Abstract

Introduction: Lamina dura is one of the important components in the “periodontium” that encircle the socket of the tooth because it provides the connection area to the periodontal ligaments (Sharpey's fibers). In addition, the lamina dura has a significant role in the remodeling of the bone, so in this way in orthodontic therapy. The presence of intact and regular lamina dura often refers to a “healthy periodontium”. Many conditions may affect the status of lamina dura, which may lead to disruption in the symmetry and uniformity of the lamina dura.

Purpose of the Study: To observe the possible “radiographic changes” of lamina dura in patients treated with “corticosteroids”.

Materials and Methods: The study included fifty-two individuals aged between 18 - 45 years who referred to the oral radiology units in some dental specialized centers of Baghdad capital from December 2018 to December 2019 for taking periapical radiographs. Thirty-two of individuals were healthy and without any systemic diseases and they are considered as a control group and the other twenty individuals were with a history of treatment with different doses of “oral or systemic corticosteroids” for at least two years ago and up to five years maximum and they are considered as patient group. A total of 1439 “periapical radiographs” selected in the study for evaluating the thickness of lamina dura including the anterior and posterior teeth in upper and lower jaws and excluding third molars for two groups. All “periapical images” were viewed on the monitor using digital radiography. Different patterns of examining lamina dura from the two groups had shown in “periapical radiographic images”.

Results: From the total of the two groups, the results in the patients treated with “corticosteroids” showed that the pattern IV of lamina dura was more than the other patterns in the percentage of 21.61%, followed by pattern V (13.96%), the pattern I (8.33%), pattern II (4.37%), pattern III (3.26%) respectively. In addition, the results showed that the pattern I of lamina dura was more in the control group in percentage of 35.71%, followed by pattern V (4.51%), pattern III (3.68%), pattern II (2.64%) and pattern IV (1.87%), respectively. The statistical analysis showed that there was no significant relationship regarding the lamina dura changes between the patients’ group and healthy group of p-value < 0.05 (Spearman’ Rho, rs = 0.2, p-value = 0.7).

Conclusion: The study found that the use of “corticosteroids” has no direct effect on the status of lamina dura.

Keywords: Radiography; Lamina Dura; Patient; Corticosteroid

Introduction

The lamina dura is a narrow thin layer of dense cortical jawbone so-called “alveolar bone proper” or cribriform plate. It surrounds roots of sound teeth and continuous with the shadow of the cortical plate till the alveolar crest. Radio-graphically, the lamina dura seen as a thin radiopaque line bound the normal tooth socket. The side adjacent to the roots is the periodontal membrane which is seen as a thin radiolucent shadow on the radiograph. The opposite side and below the lamina dura is the cancellous bone [1,2].

Clinically, differentiation of a lamina dura is most likely impossible due to small differences and perturbations in the uniformity of the lamina dura that may result from overies of cancellous bone and delicate nourishing canals crossing through the lamina dura from cancellous bone spaces to the periodontal space [1].

Factors affecting the radiographic appearance of lamina dura

Any changes in the x-ray beam “angulation” may affect the appearance or disappearance of lamina dura and periodontal membrane space on radiographs [3]. When the x-ray beam passing lamina dura thickness cause attenuation and seen as radiopaque. This radiopaque appearance of lamina dura is well defined and narrow in the case of x-ray passing directly through a relatively wide area of lamina dura and in the case of the mesial and distal sides of the root is flat. On another side, the radiopaque appearance is diffused in the case of the x-ray passing obliquely through lamina dura and in the case of the mesial and distal sides of the root is not flat because the amount of penetrating radiation is small. In addition, The density and thickness of lamina dura also vary relative to the occlusion stresses exerted on the teeth, so radio-graphically, the lamina...
Radiographic Study of Lamina Dura in Patients on Corticosteroids

Hussein Haleem Jasim

Citation: Hussein Haleem Jasim. “Radiographic Study of Lamina Dura in Patients on Corticosteroids”. Scientific Archives Of Dental Sciences 3.6 (2020): 19-25.
“cytoskeleton” by the action of macrophage colony-stimulating factor [32].

