

Enamel pearl associated with localized periodontitis in Hellenistic age woman

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Abstract

Tooth anatomic factors like ectopic enamel pearls are often associated with localized periodontal inflammation and bone loss. There are no existing paleopathological data for such structural anomalies in ancient populations associated with periodontal pathology in the literature. A rare case of enamel pearl on the maxillary right first molar of women associated with localized periodontitis is presented and discussed.

Keywords: enamel pearl; localized periodontitis; paleopathology; Hellenistic age



Introduction

Bacterial plaque has been implicated as the primary etiologic factor in the initiation and progression of gingivitis and periodontitis (1). It is also well-established that variations in tooth morphology and local anatomy like enamel pearls (EP) can predispose an isolated area to inflammation by retention of periodontopathogenic bacteria (2-4). The nature and location of such enamel protuberances may compromise the integrity of the periodontal ligament and once breakdown occurs, a more rapid progression of disease is likely (5, 6).

The prevalence of periodontal diseases in archaeological populations has been a controversial topic in paleoepidemiology (7). Early studies on periodontal disease supported the idea that ancient populations experienced little periodontal disease, with the prevalence of periodontal disease increasing in populations during recent centuries (8, 9). More recent studies of periodontal disease have recognized that the prevalence of periodontal disease has been variable between archaeological populations and factors other than diet also influencing the development of periodontal disease (10-12). However the tooth-related anatomical factors predisposing to initiation and further development of periodontal diseases in archaeological populations are not discussed in the literature. What is more there are no existing paleopathological data for such structural anomalies associated with periodontal pathology.

A rare case of enamel pearl on the maxillary right first molar of Hellenistic Age women associated with localized periodontitis is presented and discussed.

Case report

The skeleton originates from archeological excavations dated from the Hellenistic Age (4th century BC) and belongs to female individual approximately 35-40 years of age. The remains

are found in Plovdiv, Bulgaria (archeological site "Kirkor Azarian" №4) and are provided for anthropological study in the Medical University of Plovdiv. Archeologist, anthropologist, and specialists in periodontology and oral pathology are involved in this study. The bone fragments are cleaned, dried and impregnated with preserving chemicals. After fragments assembling the anthropological analyses is done according to the established protocols. All identified pathological features were carefully measured and photographed in different magnifications.

The anthropological examination revealed right maxillary posterior region exhibiting advanced bone loss, furcation involvement and root approximation of tooth 16. Enamel pearl is identified in the furcation area (between the distobuccal and palatal roots). (Fig.1) Linear enamel hypoplasia of 16 and 13 is also evident. The advanced bone resorption and remodeling of the right maxilla alveolar ridge indicates for early ante mortem loss of the right maxillary second molar (and eventually third molar) due to localized periodontitis. (Fig. 2) The alveolar sockets of the left maxillary molars are well preserved (including the wisdom tooth). The size of the enamel pearl is 1.2 mm. The distance of the enamel pearl from the cemento-enamel junction is 2.5 mm.

Discussion

According to Kupietzky & Rozenfarb, the enamel pearl anomaly was first described in 1842 by Linderer (13). Histologically, the enamel pearl is a globule of enamel formation located on the root surface often covered by a thin layer of cementum (14). The size of clinically recognizable enamel pearls may vary from 0.3 mm to 4 mm, with the mean diameter 0.96 ± 0.43 mm (15). The average distance of the enamel pearl from the cement-enamel junction (CEJ) was found to be 2.8 ± 1.00 mm (15). The distal proximal surfaces of the maxillary molars and the buccal or lingual

