

Ectopic Eruption of Teeth and their Management in Children: Literature Review and Case Reports

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Abstract

The ectopic eruptions are commonly seen in the early and late mixed dentition period in children and adolescent. The etiology of ectopic eruption may be trauma to the primary dentition, retained deciduous tooth, presence of supernumerary tooth, ankylosis of primary tooth, cleft lip and palate and genetic influence. The treatment modalities can be simple extraction of primary or supernumerary tooth for self-correction of the affected tooth or extraction of primary tooth followed by placement of a space maintainer. In some cases, a minor orthodontic treatment may be required for alignment of such malposed tooth or teeth. The present paper highlights the etiology and pathogenesis of various types of ectopic erupting or erupted teeth and their management in children in the mixed dentition period.

Keywords: Ectopic Eruption; Orthodontic Treatment; Ankylosis; Supernumerary Tooth

Introduction

A tooth erupted (Figure 1) or try to erupt (Figure 11) in an abnormal position rather than it should occupy normally in the dental arch is called ectopic eruption. The ectopic eruption can be buccally (Figure 6) or lingually, mesially (Figure 11) or distally or the tooth may erupt into the palate or even into the nose [1]. The mandibular permanent lateral incisors often erupt ectopically causing root resorption of primary canine which exfoliates prematurely. If there is unilateral premature loss of primary canine occurs, there will be midline shift too. This is more common when there is crowding present in the developing dentition (tooth buds) as a result of smaller jaw size than tooth size. The prevalence of lingual eruption of permanent mandibular incisors is about 10% [2] which is quite high but the most common tooth which is ectopically erupting is the maxillary permanent canine as it is developing high into the maxilla.

The tooth eruption is a complex process and many different mechanisms are closely involved. According to Wise, *et al.* 2002, mononuclear leukocytes (precursor of osteoclasts) must be recruited into the dental follicle prior to onset of tooth eruption [3]. These cells fuse together to form osteoclasts that resorbs alveolar bone, creating an eruption pathway for the tooth to erupt through the bone. In fact, interaction of osteoblasts, osteoclasts, dental follicle and other soluble factors plays an important role for eruption of teeth. Any deviation of these factors may cause abnormal eruption path for a permanent tooth which may lead to its ectopic eruption or there may be retention of primary tooth as a result of abnormal root resorption causing a physical barrier for the permanent tooth.

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The prevalence of ectopically erupting tooth varies from one author to another and there is no uniform agreement about which tooth is more likely to be ectopic. Byrd in 1954 studied 444 subjects of 5 to 10 years old children living in North Carolina, USA had at least one ectopically erupting central incisors or lateral incisors or first permanent molar [4]. In another study of ectopically erupting teeth, Young in 1957 found 3% ectopic eruption in 1,619 children in San Francisco, USA [5]. Sweet in 1939 and Nikiforuk in 1948 have found that lateral incisors followed by first permanent molars were the frequency of order of ectopically erupted teeth [6,7]. The other authors claim that maxillary permanent first molar is the most common tooth to erupt ectopically [8]. Sometimes, the maxillary permanent first molar erupts so mesially that it causes abnormal root resorption of primary second molar causing its premature loss.

The ectopic eruptions are multi-factorial, including a genetic component and local factors which we will discuss later on. The reported increased prevalence of ectopic eruption in siblings suggests a genetic component and it was also reported in cases of maxillary canine impaction and/or its ectopic eruption. Nikiforuk explained the condition that because of deficiency of growth in the jaw or segment of jaw, a tooth assumes a path of eruption that intercepts a primary tooth, causes its premature loss and produces a consequent malposition of the permanent tooth [7]. Failure to treat ectopic eruption can result in loss of arch length, inadequate space for the succedaneous tooth and development of malocclusion.

The following cases put emphasis on such ectopic eruption of permanent incisor, canine and premolar that has been successfully managed by simple space maintainer or minor orthodontic treatment.

