

## Adaptive Ability of Periodont, Expressed in Numerical Relationships of Radiographic Average Width

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### Abstract

**Introduction:** The forces that are applied to periodont incentive to reduce or increase the width of the periodontal ligament. Modeling these forces can significantly depend on the intervention or not, in time, the dentist through dental procedures.

**Materials and Methods:** The study was based on measurements of the width of the periodontal ligament, medial surface measurements 3 and 3 to the distal surface. Samples that underwent the assessment were 102 teeth, 34 for each set of teeth. In total, 612 measurements were carried out.

**Results:** Width of periodontal ligament ranged in values within the limits 0.06-0.35mm. They were registered in the values of averages findings of certain areas of the teeth to the selected membership. Tables were organized in the data collected for separate teeth as the teeth with normal function, function easily and without function in the coronal tooth in the center of the tooth root and apex. Teeth were classified as incisors, canine, premolar and molar.

**Conclusion:** The forces that are within the limits of the capacity resistant, adaptive to ligament periodontal cause significant expansion of ligament periodontal, on the opposite occurs atrophy dysfunctional that is accompanied by a decrease in the number and thickness of trabecula of bone, with reduced density fibers periodontal.

### Introduction

Tooth is under the continuous effect of axial and not axial forces, cyclical or non-cyclical, depending on the position of the tooth in the arcade, the periodontal status of the tooth itself, and that in the end, results in biomechanical status of the tooth [1].

The force applied to the tooth has the direction, magnitude, duration; these elements that make active periodontal ligament, to cope with different forces, without damage of solid structures. The periodontal ligament compression in different areas, throughout the length of the root, reflects the direction of the applied force. The duration of the force indicated by changes, repairable or not of the periodontal ligament. The size of the force let you know if periodontal ligament supports this force only with compression and expansion in certain areas, or force is so great that solid structures allows contact with each other; contact that could translate well to gluing, soldering, these structures. As long as the force applied to the tooth, is within the limits of biological forces, applicable to the tooth, it causes irreparable damage.

The duration of application of the forces depends on the milling process of food, swallowing, according to vice patient contacts, appearing between the teeth. Occlusal contact during grinding food, is less than 1 second and the force applied in the apex of the tooth, between furcation when forces are axial, lasting 3-5 seconds [2]. To think that these forces are only axial, but as forces not axial can act to tooth to force it in one way or another, emerge from the balance, a balance that provides the complete apparatus mastication, with the mandible moving and maxilla stable with bilateral muscles acting on the mandible as a single removable bone of the head, and the essential element, the construction of the mandible. Mandible bone elements consist of horizontal and vertical bone elements that perform as a single body, minimally oscillating movement, obsessed with articular capsule of ATM. Faced with this view is periodont, which operates under the theory of tension and visco-elasticity. Teeth-bearing structures are absorbable, repairable, the remodeled-perishable [3]. Patients should not suffer from systemic diseases that directly affect the increase or reduction of the width of the periodontal ligament.

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## Materials and Methods

Periodontal ligament depending on the skill of adaptation versus adding function or not the tooth reacts with increased or reduced width. This change in the thickness of the periodontal ligament fibers expressed in existing obesity or increase in diameter and number of Sharpey fibers. For this reason, measurements were carried out in the hundredths of mm width of periodontal ligament function to express teeth, eased function and without function, periodontal space at the entrance to the alveola, in the middle of alveola and at the end of alveola; as in areas medial and distal surfaces of the teeth in the selected in the patients received treatment, documented in precise periapical x-rays.

Under the term function, the study set this criterion:

- Function expressed: tooth has occlusal contact and the contact point with two neighboring teeth.
- Eased function: occlusal contact of the tooth and missing one or both of the contact points.
- Without function: no occlusal contact of the tooth.

