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Pre-eruptive coronal resorption of unerupted molar teeth in orthodontic patients

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Abstract

Pre-eruptive coronal resorption (PCR) is a rare phenomenon affecting unerupted permanent teeth. The aetiology of PCR is unknown and it is often detected as an incidental finding. The prognosis of affected teeth can be extremely variable and may involve multidisciplinary management. The lower second permanent molars are most commonly affected. The following is a description of three clinical cases of pre-eruptive coronal resorption affecting lower permanent molars in orthodontic patients.

Keywords

Pre-eruptive, intra-coronal, resorption, molars

Introduction

Pre-eruptive coronal resorption (PCR) is a rare but significant phenomenon. Within the literature, the condition has also been described as intrafollicular or idiopathic coronal resorption and in earlier studies, the now discounted phrase ‘pre-eruptive caries’ was used (Davidovich et al, 2005). The radiographic incidence of PCR is reported to be around 2-4%, depending on type of radiographic imaging (Seow, 2000). The aetiology of PCR is unclear, with a multifactorial theory proposed. Blackwood (1958) suggested that early contact between epithelial derived and connective tissues during dental development initiates a resorption process within coronal dentine. Early dental caries and periapical pathology associated with overlying primary predecessors have also been suggested (Kronfeld, 1955), however, most histopathological reports do not support this (Seow, 2000). Additionally, previous studies including evaluation of 9,750 radiographs (Ozden and Acikgoz, 2009) have deemed the mandibular second permanent molar the most commonly affected tooth, which has no primary precursor (Muhler, 1957; Seow et al, 1999a). The condition has only ever been reported in permanent teeth in all but one study, which diagnosed PCR on a lower second deciduous molar post-eruptively in a 2.5-year-old, with histological evaluation confirming caries was not an aetiological factor (Seow and Hackley, 1996).

There appears to be no relationship between pre-eruptive coronal resorption and systemic factors such as race, gender or fluoride treatment. However, an association with ectopic teeth has been reported (Seow et al, 1999b; Seow et al, 2000).

PCR is commonly detected as an incidental radiographic finding. Affected teeth are clinically asymptomatic, with an intact enamel structure and the absence of any periapical pathology (Singer et al, 1991). The extent of resorption in affected teeth can be variable but tends to be progressive in nature. In the advanced stages of PCR, the crown of the tooth may take on a characteristic ‘pink’ appearance (Eidelman et al, 1997). Partially or fully erupted teeth are highly prone to caries, which can accelerate the breakdown of these teeth resulting in secondary symptoms and poor long-term viability.

Depending on the stage of presentation, co-operation of the patient, access to the affected tooth and the extent of resorption, management of PCR may involve a multidisciplinary approach. The aim of this retrospective case series is to describe three clinical cases of pre-eruptive coronal resorption affecting the lower permanent molars in orthodontic patients. These cases are discussed in relation to the current evidence base.

Case 1

History

A 12-year-old male with a history of a repaired bilateral cleft lip palate was referred for the management of his malocclusion.

Assessment

Extra-orally, the skeletal pattern was assessed as a mild Class III relationship with average vertical proportions. Intra-orally, the patient presented in the permanent dentition with the absent UL2 and retained LRE and LLE. Radiographic examination confirmed the developmentally absent UL2, LL5 and LR5 and a radiolucent lesion associated with the coronal portion of the unerupted LL7 (Fig.1)

Treatment

Following consent, the treatment plan prescribed for this patient involved opening the space in the UL2 region for a future resin-bonded bridge, maintaining the LLE and LRE and monitoring the unerupted asymptomatic LL7. Following alveolar bone grafting, orthodontic treatment commenced with a sectional fixed appliance (Pre-adjusted edgewise appliance, 0.022”x0.028” bracket slot with MBT prescription) in the upper arch to redistribute space for the absent UL2. On further eruption of the LL7, the crown of the tooth exhibited a ‘pink’ appearance (Fig.2). Updated radiographs revealed extensive progression of the radiolucent lesion into the pulpal chamber of the LL7 (Fig.3). Soon afterwards the patient attended the department as a dental emergency complaining of severe pain associated with the LL7. On examination the LL7 had further erupted into the oral cavity and the coronal

portion of the tooth had completely fractured. The tooth was extracted under general anaesthesia and healing was uneventful.

