

Evaluation of root resorption levels in patients with bruxism

Avaliação do grau de reabsorção radicular em pacientes com bruxismo

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ABSTRACT

Objective: The aim of this study was to evaluate the frequency of the degree of apical root resorption by digital radiographic analysis of patients with bruxism and also to check whether there is any correlation between bruxism and root resorption. **Material & Methods:** A total of 22 patients with parafunctional habit, bruxism, were selected. The patients underwent six digital periapical radiographs to evaluate teeth numbers 13 to 23 and 33 to 43 (a total of 264 teeth). These were evaluated by a calibrated radiologist and classified as: grade 0 - no root resorption; grade 1 - mild resorption; grade 2 - moderate resorption; grade 3 - severe resorption; grade 4 - extreme resorption. **Results:** The result of the overall analysis was: grade 0 appeared in 223 teeth (84.5%), grade 1 in 34 teeth (12.9%), grade 2 in 7 teeth (2.7%) while grades 3 and 4 were not seen in any teeth in the study (0%). **Conclusion:** It was concluded that root resorption degree 0 (no resorption) had the highest frequency (84.5%); there was no positive correlation between bruxism and root resorption and tooth number 13 presented a rate of 27.13% for grade 1 root resorption (mild resorption).

KEYWORDS

Root resorption; Sleep bruxism; Radiography, Dental, Digital

RESUMO

Objetivo: O objetivo deste estudo foi avaliar a frequência do grau de reabsorção radicular apical por meio de análise radiográfica digital em pacientes com bruxismo e avaliar se existe uma correlação entre bruxismo e reabsorção radicular. **Material e Métodos:** Foram selecionados 22 pacientes que realizavam o hábito parafuncional bruxismo. Os pacientes foram submetidos a seis radiografias periapicais digitais para avaliar os seguintes dentes: 13 a 23; 33 a 43 (Total de dentes: 264). Estas foram avaliadas por um radiologista calibrado e classificado da seguinte forma: Grau 0 - ausência de reabsorção radicular; Grau 1 - reabsorção leve; Grau 2 - reabsorção moderada; Grau 3 - reabsorção acentuada; Grau 4 - reabsorção extrema. **Results:** O resultado da análise geral do grau de reabsorção da raiz foi: Grau 0 - frequência de 223 dentes (84,5%); Grau 1- frequência de 34 dentes (12,9%); Grau 2- frequência de 7 dentes (2,7%); e Graus 3 e 4 não foram observados em nenhum dente do estudo (0%). **Conclusão:** Concluiu-se que o grau 0 de reabsorção da raiz (ausência de reabsorção radicular) teve uma maior frequência (84,5%); o dente 13 apresentou uma frequência de 27,13% para o grau 1 de reabsorção radicular (reabsorção leve) e não houve uma correlação positiva entre bruxismo e reabsorção da raiz.

PALAVRAS-CHAVE

Bruxismo do Sono; Reabsorção da raiz; Radiografia dentária digital.

INTRODUCTION

Sleep bruxism is an oral parafunction [1-5] considered to be a frontal neurological, psychophysiological disease [4], and a dysfunction of the autonomic nervous system, [6] characterized by an abnormal mandibular movement while sleeping or awake. It involves clenching and grinding of the teeth and can be centric and/or eccentric, conscious and/or unconscious, mild and/or with full force [2-5,7,8].

Bruxism has a multifactorial complex etiology, including systemic, occupational, local and genetic factors, and problems related to occlusion. It is strongly related to high levels of stress and central nervous system disorders [5,6,8,9].

This oral parafunction can have adverse consequences for the periodontium, masticatory muscles and the temporomandibular joints (TMJ), such as thickening of the periodontal ligament, bone resorption, root resorption, tooth mobility, discomfort and pain in the muscles and/or TMJs and adaptive changes in the latter [2,10]. In addition, it can cause headaches and incisal wear with aesthetic consequences [2,3,5,6,9,10,12,13]. Patients with oral parafunction generally present temporomandibular disorders (TMD), orofacial pain and cephalalgia due to muscle hyperactivity [3-8,14].

Early diagnosis can prevent irreversible damage to the components of the stomatognathic system [10] and should be made through a self-report and clinical observation and evaluation of the signs and symptoms [3,5,6,10,15,16]. To carry out an adequate clinical evaluation, it is suggested that the criteria indicated by Lavigne, Manzini (2000) be considered, using a contribution of at least two of the factors they listed [11,16].