Measurements were carried out in precise periapical x-rays accuracy criteria of evaluation for use in periodontology. Three measurements were carried out for medial surface and three for distal surface. Samples that underwent the assessment were 102 teeth, 34 for each group of teeth. In total, 612 measurements were carried out.

## Result

Results gathered from measurements are reflected in the table, respectively, according to the teeth with the normal function, eased function and without teeth function.

The collected data according the teeth function are presented in tables 1 and 2.

In tables 1 and 2 are presented data on periodontal ligament average width, measured at three predetermined areas, but depending on the type of tooth involved in the study. It is understood that depending on the position of the tooth in the arcades, the average value fluctuates even mastikacion's force, applied to the tooth.

Compared with tables 1 and 2, to tables 3 and 4, are distinguished the data collected for teeth with easy function in

Functional teeth	Incisors	Canine teeth	Premolar teeth	Molar teeth
Crown	0.24	0.4	0.375	0.4
Center	0.24	0.35	0.34	0.35
Apex	0.24	0.35	0.3	0.34
Average	0.24	0.37	0.34	0.36

Table 1: In this table the average values of the width of the periodontal ligament, are reflected expressed in mm, for medial surfaces and distal surfaces.

Teeth with function	Medial surface	Distal surface
Crown	0.32	0.31
Center	0.3	0.29
Apex	0.28	0.29
Average	0.3	0.296

Table 2: Average values for the teeth with function, distributed by area and the distal medial, coronal area, the middle and apical.

numerical values that are much reduced. These values are much reduced everywhere, also depending on the type of tooth, in average. At tables 3 and 4 are reflected the data at teeth with reduced function. At tables 5 and 6 are grouped the data at teeth without function.

Reducing the width of the periodontal ligament is expressly visible at the antagonist teeth that have not and do not have a focal point. Buffer function, diving and exit of the tooth from the alveoli, the periodontium performs as well in these cases also.

To cope with grouped data and to compare these data for the teeth of the group involved in the study, serves table 7.

Width of periodontal ligament ranged in values within the limits 0.06-0.35mm. They were registered in the values of averages findings of certain areas of the teeth of the crusher.

Below in figures 1-3, are presented some clinical cases in the study. Clinical cases are presented by the X-rays.

Teeth with easy function	Incisors	Canine teeth	Premolar teeth	Molar teeth
Crown	0.1	0.2	0.18	0.1
Center	0.06	0.15	0.13	0.1
Apex	0.06	0.2	0.11	0.1
Average	0.073	0.18	0.14	0.1

Table 3: This table reflects the average value of the width of the periodontal ligament, expressed in mm, the medial surfaces and distal surfaces.

Teeth with easy function	Medial surface	Distal surface
Crown	0.16	0.11
Center	0.12	0.11
Apex	0.11	0.11
Average	0.13	0.11

Table 4: Summary of average values for teeth with easy function, the distribution by medial and the distal surface, the coronal area, the middle and apical.

Teeth without function	Incisors	Canine teeth	Premolar teeth	Molar teeth
Crown	0.08	0.2	0.1	0.08
Center	0.06	0.1	0.1	0.06
Apex	0.06	0.1	0.1	0.06
Average	0.06	0.13	0.1	0.06

Table 5: This table reflects the average value of the width of the periodontal ligament, expressed in mm, at the medial surfaces and at the distal surfaces.

Teeth without function	Medial surface	Distal surface
Crown	0.09	0.09
Center	0.08	0.09
Apex	0.08	0.09
Average	0.08	0.09

Table 6: Summary of average values for teeth without function, distributed by area and the distal medial, coronal area, the middle and apical.

	Teeth with function	Teeth with easy function	Teeth without function
Incisors	0.24	0.073	0.06
Canine teeth	0.37	0.18	0.13
Premolar teeth	0.34	0.14	0.1
Molar teeth	0.36	0.1	0.06
Average	0.33	0.12	0.09

Table 7: Summary of data based on the width of the periodontal ligament depending on the type of tooth and its function.