Case 2

History

A 11-year-old asthmatic male was referred by his general dental practitioner for the management of his persistent digit habit and anterior open bite.

Assessment

Extra-orally, the skeletal pattern was assessed as a mild Class III relationship with increased vertical proportions. Intra-orally, the patient presented in the mixed dentition. The incisor relationship was classified as Class II div 1 with a 4mm overjet and an anterior open bite measured at 2mm. Radiographic examination revealed a radiolucent lesion associated with the coronal portion of the unerupted LL7, the ectopic UL3 and inverted upper midline supernumerary tooth (Fig.4).

Treatment

The initially treatment plan for this patient involved the provision of digit cessation advice,. Consent for the extraction of the URC, ULC and surgical removal of the upper midline supernumerary was obtained. Long-term monitoring of the eruption of the UL3 and LL7 was also planned.

Case 3

History

A medically fit and well, 51-year-old female was referred for the management of her significant Class II div 1 malocclusion which was beyond orthodontic camouflage and required an orthognathic approach to address the patients profile concerns.

Assessment

Extra-orally, the skeletal pattern was assessed as a Class II relationship characterised by mandibular retrusion and average vertical proportions. Intra-orally, the patient presented in the permanent dentition with a Class II div 1 incisor relationship and increased overjet. Radiographic assessment revealed a radiolucent lesion associated with the coronal portion of the unerupted asymptomatic LL8 (Fig.5), with the roots of the LL8 displaying an intimate relationship to the inferior alveolar nerve.

Treatment

Following consent, the treatment plan formulated involved a combined approach of pre–surgical orthodontics (upper and lower pre-adjusted edgewise appliance, 0.022”x0.028” bracket slot with MBT prescription) and mandibular surgical advancement. Following a discussion with the multi-disciplinary team, considering the surgical risks including inferior alveolar nerve injury, it was decided to remove both the LR8 and LL8 at the time of the mandibular surgical advancement. Radiographs taken following the pre-surgical orthodontic phase show extensive progression of the coronal radiolucent lesion present in the LL8 (Fig.6).

Discussion

Based on previous literature, Pre-eruptive coronal resorption (PCR) appears to present more commonly in patients aged between 10 – 13 years, has a approximately equally prevalence in both males and females and typically involves the lower second permanent molars (Table 1). The latter is consistent with the findings of Singer et al, 1991 who reported a higher incidence in these teeth. Two of the three cases reported (Case 1 and Case 2) involved the lower second permanent molars in adolescent patients. In Case 3, the unerupted LL8 was affected in an older patient. This is not unusual as a similar case has been previously reported (Lenzi et al, 2016). Interestingly, given that lesions can present in patients of different ages it may suggest that the of progression of PCR lesions is also variable.

Radiographically, pre-eruptive coronal resorption can appear very similar to dental caries, as a well-circumscribed radiolucent area within the coronal portion of the tooth. However, caries often progresses from enamel lesions in both partially and fully erupted teeth and commonly in the presence of poor oral hygiene. Despite a heavily restored dentition in Case 3, all three cases demonstrated an acceptable level of oral hygiene. The lower molars were unerupted at diagnosis, hence excluding caries as a cause. Ideally, histopathological examination of the coronal tissue is required to differentiate between resorption and caries (Skaff and Dilzell, 1978). Histologically, a loose fibroblastic tissue with a diffuse chronic inflammatory cell infiltrate is reported, including osteoclasts and macrophages with a scalloped border (Davidovich et al, 2005). Interestingly, Ilha et al (2018) recently reported that during restoration of a tooth diagnosed with PCR, the defect had no intra-coronal soft

tissue and just a space of ‘empty dentine’. Histological examination is also not possible when there is little remaining coronal tissue at time of intervention. In documented cases histological examination of the dental tissues was not undertaken. However, the radiographs in all three cases clearly highlight the classic radiographic appearance. In addition, the LL7 in Case 1 displayed the clinically characteristic ‘pink tooth’ appearance, indicating extensive coronal resorption.

