ani mandibular, jinându-se cont de vârsta pacientului și momentul extracției molarului. S-a demonstrat că oferta ososă este invers proporțională cu perioada scursă, din momentul extracției molarului de 6 ani.

CLINICAL ASPECTS

VICTOR TRĂISTARU1, MIHAI BURLIBAŞA2, MIHAI DAVID3, MIHAI BOGDAN BUCUR4, MIHAELA CERNUŞCĂ-MIȚIARU5, GABRIELA TĂNASE6, CRISTIAN ANDREI COMES7, CLAUDIA CAMELIA BURCEA8

1-3“Carol Davila” University of Medicine and Pharmacy, București, 5-6“Lucian Blaga” University of Sibiu

Corresponding author: Mihai Burlibașa, Bld. Mărășești, Nr. 2B, Bl. A, Sc. 2, Et. 5, Ap. 17, Sect. 4, București, E-mail: mburlibasa@gmail.com, Tel: 440723 472632

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which can affect the outcome of the rehabilitation is the size of implants. Choosing implant size will depend on the supply of bone at this level. In this study were analyzed reports of bone level offers in the first mandibular molar area for the insertion of a dental implant.(3,4)

METHODS

In the study included 16 patients. Patients were clinically and imagistically investigated. In terms of dental imaging, X-ray computed tomography had been used. The equipment used to make CT scans is a trademark of KODAK, Model 9000 3D. The software used for the analysis of the results of the computerized dental tomographies is i-CATVision. All the 16 subjects present unilateral mandibular first molar edentations. Thus, we proceeded to the measurement and analysis of the edentulous alveolar bone compared to the homologous area, with the first molar present. With the aid of computerized tomography, we were able to get the cross sections of the dentate and edentate alveolar ridge. For each patient, it was chosen as a standard size the mesio-distal dimension of the present mandibular first molar. Half this size, measured from distal face of the second premolar, was established as a landmark for selecting the cross section on which, we have measured the height and width of bone in the homologous edentulous area. To measure the height of the edentulous ridge, 2 points have been chosen (one superior and another inferior) at this level, these 2 points by defining maximum height of the edentulous ridge. To determine the width of the remaining bone, it was measured the horizontal dimension of the ridge by choosing a point 3 mm lower than the upper point chosen for determining height of the bone (See figure no. 1 and figure no. 2).

Results of the study come to help practitioners with notable results in terms of change, over time, of the bone tender in the mandibular first molar area. Detailed and correct

Table no. 1. Consolidate data obtained from data sheets of patients included in the study and the data resulting from measurements on computed tomography

<table>
<thead>
<tr>
<th>Patient's initials</th>
<th>AGE</th>
<th>SEX</th>
<th>( \Delta t ) lower left</th>
<th>( \Delta t ) lower right</th>
<th>h/L left</th>
<th>h/L right</th>
<th>( \Delta h ) if applicable</th>
<th>( \Delta L ) if applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.D.</td>
<td>49</td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>26.50</td>
<td>28.25</td>
<td>1.75</td>
<td>6.19%</td>
</tr>
<tr>
<td>A.I.</td>
<td>35</td>
<td>M</td>
<td>25</td>
<td>3.12</td>
<td>32.57</td>
<td>35.17</td>
<td>2.60</td>
<td>4.14</td>
</tr>
<tr>
<td>A.R.</td>
<td>37</td>
<td>F</td>
<td>9</td>
<td>-</td>
<td>22.98</td>
<td>25.12</td>
<td>2.14</td>
<td>1.85</td>
</tr>
<tr>
<td>A.N.</td>
<td>54</td>
<td>M</td>
<td>11</td>
<td>-</td>
<td>24.71</td>
<td>27.54</td>
<td>2.84</td>
<td>25.12%</td>
</tr>
<tr>
<td>A.E.</td>
<td>68</td>
<td>M</td>
<td>28</td>
<td>-</td>
<td>22.88</td>
<td>25.83</td>
<td>2.95</td>
<td>15.43%</td>
</tr>
<tr>
<td>B.E.</td>
<td>63</td>
<td>F</td>
<td>-</td>
<td>2</td>
<td>33.51</td>
<td>35.50</td>
<td>1.99</td>
<td>10.31%</td>
</tr>
<tr>
<td>C.I.</td>
<td>53</td>
<td>F</td>
<td>-</td>
<td>13</td>
<td>22.22</td>
<td>25.53</td>
<td>1.99</td>
<td>18.85%</td>
</tr>
<tr>
<td>F.I.</td>
<td>35</td>
<td>F</td>
<td>12</td>
<td>-</td>
<td>22.95</td>
<td>26.10</td>
<td>3.15</td>
<td>3.77</td>
</tr>
<tr>
<td>I.L.</td>
<td>54</td>
<td>F</td>
<td>10</td>
<td>-</td>
<td>27.52</td>
<td>30.01</td>
<td>2.49</td>
<td>2.75</td>
</tr>
<tr>
<td>M.C.</td>
<td>32</td>
<td>F</td>
<td>-</td>
<td>8</td>
<td>28.70</td>
<td>30.77</td>
<td>1.97</td>
<td>3.13</td>
</tr>
<tr>
<td>M.M.</td>
<td>35</td>
<td>M</td>
<td>-</td>
<td>18</td>
<td>37.52</td>
<td>41.50</td>
<td>3.98</td>
<td>28.09%</td>
</tr>
<tr>
<td>M.G.</td>
<td>67</td>
<td>F</td>
<td>15</td>
<td>-</td>
<td>25.75</td>
<td>27.44</td>
<td>1.69</td>
<td>5.06%</td>
</tr>
<tr>
<td>N.C.</td>
<td>58</td>
<td>F</td>
<td>-</td>
<td>13</td>
<td>33.32</td>
<td>35.75</td>
<td>2.43</td>
<td>1.46</td>
</tr>
<tr>
<td>N.S.</td>
<td>59</td>
<td>M</td>
<td>2</td>
<td>-</td>
<td>25.12</td>
<td>27.26</td>
<td>0.85</td>
<td>8.91%</td>
</tr>
<tr>
<td>N.M.</td>
<td>34</td>
<td>F</td>
<td>12</td>
<td>-</td>
<td>23.31</td>
<td>25.67</td>
<td>2.36</td>
<td>2.27</td>
</tr>
<tr>
<td>P.M.</td>
<td>47</td>
<td>F</td>
<td>-</td>
<td>21</td>
<td>27.80</td>
<td>34.50</td>
<td>6.70</td>
<td>47.53%</td>
</tr>
</tbody>
</table>

