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Intracoronal Radiolucency, Common Myth or Mythical Common?

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Abstract

Intracoronal radiolucency (ICR) is a group of dental lesion may occur before or after tooth eruption, and may exist in both primary and permanent dentition. The purpose of this review is to investigate the current understanding of etiology and types of intracoronal radiolucency, diagnosis and clinical management recommendations.

Keywords: *Intracoronal radiolucency; pre-eruptive intracoronal radiolucency; pre-eruptive dentin radiolucency; pre-eruptive coronal resorption; pre-eruptive intracoronalresorption; pre-eruptive intracoronalresorptive lesions; pre-eruptive caries; occult caries and hidden caries*

Introduction

Overview

Intracoronal radiolucency (ICR) is a group of dental lesion defined by radiographic findings, characterizedbytheexisten ceofaradiographicradiolucentareainsidethecoronaldentin.Thismay occur before or after tooth eruption, and may exist in both primary and permanent dentition [1,2].

In erupted teeth, dental caries is the most common dental pathology [3] associated with the radiographic finding in hard tissue of the tooth, of which the etiology has been long studied and established as a multifactorial disease. Dental caries presents as destruction of hard tissue of teeth by metabolites produced by oral microorganisms, with a dynamic process of deminieralization and remineralization[4], theimbalance towards deminieraliztion causes thelossof inorganic andorganic structure,which shows reduce radiopacity on the radiographs.Most of dental caries has identifiable clinical findings in pits and fissures, or smooth surfaces, as the tooth has been exposed in oral cavity under contact with cariogenic bacteria and fermentable carbohydrates.

"Occultcaries"or"hiddencaries"maydescribetheremainingminorityofintracoronalradiolucency occurred in erupted teeth: such terms refer to occlusal caries which is not diagnosed clinically because the occlusal surface appears ostensibly intact, and radiographs show radiolucencies indentin[1]. Etiology of occultcariesis less clear as said teeth seem to lack of communication between dentinand micro organisms given the ostensibly intact surface.The hypotheses mostly discussed are based on dental development defects, such may occur as a result of loss of continuity of the reduced enamel epithelium[2].

Prevalence of occult caries has been reported in a few investigating studies, varying from 0.8% in premolars in 14- 15 year-olds to as high as 50% in molars of 20 year-olds, defined by correlating clinical examinations of intact occlusal surfaces with bitewing radiographic examinations of radiolucencies in dentin of the same teeth [1].

Besides the intracoronal radiolucency largely explained by caries process post-eruption, pre- eruptive intracoronal radiolucency is usually regarded as a separate entity of lesions. Due to the radiographic resemblance of caries with reduced radiopacity, they were previously referred to as "pre-eruptivecaries"[5-7]. However, many argued against the term as the etiology of this entity may differ from dental caries, although remains uncertain [1, 8-10]. As the affected tooth has no communication with oral cavity, the etiological factors for dental caries are not present in the process. Such

teeth may face great challenges in management, as they often are missed in the detection and diagnosis. Other obstacles may include difficulty to access and isolation. Without proper treatment, serious complications and adverse outcomes may occur [11-13].

Prevalence of pre-eruption intracoronal radio lucencies has been reported varying from 0.5-2% at the tooth level and of 3-6% the patient level [1, 9, 14-15], mostly affecting molars and premolars. It is much more commonly observed in a single tooth than several teeth affected [1, 9].

Occult caries (post-eruptive) and pre-eruptive intracoronal radiolucency are often discussed together indental literature, since they share the absence of exposuretomicro organisms in affected teeth. Multiple theories have been proposed revolving developmental anomaly. During dental development, tooth formation occurs with intercuspal coalescence following calcification at centers of calcification. Occult caries may attribute to afaulty union or imperfection at the time of coal escence of the center sofcalcification [11,16], there fore defects onposterior crowns are intimately associated with the calcification pattern peculiar to the individual teeth [11].

Inthepre-eruptivestate, current clinical and histological evidence substantiates the hypothesis that these defects are resorptive in nature [1-2, 17-18]. To date, trigger factors for the initiation of resorption are unknown, abnormal local pressure was suggested as one possible inciting factor for the resorption due to a high association of ectopic positioning of affected teeth was reported in controlled studies [9, 15]. Soft, mushy tissue was reported found in these lesions. Histological analysis reported signs of resorption, such as scalloping of the lesion margin. Osteoclasts and macrophages were found in the resorption lacunas as well as sound dentin between the lesion and the pulp [19]. Resorptive cells originated from the surrounding bone are speculated to enter the dentin through a break in the dental follicle and faulty enamel coalescence or the cementoenamel junction.SpiererandFuksalsohypothesizethelesionlosesitsnutrientsupplyandit svitalelementsnecrose once the hermetic seal from protective follicle, “leaving an inert and dead mush within the crown of the tooth” [20]. One case report also describes clinical finding of an “empty dentin” local area corresponding to the radiolucent area, with no soft tissue existence [8]. In some resorptionareas, the dentinis replaced by calcified tissue resembling bone tissue [2].Other studies found tissue inside the radiolucent dentin similar to carious lesions adjacent to the amelodentinal junction, and may extend to different depths of dentin [9;21].