surfaces of the mandibular molars are the preferred sites of localization (14, 15). In our case the EP has typical furcation localization in-between DB and palatal roots of tooth 16. The size of the enamel pearl is 1.2 mm. The distance of the enamel pearl from the cemento-enamel junction was found to be 2.5 mm. The reported prevalence of enamel pearls varies in different studies. Risnes found enamel pearls on 2.28% of the molars amongst 8,854 examined teeth and reported EP to occur more commonly on roots of maxillary molars, especially the third molar, followed by the roots of mandibular molars (15). Darwazeh & Hamasha, reported enamel pearls occurred in 2.32% (48 of 2,064 examined teeth) of permanent molars when detected radiographically, with enamel pearls being more common on roots of mandibular, rather than maxillary teeth and third molars least affected with the anomaly (16). Sutalo et al., studied a sample of 7,388 extracted teeth and detected enamel pearls in 1.6% of the sample (17). Chrcanovic et al., observed similar findings of 1.71%, with the most prevalent

furcation between the distobuccal (DB) and palatal root (18). The variation in the reported prevalence may reflect ethnic, racial or national variations in the prevalence of the condition but there is no existing paleopathological data for such structural anomalies associated with periodontal pathology.

Different theories have been proposed to explain the ectopic presence of enamel pearls. Possible disturbances in ameloblastic differentiation and further formation of ectopic enamel is one of the suggestions (19). Moskow & Canut postulated that enamel pearls develop from proliferating buds of epithelium that have become separated at the margin of enamel structure (14). It has also been proposed that the quiescent cells of the rests of Malassez may differentiate into ameloblasts and give rise to ectopic enamel formation in the periodontal ligament space (14). In our case the association of the EP with enamel hypoplasia suggested possible disturbance during the enamelogenesis of permanent teeth due to environmental factors which correlation is not discussed in the



Figure 1. Right maxillary posterior region of female individual exhibiting advanced bone loss, furcation involvement and root approximation of tooth 16. Enamel pearl is identified in the furcation area (arrow indicates the enamel pearl between DB and P roots). Linear enamel hypoplasia of 16 and 13 is also evident (red arrows).

anatomical location of enamel pearls for the maxillary first and second molars, being the

literature before as etiological factor of EP.

There is evidence suggesting that the clinical significance of EP may be related to periodontal

structural anomalies associated with periodontal pathology. It is controversial if the



Figure 2. The advanced bone resorption and remodeling of the right maxilla alveolar ridge (arrow) indicates for early ante mortem loss of the right maxillary second molar (and eventually third molar) due to localized periodontitis. The alveolar sockets of the left maxillary molars are well preserved (including the wisdom tooth).

disease. (20, 21) These nodules contribute to local deepening of periodontal pockets because, in their presence, the attachment of the periodontal ligament does not occur properly (2-6).

Mechanical factors which favor the retention and growth of the dental biofilm act as secondary etiological factors of periodontal diseases. However the tooth-related anatomical factors predisposing to initiation and further development of periodontal diseases in archaeological populations are not discussed in the literature (22). What is more there are no existing paleopathological data for such

cause of antemortem tooth loss cannot be determined from skeletal remains, but the extensive loss of adjacent alveolar bone may suggest that periodontal disease led to tooth loss (23). In the reported case the advanced bone resorption and remodeling of the right maxilla alveolar ridge indicates for early ante mortem loss of the right maxillary second molar (and eventually third molar) due to localized periodontitis. In contrast with this finding the alveolar bone and teeth sockets of the left maxillary molars are well preserved (including the wisdom tooth), so the conclusion is that local factors have contributed to this regional

bone loss. The reasonable local risk factor in this particular case is the presence of EP at furcation area of 16. Its distal position corresponds with the advanced bone loss, furcation involvement and root approximation of tooth 16.

There is a scientific consensus that EP favor the initiation or at least an increase in the severity of isolated periodontal problems. In the case described, the enamel pearl was of sufficient bulk and size to facilitate the retention of bacterial plaque during routine mastication and to render the overlying gingiva susceptible to irritation and inflammation. After the initial attachment loss had progressed to the enamel pearl level, accelerated localized bone resorption with consequent teeth lost occurred. The described rare case of enamel pearl associated with localized periodontitis in Hellenistic Age woman is contribution both to periodontology and paleopathology and confirm the influence of the anatomical structures on the development of periodontal disease despite the diet.

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