\( \Delta t \) - is the period (expressed in years) from the moment of extracting mandibular first molar up to the time of the computerized tomography;

\( h/L \) - ratio (expressed in mm) between the height and width of the body of the mandibular bone, measured at the level of the first molar; to measure the width of the bone has been used the following landmarks: bone height (conjunction of the top point with the lower point at the level of the analyzed section); bone width was measured at 3 mm from the top on the above established height;

\( \Delta h \) - represents the difference (in mm and as a percentage) between the height of the body of the mandibular bone in the counterpart first molar (present) area and bone height in the edentulous first molar area (height are measured on transversal section on computed tomography, at bone level, from the highest point to the lowest point);

\( \Delta L \) - is the difference (in mm and as a percentage) of the average width of the body of the mandibular bone in the first molar area and average width at the level of the edentulous counterpart first molar.

The ages of the subjects are ranging between 32 and 68 years. Periods of time (in years) from the moment of the first mandibular molar extraction and up to the time of the study are between 2 and 28 years (See table no. 1). In the study was not taken into account the pathology that led to extraction of the first mandibular molar. The test subjects are patients who were clinically healthy at presentation date, with good general status, with no chronic diseases.

Figure no. 1. Orthopantomografic of patient P.M.

Figure no. 2. Measurements on the section with the help of computerized tomography in quadrant 3 (tooth 36) and in quadrant 4 (tooth 46 absent). Ridge height is calculated adding value 1 to 2. The width of the ridge is represented by value 3.
information to patients must become a general purpose in dental practice. The treatment options of the patients must be presented, with both advantages and disadvantages, and the consequences that may occur in the short term, medium and long term. Choosing a treatment plan optimized for each case represents a real chance of success. We must explain to the patients all the local and regional changes that will take place in consecutive time the loss of one or more teeth. Thus, from the patients included in the test, in the range of 2-10 years from the moment it was extracted one of the mandibular first molars, the average loss of bone tissue on mandibular bone height is 7.09%, yet compared with the homologous area in which the first molar is present. At the same time, the average percentage reduction of bone tissue on width at the level of the edentulous first molar is 15.41 percent over the counterpart first molar present on the arcade. In the range of 11-15 years, the average height is loss of 11.93%, while the average width reduction is 22.66% bone. In the last time interval, 18-28 years, the average deficit of bone height is 17.23%, while the average width loss is 35.65% (See table no. 1). Between the first interval (2-10 years), and the last time interval (18-28 years) there is an increase bone height deficit by approximately 14.3%, and in terms of width, bone loss is about 13.1% (See table no.1). According to the figure no. 3 we can see only 3 subjects from the analyzed group, who presents a larger percentage change of the vertical face of the deficit.

Figure no. 3. Comparison between the loss of bone height and width (%)

Thus, bone loss, both the percentage and in mm, is more significant in terms of bone width at the level of the ridge in the first permanent molar area, in comparison with the counterpart area. Patients should be informed that option regarding the rehabilitation using dental implant in the mandibular first molar area requires a series of general, regional and local conditions.

Figure no. 4. The correlation between the period (expressed in years - HORIZONTAL) of the mandibular first molar edentation and percentage of mandibular bone loss (expressed in% - VERTICAL) on vertical height aspect in the counterpart area where the first molar is present

Among local issues, one of the most important factors is the vertical and horizontal bone dimensions. Therefore, the medium and long periods of mandibular first molar edentation, may lead to an inability to restore the area with a dental implant, due to insufficient bone offer.

Figure no. 5. The correlation between the period (expressed in years - HORIZONTAL) of the mandibular first molar edentation and percentage of bone loss (expressed in% - VERTICAL) in horizontal aspect of the counterpart area where the first molar is present

The criteria for the implant disposition according to the available space in the mandibular first molar area are shown in figure no. 6.(5)

Figure no. 6. Optimal space criteria

There is a requirement for a minimum of 6 mm space in vestibulo-oral dimension for insertion of an implant of 4 mm diameter in this area. The characteristics of the implant are dictated in this area by the great masticatory forces and by the dimensions of the crown.(5) It is strongly recommended to avoid the appearance of large lever arms that may affect the dental implant.(3) To this minimum space requirements, in practice, we add information obtained with the aid of computerized tomography of morphological characteristics and quality of bone at this level. Thus, it should be analyzed and interpreted the cortical and cancellous bone structure.

REFERENCES
1. Dunn G, Everitt BS. Clinical biostatistics-an introduction to evidence-based medicine; Edward Arnold; 1995.