



A Radiographic Study of Prevalence and Location of Enamel Pearls in a Saudi Arabian Adolescent Population

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Abstract

Objective: To determine the prevalence of enamel pearls on panoramic radiographs and to explore any potential correlation between the occurrences of enamel pearls with gender, jaw and tooth involved. **Material and Methods:** Digital panoramic radiographs of 642 adolescents aging 12–19 years were examined for the presence of enamel pearls. The location of involved tooth in terms of jaw and side and gender were recorded. Statistical analysis was carried out by applying Chi-square tests with the Yates correction. The level of significance was set at 5%. **Results:** The person prevalence of enamel pearls was 4.82% of patients and tooth prevalence was 0.96%. No statistical significant difference was observed between maxillary and mandibular arches and no gender and side predilection was observed. Most of the enamel pearls were seen in maxillary third molars (4.76%) and mandibular third molars (2.68%), followed by maxillary first molars (2.68%) and mandibular second molars (1.95%). No enamel pearl was observed in any of the anterior teeth or in any of the deciduous teeth. **Conclusion:** The prevalence of enamel pearls was observed in 4.28% of patients and 0.96% of teeth. They were most frequently seen on molars with no predilection for gender, jaw and side.

Keywords: Radiography, Panoramic; Dental Enamel; Prevalence.

Introduction

Enamel is typically confined to the anatomical crowns of teeth yet might be discovered ectopically over the surfaces of the root, either as enamel pearl (EP) or as cervical enamel projections. These EP's are immovably backed to the root surface of primary and permanent teeth [1]. Developmental disturbances affecting the hard tissues, for example, palatal grooves, cervical enamel projections or EPs may enhance the chances of plaque retention subsequently leading to periodontal breakdown [2].

The principal portrayal of an EP was chronicled in the primary portion of the nineteenth century and, from that point forward, it has been alluded to as enamel droplet, enamel nodule, enamel globule, enamel knot, enamel exostoses and enameloma [3-5]. The EP has been portrayed as a well representing globule of the enamel, by and large spherical, white, serene, translucent, that rigidly attached to the root surface of a teeth [6]. Despite the fact that it comprises fundamentally the enamel, in many examples, a center of dentine or a pulp cavity might be noted inside it [7].

The specific aetiology of EP's is not clearly established till date. The most satisfactory hypothesis is that the pearl is formed as a result of a localised formative activity of the Hertwig's epithelial root sheath cells that remained advocated to the root surface amid the root formation comprehending into functioning ameloblasts [8]. EP's have a definite predisposition for the root furcation of molar teeth and for concavities or furrows inside the roots [9].

The lesion which is often related with EP's, commonly appears at periapical or a periodontal location with angular loss of underlying alveolar bone along the root surface when observed on a radiograph. Sometimes, the lesion manifests clinically as a swelling, draining sinus in the sulcus area and a sinus tract mimicking an endodontic-periodontic lesion [10].

Previously, the prevalence of EP has been estimated in vivo and ex vivo in conventional radiographs, cone beam computed tomography (CBCT) and extracted teeth [11]. To the best of our knowledge, no studies were carried out to assess the prevalence of enamel pearls in Saudi Arabian population.

The objective of this study is to determine the prevalence of enamel pearls on panoramic radiographs and to explore any potential correlation between the occurrences of enamel pearls with gender jaw and tooth involved.

Material and Methods

The present study was carried out in College of Dentistry, AlJouf University, Kingdom of Saudi Arabia.

Data Collection

Panoramic radiographs of 642 adolescents aging 12–19 years were obtained with a digital panoramic imaging system; the radiographic apparatus used was Cranex (SOREDEX, Tuusula,

Finland). Radiographs with artifacts, those with patient positioning and magnification errors were not included in this study.

All the radiographs were interpreted by two qualified, experienced and previously calibrated examiners. Radiographically a well-defined dense, smooth radio-opaque with the density matching with the enamel overlying any portion of the crown or root of an otherwise unaffected tooth was considered as enamel pearl. To evaluate the intraobserver variations, the same examiners interpreted the radiographs two week later.

Statistical Analysis

The obtained data were statistically analyzed using IBM SPSS Statistics V21 (Chicago, IL, USA) through descriptive and inferential statistics (Chi-square with the Yates correction). The level of significance was set at 5%. The reliability of measurements was evaluated by Kappa statistics.