However, a radiographic assessment of patients with this parafunction should also be considered [15], since there may be root

resorption of permanent teeth in some cases of bruxism [9].

Root resorption is both a physiological occurrence, exfoliation of deciduous teeth, and a pathological one, resulting from traumatic damage or irritation of the periodontal ligament [17]. It has several causes: individual susceptibility, genetic predisposition, a factor which is still hotly debated, heredity, root morphology, orthodontic treatment, onychophagia, trauma and bruxism [12].

Root resorption results exclusively from local factors which, because of the concentration of forces in the periodontium, can bring about an imbalance in the local homeostasis site, and eliminate the layer of cementoblasts, a process which varies from person to person and in the same person at different times, resulting in root resorption [2,10,17].

For certain authors, occlusal trauma which occurs in bruxism [2,10,15] is a potential predisposing factor for root resorption. However, there is no fully-defined cause-effect relationship between deleterious oral habits and/or oral parafunction and the increased risk of root resorption [10]. This correlation is still extensively discussed in the literature [10,12].

Early diagnosis through control and a radiographic clinical follow-up is the best approach to treatment, if future damage is to be prevented [15]. The diagnosis of root resorption is done by means of periapical radiographs [10,12,18].

As there is still no conclusion in the literature about the relationship between bruxism and root resorption, it was deemed necessary to carry out this study. It is intended that the results will guide practitioners as to the correct diagnosis of bruxism, and its consequences, so that specific treatment and control can be set up, thereby preventing more serious or even irreversible damage to the periodontium, masticatory muscles and TMJs. Hence this research set out to evaluate: 1-the frequency of the degree of apical root resorption, using digital

radiographic analysis in patients with bruxism; 2- and see if there is any correlation between bruxism and root resorption.

MATERIAL & METHODS

For this study 22 (twenty-two) patients of both genders between the ages of 20 and 43 were selected. They engaged in oral parafunction of the bruxism type, and had been clinically diagnosed and evaluated according to the criteria suggested by Lavigne & Manzini [5]. According to these criteria the patient should present a combination of at least two of the following factors: 1 – a history of gnashing and/or grinding of teeth, confirmed by a roommate or family member; 2 – surface tooth wear, incompatible with age and function; 3 - in addition to these factors, some more signs which could be associated are also suggested: headache in the temporal region, stiff or fatigued mandibular muscles during the night or on waking, locking or difficulty in opening the mouth in the morning; dental hypersensitivity, hypertrophy of the masseter muscles.

The study adopted these exclusion criteria: presence of previous orthodontic treatment, because of the marked relationship between root resorption and orthodontic treatment, presence of endodontic treatment or fixed prostheses in teeth numbers 13 to 23 and/or 33 to 43 [10].

The patients underwent periapical radiographic examinations of the central and lateral incisors, upper and lower left and right canines, in all, six (6) radiographs, including: 1 - the left and right upper central incisors, 2 - the upper left lateral incisor and canine, 3 – upper right lateral incisor and canine, 4 - the four lower incisors (central and lateral), 5 - lower left canine, and 6 - lower right canine.

The Gendex Expert DC ® X-ray machine (Gendex, Des Plaines, USA) was used to take the radiographs, operating at 7 mA, 65 kVp with an exposure time of 0.16 s. The radiographic image receiver used was the sensor of the Visualix eHD direct digital system (Gendex, Des Plaines, USA).

The radiographs were made by a single operator, following the parallelism technique using the Rinn positioning sensor model (Dentisply, USA), thereby ensuring standardized images.

The radiographs were analyzed by an experienced calibrated radiologist who assessed the degree of root resorption of each tooth in 2 stages: first an evaluation was made of the radiographs of 11 patients giving a total of 132 radiographs. After a week 12 randomly chosen radiographs were re-evaluated. After this re-evaluation the Kappa test for intraexaminer reliability was carried out to qualify the examiners. In the second phase of the research the analysis of the radiographs of the other 11 patients was undertaken, giving a total of 132 radiographs.

The degree of root resorption of each tooth was measured according to the scoring system defined by Levander, Malmgreen & Eliasson [19]. In this classification the degree of root resorption varies from 0 to 4: 0 - no root resorption, 1 - mild resorption, 2 - moderate resorption, 3 – severe resorption and 4 - extreme resorption (Figure 1).