Case 1

A 9-year-old girl (Figure 1-5) reported to the Department of Pedodontics and Preventive Dentistry with the chief complaint of retained deciduous tooth (61) and labially erupting permanent central incisor (21). The detailed history of the child suggested that she had fallen while playing games in the school and broken her front tooth (Figure 1). Extra-oral examination presented a symmetrical face with a convex profile. On intra-oral examination of the patient suggested that she was in the mixed dentition stage where the 21 erupted high into the vestibule of the mouth (Figure 1). It was also found that the retained, fractured deciduous left central incisor was the etiology behind ectopically erupting maxillary left central incisor (21). The retained deciduous tooth was extracted and the ectopic erupted tooth was allowed to correct itself (Figure 1 and 2). When there was not much improvement of the condition seen even after 6 months, a fixed orthodontic therapy (Figure 3 and 4) was initiated to align the ectopic erupted tooth (21). The incisors as well as the primary canine were bonded with Begg's brackets and both the upper second deciduous molars were banded for anchorage. Initially we made a simple arch wire with .018 Australian wires to give elastic traction for 21 (Figure 3) to bring the incisor towards the dental arch. Later on, with .014 Australian wires the ectopic erupted tooth was brought into the perfect alignment with the dental arch (Figure 1-5). Once the tooth was aligned, the fixed appliance was debonded and a retention appliance was given for 6 months.



Figure 1



Figure 2



Figure 3



Figure 4

*Figure 5*

Case 2

A 13 year old girl (Figure 6-10) reported to the Department of Pedodontics and Preventive Dentistry, with the chief complaint of buccally erupted tooth in the left upper middle region of the mouth. Extra oral examination presented a symmetrical face with no other relevant cause for the malposed tooth. On intra-oral examination revealed a buccally erupting canine (23) and the presence of a supernumerary tooth (supplemental lateral incisors, figure 6). It was observed that the supernumerary tooth was the etiology behind ectopically erupting canine (Figure 6,7). The supernumerary tooth was extracted and a fixed appliance was given for correction of canine (Figure 6-10) as there will be no self correction of the buccally erupted permanent canine. After correction of the ectopically erupted canine, the fixed appliance was removed and a removable retainer was given (Figure 10) for six months.

*Figure 6**Figure 7*



Figure 8



Figure 9



Figure 10

Case 3

A 10-year-old boy (Figure 11-13) reported to the Department of Pedodontics and Preventive Dentistry, with the chief complaint of pain and decay in right lower back tooth for 1 month. Extra-oral examination presented a symmetrical face with no other abnormality detected. On intra-oral examination, a grossly carious deciduous second molar (85) was noted and the intraoral periapical radiograph (IOPA) revealed an ectopically erupting 45 (Figure 11). It was found that the grossly carious deciduous tooth was causing spread of infection and inflammation to the reduced enamel epithelium of the developing 45 which was the etiology behind ectopically erupting second premolar (Figure 11). The carious deciduous tooth (85) was extracted and a band and loop space maintainer was given (Figure 12). The postoperative follow up after 6 months was shown in figure 13 where the ectopically erupting tooth was self corrected and it was erupting through the loop of space maintainer (Figure 11-13).

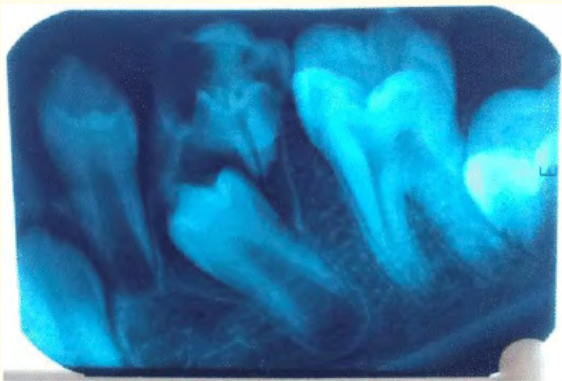


Figure 11



Figure 12



Figure 13

Discussion

Eruption of tooth is the movement of the developing tooth within and through the bone and the overlying mucosa to appear in the oral cavity and reach the occlusal plane. A number of eruption disorders are seen during the transitional period of occlusal development in children. The abnormal eruption of teeth may be due to the presence of retained primary tooth (Figure 1) or supernumerary tooth (Figure 6), formation of eruption cyst (Figure 11) or eruption hematoma and trauma to the primary tooth. The other factors which are also involved in the etiology of ectopic eruption of tooth are ankylosis of primary or permanent tooth, premature loss of primary tooth, tooth-size arch length discrepancy, macrodontia or microdontia and cleft lip and palate. The ectopic eruption is most common in children and adolescent during the transitional period of occlusal development. If these abnormal eruption patterns are not handled properly in this period of dental development, there will be severe malocclusion in the permanent dentition.