Ethical Aspects

Clearance was obtained from the ethical committee of the College of Dentistry, AlJouf University and consent was obtained from all the participants.

Results

The reliability was very good, with Kappa values of 0.91 for intraoperator agreement and of 0.84 for interoperator agreement. Out of a total of 642 subjects enamel pearls were identified in 4.82% of patients and 0.96% of teeth. In 354 males, 4.80% were having with enamel pearls and 95.20% were without enamel pearls as compared to 288 females, 4.86% with enamel pearls and 95.14% without enamel pearls. The association between gender and status of enamel pearls is found to be statistically non-significant ($p = 0.9835$) (Table 1).

Table 1. Comparison of presence and absence of enamel pearls per gender.

| Gender | Examined N | No. of Patients | | | | p-value |
|--------|---------------|-------------------------|------|----------------------------|-------|---------|
| | | With Enamel Pearls n | % | Without Enamel Pearls n | % | |
| Male | 354 | 17 | 4.80 | 337 | 95.20 | 0.9835 |
| Female | 288 | 14 | 4.86 | 274 | 95.14 | |
| Total | 642 | 31 | 4.82 | 611 | 95.18 | |

In left side of maxillary arch, among 970 teeth, 12 (1.23%) were having enamel pearls and 958 (98.77%) were not seen with enamel pearls as compared to right side, where among 1179 teeth, 10 (0.84%) were seen with enamel pearls and 1169 (99.16%) were not having enamel pearls. The difference is found to be statistically significant ($p = 0.0154$). Similarly, in left side of mandibular arch, out of 1101 teeth, 11 (0.99%) were having enamel pearls and 1090 (99%) were without enamel pearls as compared to right side, where among 1221 teeth, 10 (0.81%) were identified with enamel pearls and 1211 (99.19%) were not having enamel pearls. The difference is found to be statistically

significant ($p = 0.0290$). However, no statistical significant difference was observed between maxillary and mandibular arches with enamel pearls in left side ($p = 0.6814$) and right side ($p = 0.6231$) (Table 2).

Table 2. Comparison of presence and absence of enamel perls according to arch and side.

| Teeth location | | No. of Teeth | | | | p-value | |
|-------------------------|------------|--------------|--------------------|------|-----------------------|---------|---------|
| | | Examined | With Enamel Pearls | | Without Enamel Pearls | | |
| | | | n | % | n | | % |
| Maxillary Arch | Left side | 970 | 12 | 1.23 | 958 | 98.77 | 0.0154* |
| | Right side | 1179 | 10 | 0.84 | 1169 | 99.16 | |
| Mandibular Arch | Left side | 1101 | 11 | 0.99 | 1090 | 99.00 | 0.0290* |
| | Right side | 1221 | 10 | 0.81 | 1211 | 99.19 | |
| Total | | 4473 | 43 | 0.96 | 4430 | 99.04 | |
| Maxillary vs Mandibular | | Left side | | | | | 0.6814 |
| | | Right side | | | | | 0.6231 |

*Statistically significant.

From Table 3, most of the enamel pearls were seen in maxillary third molars (4.76%) and mandibular third molars (2.68%), followed by maxillary first molars (2.68%) and mandibular second molars (1.95%). No enamel pearl was observed in any of the anterior teeth or in any of the deciduous teeth.

Table 3. Comparison of between presence and absence of enamel pearls according to type of tooth and jaw.