**Materials and Methods**

The study included fifty-two individuals aged between (18 - 45) years who referred to the oral radiology unit of different dental centers in Baghdad from December 2018 to December 2019 for taking periapical radiographs, thirty-two of them were without any systemic diseases and they are considered as a control group and the other twenty individuals were found with a history of treatment with different doses of oral or systemic corticosteroids for a period of at least two years ago up to five years maximum and they are considered as patients group.

A total of 1439 periapical radiographs from the two groups (control and patient) were selected in the study for evaluating the thickness of lamina dura including the anterior and posterior teeth in upper and lower jaws. The study excluded the upper third molars for two groups (Figure 1-3).

The thickness of lamina dura was evaluated according to the modified standards introduced by Vidyullatha., et al [33]. The normal range of lamina dura thickness was ranged 0.22 - 0.54 mm [34].

The study used the digital radiography and the periapical radiographs viewed on the monitor. The assessment of lamina dura was carried out on these radiographs in each selected tooth by evaluating the entire thickness of lamina dura along the tooth socket starting from the maximal point of lamina dura toward the periodontal space and to the maximal point of lamina dura toward the cancellous bone of the opposite side. After the assessment, different patterns of examining lamina dura had shown in the current study were classified from Cl I to Cl V, these patterns were inspired by the modified standards of Vidyullatha., et al. [33] (Table 1). All patients have explained to them the goal of the study through signed consents.

**Statistical analysis**

Data were analyzed using the Statistical Package for the Social Sciences software (version 19). The relation between the patient and healthy group was analyzed by Spearman’s Rank Correlation Coefficient (Spearman Rho) and the significance level adjusted 0.05 and a value of P < 0.05 is statistically significant.

**Results**

The statistical analysis of the two examined groups (healthy and patient groups) showed that the pattern IV was more in patients group treated with “corticosteroids” in the percentage of 21.61%, followed by pattern V (13.96%), the pattern I (8.33%) pattern II (4.37%), and pattern III (3.26%), respectively. In addition, the results showed that the pattern I was more in the control group in percentage of 35.71%, followed by pattern V (4.51%), pattern III (3.26%), and pattern II (4.37%).
Radiographic Study of Lamina Dura in Patients on Corticosteroids

Patterns of lamina dura | Radiographic appearance
---|---
Pattern I | The entire lamina dura within the normal thickness
Pattern II | The entire lamina dura is significantly thickened
Pattern III | Parts of Lamina dura are thickened and thinned
Pattern IV | Lamina dura is significantly thinned; some areas are missing
Pattern V | Lamina dura is basically disappeared, but may appear in different areas

Table 1: Classification of “radiographic lamina dura patterns” in the current study - Inspired by the modified standards provided by Vidyullatha, et al [33].

<table>
<thead>
<tr>
<th>Radiographic patterns of lamina dura</th>
<th>Control group n (%)</th>
<th>Patients group n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pattern I</td>
<td>514 (35.71%)</td>
<td>120 (8.33%)</td>
</tr>
<tr>
<td>Pattern II</td>
<td>38 (2.64%)</td>
<td>63 (4.37%)</td>
</tr>
<tr>
<td>Pattern III</td>
<td>53 (3.68%)</td>
<td>47 (3.26%)</td>
</tr>
<tr>
<td>Pattern IV</td>
<td>27 (1.87%)</td>
<td>311 (21.61%)</td>
</tr>
<tr>
<td>Pattern V</td>
<td>65 (4.51%)</td>
<td>201 (13.96%)</td>
</tr>
<tr>
<td>Total</td>
<td>697 (48.43%)</td>
<td>742 (51.56%)</td>
</tr>
</tbody>
</table>

Table 2: Frequency and percentage of radiographic lamina dura patterns in the jaws of both control and patients group.

(3.68%), pattern II (2.64%) and pattern IV (1.87%) respectively (Table 2). The statistical analysis showed that there was no significant relationship between the control group and patient groups at p-value < 0.05 (Spearman’ Rho, rs = 0.2, p-value = 0.7).

Discussion

Many studies showed the importance of “periodontium” for a healthy dentition. Lamina dura considered one of the most important bony components of the “periodontium” that surround the tooth socket. It precipitates in the remodeling of the bone, so it plays a significant role in the orthodontic therapy.