The permanent anterior tooth germs develop lingual to the primary anterior teeth and premolar tooth germs are positioned in between the divergent roots of deciduous molars. With due course of time, the permanent tooth bud migrates apically to their predecessors as dictated by growth and development of jaws and teeth. However if it does not take place, the resorption of roots of primary tooth will not occur or it may not be uniform because of different position of the permanent tooth buds, hence primary tooth may retain in the mouth and permanent tooth erupts either in lingual or buccal direction. The retained primary tooth should be extracted as and when it is discovered for self-correction of the respective tooth or teeth (Figure 1 and 2). In some cases of ectopic erupting tooth, the condition may be initiated by infection and inflammation of the dental follicle (Figure 11) or formation of a dentigerous cyst as a result of spread of infection from grossly carious primary tooth for a long period of time (Figure 11) [9].

The traumatic injuries of teeth in the primary dentition may cause actual displacement of the developing tooth bud, hence ectopic eruption (Figure 1 and 2). In children aged 1 - 3 years, the intrusive dental injuries are more common (prevalence is 4.4% - 22%) [10], which may cause enamel hypoplasia or dilacerations of permanent tooth or displacement of the permanent tooth bud as we have already mentioned above. When dilacerations take place in the permanent dentition, the affected tooth becomes impacted in most of the circumstances. The traumatic injuries in primary dentition may also cause premature loss of the deciduous tooth which causes neo bone formation into the socket as well as thick-fibrous mucosa are developing above the tooth bud which might cause ectopic eruption or delayed eruption or impactions of the permanent tooth [11]. The thick mucosa should be excised when it is diagnosed for spontaneous eruption of the impacted or ectopically erupting permanent tooth.

The ankylosis of primary and permanent tooth may cause ectopic eruption of permanent tooth or their impaction. According to Henderson ankylosis is an interruption in the rhythm of eruption [12] because the ankylosed tooth is fixed with the alveolar bone whereas the adjacent teeth erupt passively. As a result of ankylosis the affected tooth is submerged or infra-occluded. The ankylosed primary tooth may retain in the mouth causing permanent tooth to erupt in an unusual position should be extracted immediately when its successor is erupting ectopically. The ankylosed permanent tooth which is delayed in eruption should be exposed into the oral cavity for its spontaneous eruption.

In cleft lip and palate cases, there is ectopic eruption of tooth taking place in most of the circumstances. The primary and permanent lateral incisors as well as permanent canines tend to erupt through the cleft as a result of tendency to develop an ectopic eruption path (Figure 11). Therefore, the bone grafting into the cleft should be done before the permanent lateral incisor or canine has erupted into the oral cavity (between 7-10 years of age) [13] or as and when the permanent canine is showing ectopic eruption path with half root formation is seen through radiograph [13].

The supernumerary tooth (Figure 6) is more common in the permanent dentition in the maxilla near midline which is popularly known as mesiodens. It causes ectopic eruption or impaction of the permanent central incisors in most of the conditions [14]. The mesiodens may be erupted or impacted, should be extracted (Figure 8) when they are causing interference of eruption of central incisors or others. The prevalence of supernumerary teeth in the cleft lip and palate as well as in cleido-cranial dysplasia is 22.2% which is very high. In a review article of supernumerary tooth with three cases, Kirtaniya, *et al.* have shown surgical extraction of supernumerary teeth and spontaneous correction of the impacted incisor [14]. The authors also recommend a minor orthodontic tooth movement of impacted tooth or ectopic erupting tooth when they are not self-correcting [14].