Patients accepted to participate in the research by signing the Term of free and informed

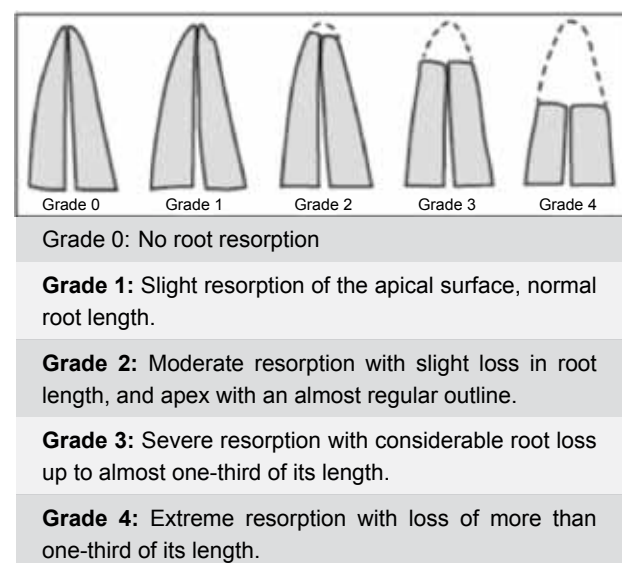


Figure 1 - Classification of resorption degree according to Levander, Malmgreen, Eliasson (1994).

consent (IC). After a thorough evaluation and classification of the radiographs with their respective scores of degrees of root resorption, the data was subjected to statistical analysis. The SPSS-15 software was used to process it and the significance level was set at 5%.

The project was approved by the Human Subjects Research Ethics Committee (CEP / PROPEAQ) at UFJF and registered as 077/2011.

RESULTS

In the general descriptive analysis of the 22-patient sample in this study, the frequency with respect to gender was 15 females (68.2%), and 7 males (31.8%) (Table 1).

Patient mean age was 25.59 years (Table 2).

Methodology error (intra-examiner error): 12 (Twelve) radiographs were randomly selected (1 of each tooth) and re-evaluated by the same examiner. These measures were analyzed using the intra-observer Kappa test with the Minitab software 14 . A kappa coefficient of 0.619048 and an agreement level of 91.67 % were obtained (Table 3).

In the per tooth descriptive analysis, the frequency of root resorption for each specific tooth was evaluated, for all 22 patients. It was seen that tooth number 13 presented grade 1 resorption in 6 patients and that tooth number

42 presented a 0 degree of resorption in all patients (Table 4).

As for the general analysis of the degree of root resorption, the frequency for grade 0 was 223 teeth (84.5 %), for grade 1, it was 34 teeth (12.9 %), for grade 2, it was 7 teeth (2.7 %) and grades 3 and 4 were not seen in any of the teeth analyzed in the study (0 %). (Table 5).

Table 1 - Descriptive analysis according to gender

		Frequency	Percentage
Gender	Female	15	68,2
	Male	7	31,8
	Total	22	100,0

Table 2 - Mean age of patients between 20 and 43 years

	Minimum	Maximum	Mean
Idade	20.00	43.00	25.59

Table 3 - Kappa test for intra-examiner reliability

Examiner	Reevaluated	Agreement	Percentage	95% CI
1	12	11	91.67	(61.52; 99.79)
Examiner	Kappa	SE Kappa	Z	P vs > 0
1	0.619048	0.28867	2.1444	0.0160

Table 4 - Per tooth descriptive analysis: evaluation of root resorption frequency for each specific tooth

Degree of resorption	Tooth 13	Tooth 12	Tooth 11	Tooth 21	Tooth 22	Tooth 23	Tooth 33	Tooth 32	Tooth 31	Tooth 41	Tooth 42	Tooth 43
Patient (P)	P	P	P	P	P	P	P	P	P	P	P	
0	16	18	18	19	19	19	19	21	17	16	22	19
1	6	2	3	3	3	3	2	1	4	4	0	3
2	0	2	1	0	0	0	1	0	1	2	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0

Table 5 - Degrees of root resorption

	Frequency		Percentage
Degree of Resorption	0	223	84.5
	1	34	12.9
	2	7	2.7
	Total	264	100

DISCUSSION

In this study, the 22 (twenty-two) patients were selected according to the diagnostic criteria proposed by Lavigne, Manzini et al. (2000) [5], which include patients' self-reports and muscle palpation to confirm hypertrophy. This same diagnostic criterion has been used in research [13,16]. The muscle palpation examination is essential if an accurate diagnosis of muscular parafunction is to be made and the palpation of the masseter and temporalis muscles was seen to be more reliable because it presents few false-positive values [13]. Although polysomnography is the gold standard for the diagnosis of bruxism, it can generate many false positive results. It is difficult to carry out and is a costly test [3,16], so many authors [3,6,9-11,13,14,16] corroborate stating that the diagnosis can be done by a self-report and analysis of signs and symptoms in the patient. An early diagnosis is recommended if irreversible damage to the stomatognathic system is to be avoided [8]. The patients underwent digital periapical radiographs, since this is the method currently used for the diagnosis and prognosis of root resorption [10,12,15].

