Original article

Anatomical evaluation of some morphological abnormalities related to periodontal diseases

Martos, J.*, Leonetti, ACM., Netto, MSG., César Neto, JB. and Nova Cruz, LER.

Department of Semiology and Clinics, School of Dentistry, Federal University of Pelotas – UFPel, Gonçalves Chaves street, 457, CEP 96015-560, Pelotas - RS, Brasil

*E-mail: josue.sul@terra.com.br

Abstract

The presence of some dental abnormalities as a predisposal factor to installation of localized periodontal alterations. The present study was to evaluate the frequency of development abnormalities present on a sample of molars that may predispose to occurrence and progression of periodontal disease. Two hundred and seventy seven molars (141 maxillary and 136 mandibular molars) were selected for this study. The evaluations were performed by two examiners together who was trained and calibrated for the study. All measurements were made by direct visualization with a magnifying glass. The following clinical parameters were measured: Enamel cervical projections; Root trunk: in the three different extensions (<3 mm, >3 mm and <6 mm, >6 mm); Enamel pearls: presence (1) or absence (0). The anatomic observations were made on four surfaces of the tooth: mesial, distal, vestibular and palatal/lingual. Descriptive statistics and percentage distribution were performed. A total of 130 molars showed at least some degree of enamel cervical projection and the most frequent score was the degree 1, according to Masters and Hoskins classification. Fifteen teeth presented enamel pearls and the root trunk was more evident on the group with variation from 3 to 6 mm of extension, observed in 64 teeth. It can be concluded that the presence of development abnormalities is a frequent finding in molars and it has to be taken into consideration during periodontal examination and therapy.

Keywords: dental anatomy, tooth abnormalities, periodontal disease, ectopic alterations, prevalence.

1 Introduction

Some anatomical peculiarities can be related to the initiation and progression of periodontal disease. Smith and Heasman (1988), Smukler, Nager and Tolmie (1989), Ong and Neo (1990), Mardam-Bey, Majzoub and Kon (1991), Olsson and Lindhe (1991), and Gher and Vernino (1980) stated that some morphological defects in dental structure must be considered predisposing factors for the onset and evolution of periodontal disease since they can favor plaque accumulation.

Mechanical plaque control can be jeopardized in the presence of a palate-gingival groove (BACIĆ, KARAKAS, KAIĆ et al., 1990; GREGHI, OLIVEIRA, NICOLIELO et al., 1999), enamel-cement junction defects (HEASMAN and SMITH, 1988), pre-furcation (RIOS, PUSTIGLIONI and ROMITO, 2002), an enamel cervical projection (ASKENAS, FRY and DAVIS, 1992); Swerts, Oliveira and Swerts (2008), enamel pearls (GHER and VERNINO, 1980; BOWER, 1983; RISNES, 2000), and root concavities (SANCHES and PUSTIGLIONI, 1998).

Storrer, Sanchez and Pustiglioni (2001) analyzed the relationship between root anatomy and periodontal disease. The authors evaluated the inf uence of anatomical accidents such as concavities, pre-furcation, and a palate-root groove on the diagnosis, prognosis, and treatment of periodontal disease. It was concluded that grooves and concavities, when exposed to the oral cavity, complicate mechanical plaque control. In addition, these anatomical abnormalities are problematic for periodontal instrumentation and enhance the presence of plaque and calculus.

Based on the described considerations, the present investigation aimed to anatomically evaluate the presence of enamel cervical projections, the frequency of enamel pearls, and the length of the root trunk in upper and lower molars.

2 Material and methods

For this study, 141 upper and 136 lower molars were included. They were from donors with no defined age, without caries or restorations, and they all had complete root formation. They were divided in groups of first, second, and third molars. The study protocol had been previously approved by the Institutional Committee of Ethics in Dental Research, and teeth originated from the bank of teeth in the Dental School of Federal University of Pelotas. The number of teeth used in this study is described in Table 1.

Specimens were only selected if the cervical area could be clearly observed, without any kind of impregnation, such as periodontal remains, calcifications, calculus, or even darker pigmentation. The selected teeth were removed from their original bottle by the teeth bank with the help of anatomic pliers on the anatomic crown. Each tooth was then immediately positioned in a plastic tray to be evaluated. The biological material was obtained from the bank of teeth, and the recorded information of the elements were performed immediately.