The management of PCR may involve a multidisciplinary team approach and is influenced by several factors. These include: underlying malocclusion, tooth affected, access to the affected tooth, patient compliance, level of oral hygiene and the progressive nature of the lesion. Treatment options include monitoring with possible treatment when the tooth has fully erupted, surgical exposure and restoration, pulpal therapy as required and extraction (O’Neal et al, 1997). In all three cases, after discussion with the patients and their parents accordingly, monitoring of the affected teeth was decided to avoid extensive treatment. With this treatment option, there can be risk of failure, as reported by Counihan and O’Connell (2012) where the PCR lesion was sealed over, but the cusps fractured after five years due to the undermined enamel. Owing to the progressive nature of PCR, as highlighted in Case 1 and Case 3, careful monitoring of these lesions is essential with reassessment of the treatment plan advised post-eruption (Ignelzi et al, 1990). The aim of pulpal therapy is to maintain the vitality of the tooth and allow continued root development and eruption (Rankow et al, 1986). A coronal restoration following pulpal therapy is indicated to preserve the remaining tooth structure (Yaacob, 1980). Instigation of pulpal therapy in unerupted

lower permanent molar teeth poses numerous clinical challenges including restricted access leading to problematic isolation, incomplete removal of pulpal tissue and the possible need for root apexification over multiple treatment visits. However, favourable long-term outcomes have been reported (Table 1), with success at six years follow up (Holan et al, 1994).

In situations with symptomatic teeth, poor access or extensive coronal resorption, extraction of the tooth can be considered. Of particular significance to the clinicians is early detection of these lesions and determination of the prognosis of affected teeth. Teeth with a poor long-term prognosis could be considered and included as part of any future orthodontic extraction pattern (Dowling et al, 1999). The space available following extraction of second permanent molars can be used to relieve crowding in the buccal segments, to aid antero-posterior correction and anterior open bite closure. However, complications to orthodontic treatment can arise if PCR is not detected at the treatment planning stage, as seen in a previous case report where the mandibular first molar had previously been extracted, whilst failing to detect PCR in the mandibular second molar which later required removal (Counihan and O'Connell, 2012). In addition, early detection allows planned decision-making whether to intervene at that point or delay treatment until sufficient eruption, with an acute awareness of rapid post-eruptive breakdown risk and need for early endodontic or surgical intervention.

The three cases highlight the importance of systematic and thorough evaluation of routine radiographs in diagnosing and monitoring PCR; a message emphasised within the literature. In addition, as the quality of diagnostic imaging advances, and three-dimensional imaging becomes more

commonplace, the detection of pre-eruptive resorption and the severity of the lesion may become more prevalent. A recent study evaluating 1,317 Cone Beam Computed Tomography (CBCT) images revealed intra-coronal resorption was prevalent in 3.5% of unerupted teeth in comparison with previous results of conventional radiography at 2% and 6% respectively (Seow, 2000; Demirtas et al, 2016). Three-dimensional scans also provide an accurate assessment and localisation of adjacent anatomical structures such as the inferior dental alveolar nerve which may need to considered during treatment planning. However, the routine use of CBCT for PCR cases is not advocated as it is unlikely to change the management of affected teeth.

As demonstrated in cases of ectopic canines, the degree of resorption of adjacent incisor roots is often shown to be more extensive on cone-beam tomography (CBCT) compared to traditional two-dimensional imaging (Ericson and Kurol, 2000). Similarly, the same may be true for cases of PCR, particularly as the lesions are suggested to be more commonly found associated with ectopic teeth as demonstrated in Case 2 and highlighted within the literature (Seow et al, 1999b; Seow et al, 2000).

Conclusion

Pre-eruptive coronal resorption of the permanent teeth is a rare clinical entity, distinct from dental caries and poses numerous clinical challenges. Commonly, the unerupted lower second molars are affected and detected as an incidental finding on radiographs taken in patients aged between 10-13 years of age. During radiographic assessment of the developing dentition in orthodontic patient’s clinicians should be aware of the possibility of detecting

these lesions. Diagnosis of affected teeth and determination of their prognosis is imperative as teeth with a poor prognosis can be included in an orthodontic extraction pattern.

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