Patients who had already undergone orthodontic treatment, and/or had had endodontic treatment and/or prostheses in the teeth evaluated, could not participate in the research because of the exclusion criteria [10]. Root resorptions are part of the main iatrogenesis resulting from orthodontic movement and apical tooth remodeling occurs as a result of endodontic treatment [11,12,14,15,17].

The results in terms of gender showed a frequency of 15 females (68.2%) and 7 males (31.8%) (Table 1). Similar results have been found in the literature [6,9]. This was probably because women may be more prone to psychosocial disorders (e.g. stress) and hormonal changes. Even though bruxism has a complex, multifactorial etiology and is often difficult to identify, there is consensus in the literature that stress may be its main predisposing and causative factor [1-4,6-11,13,14,16,20].

To calibrate the radiologist the Kappa test was applied and the results obtained were kappa = 0.619048 and an intra-examiner agreement of 91.67% (Table 3). These kappa values are considered substantial agreement and were thus an ideal value, indicating that the radiologist was calibrated.

Teeth are responsible for absorbing the force of the masticatory muscles and may suffer incisal tooth wear, mobility, filling fractures and dental hypersensitivity. Currently, there is consensus on the fact that incisal tooth wear is a result of bruxism, as it is one of the clinical signs of the habit [2,3,6,9,14,17]. In addition, bruxism can cause muscle hypertrophy, and cause pain in the temporomandibular joint (TMJ). In many patients, bruxism can bring about chronic orofacial pain, and cephalgia because of muscular hyperactivity [3,4,6-8,11,14].

Bruxism also produces negative effects in the periodontium [2,12], such as compression and thinning of the lamina dura, inflammatory pulp reaction, thickening of the periodontal ligament, hypercementosis, root and cement resorption because of the traumatic occlusal forces, since the periodontal ligament contains cementoblasts, cementoclasts, odontoclasts and other cells [1].

In the per tooth descriptive analysis, it could be seen that tooth number 13 showed grade 1 resorption in 6 patients and that tooth number 42 presented a degree of resorption in all patients (Table 4). It was also seen that the

upper right canine was the most susceptible to root resorption in patients with bruxism. This can be explained by the fact that the canine is in a strategic position in terms of receiving lateral force and excessive loads as a result of eccentric bruxism.

When resorption in the incisors only was analyzed, the average was highest for tooth number 11 and lowest for tooth number 22 [10]. In decreasing order, the teeth most vulnerable to resorption when subjected to force or excessive load were: upper lateral incisors, upper central incisors, lower incisors, distal root of the first lower molars, second lower premolars, second upper premolars and upper and lower molars [12].

In the overall analysis of the degree of root resorption in Table 5, it can be seen that the frequency of 0 grade was 223 teeth (84.5%), grade 1 was 34 teeth (12.9%), grade 2 was 7 teeth (2.7%) while grades 3 and 4 were not seen in any teeth analyzed in the study (0%). These results are consistent with the literature which claims that there is no direct cause-effect relationship between oral parafunctions and increased risk of root resorption [12] and that dental trauma may be a risk factor for root resorption, but that deleterious oral habits are not correlated with an increased risk of root resorption [3,15].

Thus, clinical diagnosis and observation of the patient's signs and symptoms and muscle palpation, preferably at an early stage, are the key to a successful outcome from therapy planning and evaluation of the patient. The importance of radiographs as complementary examinations must be emphasized. Even though this study did not show a positive correlation between bruxism and root resorption, professionals in the field, regardless of their particular sphere of action, should make a thorough assessment of their patients' radiographs. Besides not presenting any correlation between bruxism and root resorption it was also seen that tooth number 13 was most affected by resorption grade 1, and this may be due to its strategic position in receiving excessive lateral forces from eccentric bruxism.

CONCLUSION

According to the methodology used and the results obtained in this study, it was concluded that:

1 - 0 grade root resorption (no resorption) presented greatest frequency (84.5%);

2 - there was no positive correlation between bruxism and root resorption;

3 - tooth number 13 showed a frequency rate of 27.13% for grade 1 root resorption (mild resorption).

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