Evaluations were performed by two examiners together who were trained and monitored for the study. All measurements were made by direct visualization with a magnifying glass. The following clinical parameters were

measured: enamel cervical projections (ECP); root trunk (RT) in the three different extensions (<3 mm, >3 mm and <6 mm, or >6 mm); and enamel pearls (EP), indicated as present (1) or absent (0). Anatomical observations were made on four surfaces of the tooth, including the mesial, distal, vestibular, and palatal/lingual.

Enamel cervical projections (ECP) were classified according to the degree of severity using Masters and Hoskins (1964) scoring of degrees one, two, and three. Degree one includes teeth with a discreet enamel projection toward the furcation. Degree two indicates an enamel cervical projection closer the furcation but without invasion. Degree three denotes an enamel cervical projection that progresses into the furcation area.

The statistics of the individual data obtained were calculated with SPSS 8.0 software for Windows (SPSS Incorporated, Chicago, IL, USA). The descriptive statistics include the mean, standard deviation, and percentage distribution of the anatomical conditions observed.

3 Results

The different anatomical observations evaluated are shown in Tables 2 to 5. The observations of the root trunk were more evident in the group with variations from 3 to 6 mm of extension, and 64 teeth were classified in this way. An extension of less than 3 mm was observed in 40 teeth, while a 6 mm extension was seen in 6 samples.

In 80 of the 277 teeth evaluated in this study, an enamel cervical projection with a degree of one was observed. A total of 17 teeth showed a degree of two for ECP, and 33 were classified as a degree of three. Enamel pearls were found in 15 teeth of the total investigated; 8 were on the distal surface. Three were on the vestibular, and two each were on the mesial (Figure 1) or palate/lingual surfaces.

3.1 Discussion

Regarding enamel pearls, we can emphasize the relationship between this ectopic alteration and the development of localized, chronic periodontal disease. Enamel pearls, like ECP, predispose to localized periodontal disease because they serve as sites of plaque and calculus retention, which can become areas that are difficult to access for cleaning. Our findings related to the prevalence of enamel pearls on the different dental surfaces investigated were discreet, as illustrated in Table 3. The distal surface of the molars was the most prevalent location of this ectopic alteration, as eight enamel pearls were discovered.

The relationship between the presence of an EP and periodontal involvement has already been established (GHER and VERNINO, 1980; BOWER, 1983; SKINNER and SHILOAH, 1989; RISNES, 2000). The clinical implication of this correlation surrounds the easy initiation and progression of the periodontal disease confined to a single tooth. In these areas where such disturbances are present, there is no formation of a connective attachment. However, a long junctional epithelium turns the most vulnerable area into periodontal disease.

The presence of ECP as a predisposing factor for initiation of localized periodontal alterations is well established (GHER and VERMINO, 1980; PEREIRA, 1997; GREGHI, OLIVEIRA, NICOLIELO et al., 1999). This fact reinforces the importance of adequate oral hygiene once that the presence of an ECP suggests a poorer clinical outcome (SWERTS, OLIVEIRA and SWERTS, 2008). An ECP was more likely to be prevalent on the buccal surface of the evaluated teeth (Table 5). However, it was also occasionally observed on other surfaces. The most evident

Table 1. Total number of teeth (n) and dental groups used in the study.

	Teeth (n)		
	1º Molar	2º Molar	3º Molar
Upper molars	32	74	35
Lower molars	75	37	24
Total	107	111	59

Table 2. Number of teeth presenting root trunk in the three different extensions evaluated.

Root trunk	<3 mm	>3 mm - <6 mm	>6 mm
1º Molar (upper)	5	5	1
2º Molar (upper)	15	26	4
3º Molar (upper)	9	8	1
1º Molar (lower)	4	12	-
2º Molar (lower)	4	7	-
3º Molar (lower)	3	6	-
Total	40	64	6

Table 3. Prevalence of enamel pearls in the different dental surfaces investigated.

Enamel pearls	Buccal	Mesial	Distal	Lingual
	3	2	8	2

Table 4. Number of teeth presenting enamel cervical projection (ECP) in the three degrees evaluated (%).