| Tooth Type | Examined | Maxillary Arch | | | | Mandibular Arch | | | | p-value | |
|-----------------|----------|--------------------|------|-----------------------|-------|--------------------|----|-----------------------|------|---------|--------|
| | | No. of Teeth | | | | No. of Teeth | | | | | |
| | | With Enamel Pearls | | Without Enamel Pearls | | With Enamel Pearls | | Without Enamel Pearls | | | |
| | | n | % | n | % | n | % | n | % | | |
| Central incisor | 198 | 0 | 0.0 | 198 | 100 | 219 | 0 | 0.0 | 219 | 100 | |
| Lateral incisor | 162 | 0 | 0.0 | 162 | 100 | 186 | 0 | 0.0 | 186 | 100 | |
| Canine | 217 | 0 | 0.0 | 217 | 100 | 227 | 0 | 0.0 | 227 | 100 | |
| First premolar | 384 | 0 | 0.0 | 384 | 100 | 409 | 0 | 0.0 | 409 | 100 | |
| Second premolar | 359 | 0 | 0.0 | 359 | 100 | 381 | 0 | 0.0 | 381 | 100 | |
| First molar | 298 | 8 | 2.68 | 290 | 97.31 | 319 | 6 | 1.88 | 313 | 98.12 | 0.9026 |
| Second molar | 342 | 5 | 1.46 | 337 | 98.54 | 358 | 7 | 1.95 | 351 | 98.05 | 0.6394 |
| Third molar | 189 | 9 | 4.76 | 180 | 95.24 | 223 | 8 | 3.58 | 215 | 96.42 | 0.6542 |
| Total | 2149 | 22 | 1.02 | 2127 | 98.97 | 2322 | 21 | 0.90 | 2301 | 99.09 | 0.8437 |

Discussion

The EP is an ectopic bead of enamel, which substantially heed to the root of a tooth. The dimension spectrum of EP broadens superior and beneath the resolution sustained by the naked eye of an individual. EP's are normally observed over the root covering of molars; be that as it may, there are uncommon reports of EP's ensuing over the roots of premolars and incisors and occasionally these may be recognized inside the dentin and in primary dentition also [12].

In the present study, the person prevalence of enamel pearls was 4.82%; this observation was almost similar to previous authors, who observed a person prevalence of enamel pearls as 4.5% and

4.69% in Jordanian [13] and Turkish [14] population respectively. However, previous studies reported a prevalence of 5.1% [15] and 7.7% [16].

Enamel pearls were noticed in 0.96% of teeth. Several studies have demonstrated distinct prevalences of 1.6% [6], 1.72% [12], 2.32% [13], 2.28% [8] and 2.8% [17]. In contrast to this, some researchers observed a lower prevalence of enamel pearls (0.74%) using micro CT [11]. In our study enamel pearls were seen only on molar teeth not in premolar and anterior teeth, this was consistent with the findings of previous studies, which did not find enamel pearls in premolars [15], but found enamel pearls in 0.22% of premolars and without occurrence in incisors [12].

Previously a prevalence of 33% of enamel pearls has been reported in a microscopic study of deciduous teeth, where as in this present study, none of the deciduous teeth was observed with enamel pearls and this was in consistent with previous findings [12].

In the present study, no statistical significant difference was observed between maxillary and mandibular arches. Some authors observed enamel pearls most frequently in maxillary molars [12], while others reported that enamel pearls are more common on the roots of mandibular rather than maxillary teeth [13,15].

In our study no gender predilection was observed regarding the prevalence of enamel pearls, which was similar to previous findings [8,13]. Some authors found a higher prevalence of enamel pearls among males in comparison to females [15]. In this study, there was no significant difference observed between left and right side of occurrence, whereas some researchers did not correlate the occurrence of enamel pearls to either left or right side [15].

Albeit bacterial plaque is regarded as the essential factor for the commencement and advancement of periodontal pathology, anatomical variables like EP's are frequently connected with cutting edge limited periodontal annihilation. EP's have been appeared to encourage the advancement of periodontal breakdown, regarding that the enamel housing of the EP can avert a connective tissue coupling and the anatomy of EP's takes into account the confinement of dental plaque [18,19]. It may be noted that the limited separation between the cervical line of the enamel and the furcation vertex, the possibility of periodontal pathologies will be more, even with the existence of minor EP [20]. In this manner, the dimension of the EP, as well as its topographic affinity with the furcation may well be a subsidizing element to periodontal pathology. Subsequently, early detection of the EP'S is critical in the counteractive action of periodontal pathologies and conceivably in the avoidance of malpositioning of the involved tooth [5].

Conclusion

An exhaustive examination including radiological assessment and pulp vitality tests is important to help in detection of EP's and framing options required for treatment of the involved tooth. In the present study, the prevalence of enamel pearls was observed in 4.28% of patients and 0.96% of teeth. They were most frequently seen on molars with no predilection for gender, jaw and side.

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