Although an intracoronal resorptive lesion is unlikely to contain microorganisms before eruption, it soon becomes colonized by the oral flora once it has emerged into the oral cavity [10]. The pits and fissures of the tooth anatomy and retentive nature of the cavitated lesion favor the development of caries, thus the lesion becomes indistinguishable from a carious lesion once it is exposed in the oral cavity [1, 14-15, 22].

Diagnosis and clinical management

Radiography is commonly used diagnostic method for dental examination and is of considerable value when clinical visual and tactile findings are inconclusive. Bitewing radiographs are one of the most useful aids in the diagnosis of early fissure caries [10]. Panoramic radiograph adds great value in the detection of intracoronalresorptive lesions in unerupted teeth [10, 14], and may be readily available from other disciplines [23-26]. Panoramic radiograph has been recommended to examine the crowns of all unerupted teeth for these lesions [10, 27]. Other diagnostic instruments to aid detection include DiagnodentFibre-optic Transillumination (FOTI), laser luminescence, light scattering, Electrical Resistance Measurements (ERM), and dye uptake [1,10].

Very little information exists in current literature about intracoronalresorptive lesions in primary teeth. In the only case report it was detected at a very late stage where the patient was referred due to extraoral swelling. Extraction was the treatment of choice due to large periapical lesion reaching the underlying permanent tooth follicle and very young age [11].

The management of ICRL in permanent dentition may consist of a wide range of modalities from surgicaltopreventivean dacombinationinbetween.Immediatesurgicalexposurewithcurettageof the defect, or to wait for tooth eruption to achieve occlusal access for restoration of the defect, or active surveillance with annual radiographs and sealant placement after determining lesion being stable after years have been reported in current literature [8,27-30].

Understandably, more challenges lie in the pre-eruptive teeth. Once a pre-eruptive resorptive lesion is diagnosed, it is important to consider whether to initiate surgical exposure of the tooth and treat the lesion promptly or to leave the tooth for a follow up and wait until the it erupts. Therefore, it is imperative to distinguish between a progressive lesion and a static one. Timing and strategy of the treatment depend on the characteristics of the lesion.

For progressive or expansional lesions, the current literature generally supports surgical interventionassoonasthelesion hasbeendiagnosedradiographically, to halt there sorptive process and prevent its penetration into the dental pulp [2, 14, 17]. Many authors therefore, argue that as soon as the diagnosis is made, the affected tooth should be surgically exposed andprovisionallyrestored. After eruption, the material is to be replaced by a permanent one [2, 30]. In an unerupted tooth, the glass ionomer cement is a material of choice due to its multiple advantages of less sensitivity to a wet environment, chemical bonding to tooth and in addition releasing fluoride [21, 30]. If the lesion is stable and not expansional in character, it is also suggested that the tooth may be left to erupt [1-2; 31-32]. The suggested treatment consists of radiographic follow-up until the eruption of the affected tooth, thereafter making an intervention [1-2; 31-32].

Discussion

Management of intracoronal radiolucency is variable among patients, and should be decided on individual basis, taking into consideration of patient age, dental development, lesion nature and clinical presentations.

Someproposesincethesurfacesofthetoothareostensiblyintact, are sin based fissure sealant soon after eruption is sufficient to block the possible microscopic defects, without the need to access the cavity or excavate the lesion [28]. While the philosophy of minimally invasive dentistry is respected and embraced among clinicians [33-35], if the lesion is large, leaving the mush inside with sealant over the occlusal surface may provide enough support for the undermined tooth to withstand occlusal forces. A case of intracoronalresorptive lesion was reported to have tooth fracture after beingsealedandmonitoredfor5years[36].Ontheotherhand,completeexcavationoftheresorbed area may require wider opening of the surface(s) of the tooth and could well compromise the tooth structure and risk accidental pulp exposure – particularly due to the broad pulp chamber that ischaracteristic of a newly erupted tooth[20].

The decision whether to immediately treat or not depends on the progression of the lesion and its proximity to the pulp. Given the higher risk of penetration, lesion with close proximity to the pulp may warrant an immediate treatment. Teeth under clinical surveillance after eruption should be assessed individually for preventive and restorative needs.

Conclusion

While the individual clinical management may differ, consensus is that it is important to diagnose intra-coronal radiolucent lesions early on, so timely treatment can be instituted when indicated in order to prevent pulp involvement. Raising awareness and inter-discipline communication of this entity will increase early diagnosis, allow timely intervention, therefore improve prognosis and reduce complications.

Conflicts of Interest

The authors declare no potential conflicts of interest with respect to the authorship and/or publication of this article.

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