The importance of lamina dura in diagnosis was confirmed. A uniform and intact thickness of lamina dura encircling the “periapical” area strongly ensure the vitality of the pulp [35].

Several studies confirmed that any variation in the uniformity, density, and width of lamina dura may indicate the existence of different pathologies and dental diseases [36-38]. Lee stated that the disruption of lamina dura continuity may suggest the primary indication of the lesion in the “periapical” area [39].

Yokota., et al. stated that the disappearance of lamina dura is identified and diagnostic feature of pathology, but this is absolutely correct when there are discontinuity and interruption of lamina dura close to the apical area [40].

In addition, others stated that the thinning of lamina dura has indicated the localized or generalized disorders, as in the case of Paget’s disease or hyperparathyroidism [41,42].

The current study observed the possible “radiographic changes” of lamina dura in patients treated with “corticosteroids” compared to the control individuals. The study showed that there were different “radiographic patterns” of lamina dura had evaluated in the two groups. So, from the total of two groups, the results showed that the ratio of pattern IV (21.61%) was more in patients group treated with “corticosteroids” followed by pattern V (13.96%), pattern III (8.33%), pattern II (4.37%), the pattern I (3.26%) respectively, while in the control group, the results showed that the ratios of lamina dura patterns were pattern I (35.71%), followed by pattern V (4.51%), pattern III (3.68%), pattern II (2.64%) and pattern IV (1.87%) respectively. In comparison, between the healthy and patients group, the statistical analysis showed that there no was correlation between the occurrence of these “radiographic changes” in lamina dura and the use of “corticosteroids”.

Noticeably, the proportions of lamina dura pattern IV and V in patients treated with “corticosteroids” in the current study were more than other patterns. This may be associated with “bone de-mineralization” which is considered one of the evident adverse effects of “corticosteroids”. Because the lamina dura considered a sensitive bone and it may be affected by the negative effects of “corticosteroids”, although these changes were considered not significant in the current study.

However, the changes of lamina dura in the current study may not be related exclusively to the use of steroids, but there may be other factors that may have a role in the occurrence of these changes. For example, some studies stated that there was a considerable variation in thickness and density of lamina dura between individuals and even at the same person [35,43]. This may be due to differences in the configuration of roots [35]. Others referred to that there was disarrangement of lamina dura with progressing the age.

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Some authors stated that bone loss in the human body was increased due to systemic variations [45]. So, the bone loss was observed in severe lung disease [46]. Shakibaei et al. observed the radiographic changes of lamina dura in patients with renal diseases and they found that the ratios of partial loss in lamina dura were 25.7 percent and 45 percent of the study sample while the ratios of complete or semi-complete loss in the lamina dura in other studies were 74 percent, 25.7 percent and 8 percent of the study sample [47]. Some authors stated that the lamina dura becomes thicker with large occlusion forces and thinner around the teeth, which are not liable to occlusion forces [1].

Overall, the current study showed that the ratio of the changed lamina dura in the control group was 48.43% and in the patients’ group was 51.56%.

Several studies observed the radiographic changes of lamina dura in patients with renal diseases, so some authors found that the lamina dura was changed in 51.4% of the study sample (partially lost 25.7% and totally or almost totally lost in 25.7%) [47]. Kelly found that the lamina dura was changed in 53% of the study sample (partially lost 45% and totally or almost totally lost in 8%) [48]. Rani found that the lamina dura was changed in 70% of the study sample [49]. Rivas found that the lamina dura was totally absent in 74% of the study sample [50].

On the other hand, the variable patterns of the lamina dura in the current study may not be related only to the use of “corticosteroids”, but there may be other factors as environment, dosage of the drug, age of patient, gender and nature and type of food.

Conclusion

The study conducted that the use of corticosteroid has no direct effect on the status of lamina dura.

Acknowledgement

My deep gratitude is to all the dental centers where the study was conducted, especially to radiology departments.

Financial Support and Sponsorship

Nil.

Conflicts of Interest

There are no conflicts of interest.

Bibliography


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Volume 3 Issue 6 June 2020
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