The term ectopic eruption includes those cases in which the permanent teeth show abnormal eruption pattern (Figure 11), thus ectopic eruption reflects the eruption of a tooth in an incorrect position (Figure 1, 6, 11). In some cases of ectopic eruption it has been found that the tooth may erupt in the palate or into the nasal cavity or even into the maxillary sinus causing dentigerous cyst [15]. The most common tooth which is ectopically erupting is the maxillary permanent canine (Figure 6) as it is developing high into the palate before it emerges into the oral cavity [16,17]. The ectopically erupted canines are typically erupted into the buccal vestibule (Figure 6) of the mouth when there is inadequate space is present in the dental arch. Palatally ectopic erupting canines are usually become impacted as the palatal bone is dense and mucosa is thick. The palatally impacted canines require complex surgery and orthodontic traction [18]. The impacted canines are correlated with genetic influence also and females are more affected with the condition than males. The maxillary incisors may be also erupting ectopically due to macrodontia or arch length deficiency [19] or other reasons which we have discussed earlier.

However, we did not have any case of ectopic eruption of permanent first molars in this present paper although some authors claimed that maxillary permanent first molars are the most frequently tooth erupting in ectopic position [8]. Bjerklin, *et al.* in 1992 found a higher prevalence of 19.8 percent of ectopic eruption of maxillary permanent first molars [20] as compared to 4.3 percent reported by Kuroi and Bjerklin in 1982 [8]. All these above mentioned studies were carried out in siblings; hence the authors claimed a genetic influence of ectopic eruption of these teeth. The ankylosis of primary molars cause infra-occlusion in the primary dentition or in the mixed dentition is also associated with ectopic eruption of maxillary permanent first molars according to Bjerklin, *et al.* 1992 [20]. The ectopic eruption of permanent first molars can be diagnosed as early as 5 - 6 years of age through a bite-wing radiograph or clinically which may be used as a potential marker for canine impaction or its ectopic eruption in later stage of occlusal development since canine impactions are also associated with heredity.

In this present paper, the first case reported to us when her both the maxillary lateral incisors erupted into the oral cavity and we extracted the retained primary tooth (61) immediately for self-correction of ectopically erupting incisor (21). But the left central incisors (21) was so severely displaced that there was not much improvement of its position after 6 months of extraction of the primary tooth. Therefore, we had to initiate orthodontic treatment for the same tooth (Figure 1-5) to bring it into the occlusion. It is to mention here also that the left central incisor (tooth bud) may be displaced by the root of primary tooth after trauma led to its ectopic eruption. In contrast, the third case was simple where we just extracted the grossly carious 85 and place a space maintainer and the tooth has successfully erupted into the oral cavity after 6 months (Figure 11-13). In the second case, the canine has to be brought down and aligned in the dental arch as the tooth was not going to be self-correcting, hence orthodontic treatment should be started immediately (Figure 6-10) after extraction of supernumerary tooth. We have successfully treated various types of ectopic eruption of permanent central incisor, canine in the maxilla and second premolar in the mandible.

The permanent teeth are often observed to be delayed in their eruption as a result of ectopic eruption path or other reasons as we have already discussed above. The deviation in eruption path (Figure 11) may be reflected with abnormally delayed eruption times and retention of the primary tooth or teeth [21]. In the mandible parents are often complaints of two sets of teeth due to lingual eruption of permanent incisors and retention primary tooth or teeth, they should be extracted immediately. With due course of time, these malposed permanent tooth or teeth will be self corrected with tongue pressure from lingual side [21]. In other cases it is necessary to extract the primary tooth, construct a space maintainer (Figure 11 and 12), and allow the permanent tooth to erupt normally (Figure 11-13). The pediatric dentist must correlate the chronological age with dental age to each patient for delayed eruption of teeth. The guidance of eruption and development of the primary, mixed and permanent dentitions is an integral component of comprehensive oral healthcare for all pediatric dental patients. Early diagnosis and successful treatment of developing malocclusion can have both short term and long term benefits while achieving the goal of occlusal harmony, function and dento-facial esthetics.

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