ECP	Degree I	Degree II	Degree III
	80 (28.6%)	17 (6%)	33 (12%)

Table 5. Prevalence of ECP on different surfaces investigated.

ECP surfaces	Buccal	Mesial	Distal	Lingual
	101	2	5	3

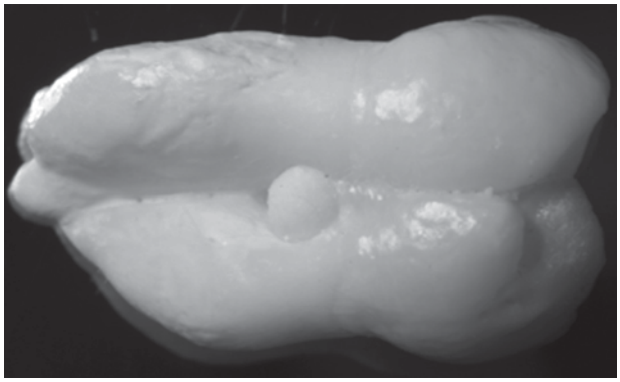

Figure 1. Anatomical examples of enamel pearls on the proximal surface.

degree was one (28.6%), which is not very important from a clinical perspective. However, an ECP of degree two (6%) or three (12%) has clinical relevance because of their extension. Our results are similar to the results of Swerts, Oliveira and Swerts (2008) who observed percentages comparable to the ones found in this study, despite slight variation on the total percentage of ECP. This small discrepancy is probably due to the larger number of subjects investigated in the other study.

Through a literature review, we found that Cecília, Correia and Rocha (1998) confirm the inf uence of ECP on the onset of periodontal disease, pointing out the importance of recognizing this projection to make an early diagnosis. Unique from other ectopic enamel alterations, an enamel cervical projection will hardly be diagnosed early by routine clinical and radiograph exams. It is very probable that its identification will only be possible when signs and symptoms characteristic of periodontal disease, such as a periodontal pocket, are present.

Even in an anatomical study, we should not underestimate the correlation between inserted clinical loss and the presence of this anatomical alteration. Its presence should be monitored during all steps of periodontal treatment.

Another anatomical feature that is of great clinical-periodontal importance is the root trunk. Among the 277 studied molars, the observed frequencies for the different root trunk extensions analyzed were, respectively, 40 teeth with an extension less than 3 mm, 64 teeth with an extension between 3 and 6 mm, and only six teeth presenting an extension of more than 6 mm. The potential relationship between furcation involvement and insertion loss with the vertical and horizontal extension of the root trunk is still unknown, as there are only limited data available (HOU, CHEN, TSAI et al., 1998).

A new classification of furcation involvement, based on the proportion of the vertical dimension of the root trunk related to root length, was developed by Hou, Chen, Tsai et al. (1998). The kinds of root trunks on molars were identified by the proportion of the root trunk and the root length. These classifications include a root trunk involving the cervical third, the cervical half, and the cervical two-thirds of roots. The analyses in this study allowed us to conclude that diagnosis, prognosis, and treatment plans can be facilitated by the determination of the type of root trunk, as well as vertical and horizontal bone loss, in classifying molar furcation involvements.

Through a series of techniques, morphological analysis of the furcation area shows a region of complex architecture, with a high number of anatomic irregularities and plaque retention structures. These factors could jeopardize an adequate cleaning during the periodontal treatment (PAOLANTONIO, di PLACIDO and SCARANO, 1999). Enamel cervical projections, as well as enamel pearls, can alter the insertion of periodontal tissues on dental surfaces, interfering with the bio-physiology of marginal periodontium. The size of the ECP inf uences initiation and progression of localized periodontal disease, along with its anatomic-topographic relationship to the furcation area.

The main deleterious factor regarding the presence of these ectopic alterations would be the presence of a long junctional epithelium instead of a connective attachment, making this area more vulnerable to the initiation of periodontal disease (GHER and VERMINO, 1980).

4 Conclusion

Even with the limits of this study, we can conclude that in order to help manage the developmental alterations observed in this investigation, we should reinforce the knowledge regarding tooth morphology and the clinical implications of ectopic enamel projections in periodontal clinical activity.

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