Figure 1: X-rays of some of the teeth involved in the study, for the first group - teeth with function. Respectively included in the study, at the first the x-rays, tooth no.22, 23; at the second x-rays, tooth no. 14 and at the third x-rays, tooth no.11.



Figure 2: X-rays of some of the teeth involved in the study, for the second group - teeth with easy function. Respectively included in the study, at the first x-rays, tooth no. 15; at the second x-rays, tooth No. 24 and at the third x-rays, tooth no.14.



Figure 3: X-rays of some of the teeth involved in the study, for the third group - teeth without function. Respectively included in the study, at the first x-rays, tooth no. 16; at the second x-rays, tooth no. 24.

## Discussion

Reduction of functional load tends to reduce the width of the periodontal ligament. Width of ligament tends to reduce with age. Loss of normal function goes with atrophic changes, such as narrowing of the periodontal space, disorientation of collagen fibers and vasoconstriction [4,5]. The width of periodontal ligament also affects many systemic diseases. Expanding ligament periodontal detected in patients with systemic sclerosis who do not have plaque or calculus [6]. In patients with hyperthyroidism, are evident the loses of lamina dura and the expand of periodontal ligament [7]. Therefore, to eliminate these impacts on group-teeth selected patients selected not suffering from systemic disease with the expression of their effect, on the width of the periodontal ligament.

From the results collected noticed a dramatic reduction of periodontal ligament in connection with the function of the tooth. By analyzing the data grouped in tables 1, 3 and 5, it is noted that the thickness of the biggest ligament, regardless of function, is to canine, followed by molar. Average thickness of the periodontal ligament in teeth function is 0.33mm, to the teeth with a slight function to teeth is 0.13mm and 0.09mm-free function is dropped. This reflects the fact that application of force on periodontium combats it with tissue reaction, to meet these forces uninjured. This reaction is expressed by tissue thickening of periodontal ligament.

From the data of tables 2, 4 and 6 distinguishes significant difference between the thickness of the periodontal ligament and medial surfaces distal surfaces. To teeth function, this distinction is easy, and for teeth with light function and no function difference is somewhat more sensitive.

Periodontal ligament width ranged in values within the limits 0.06-0.35mm. The values were recorded on the findings of averages for certain areas of teeth selected.

Based on the results of a study, taken from the literature, the effects of a reduction function for high duration may affect the morphology, mechanical skills and mineral variations periodontal ligament itself. These changes explain the biomechanical function and resetting tooth-bone connection. There modulation originating in periodontal ligament from the occlusal function. Modulations are those that should be considered especially in orthodontic treatment and prosthodontic treatment also [7].

Differences in responses to medial surfaces, and to the distal surfaces, are also supported in the literature [8].

Tooth movement under the effect of the bite forces carried out towards mesio-distal, vestibulo-oral, versus the axis of rotation of the tooth. Mesio-distal movement are reduced due to the contact point, and it is understandable that in the absence of its, movements are most sensitive in this regard. In vestibulo-oral direction, tooth mobility action is expressive at propulsion and power with respect to the inside mimicry muscle. Periodontal ligament is narrower in the region of the axis of rotation of the tooth [9]. The teeth in function and at eased function, their rotation center are at the center of the length of the tooth root, with a tendency toward root apex. The axis of rotation of teeth with function looms around the middle of the tooth. The axis of rotation to the teeth with reduced function, and without function, is approaching at the apex of the tooth root.

The data in table 7 noted the significant reduction in the thickness of the periodontal ligament and especially from canine to molars, with the sharp drop function on occlusal surfaces of the teeth.

## Conclusion

Forces that are within the limits of their resistant, adaptive capacity of the ligament periodontal, causing significant expansion of ligament periodontal, otherwise occurs dysfunctional atrophy associated with reduction in the number and thickness of bone trabecula, with reduced density of periodontal fibers.

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