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EVALUATION OF ECTOPIC ERUPTION IN TEETH'S OF CHILDRENS FROM 5 TO 12 YEARS AGE GROUP

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Abstract
Treatment is advised to guide the tooth into a more favorable path of eruption to minimize damage to affected dentition, preserve arch length, and to maintain function. Without intervention, sequelae can include premature loss of the anteriorly affected tooth, tipping and rotation of the ectopic molar, space loss and malocclusion. Treatment will depend upon the severity of the impaction. Mildly to moderately impacted molars can be guided easily with elastic orthodontic separators. More severe impactions require more complex treatment options, including potential extraction of the anteriorly affected tooth, removable or fixed appliances, or surgical uprighting. The present study was planned for evaluation of Evaluation of Ectopic Eruption in Teeth's of Childrens from 5 to 12 Years Age Group.
The present study was planned in Department of Orthodontics, Patna Dental College and Hospital, Patna. Total 50 childrens referred to Department of Orthodontics were evaluated for the ectopic eruptions. All the radiographs were compared in each patient, along all the usual followup time. To rule out the possibility of error due to radiographic magnification, the crown measurements in bitewing radiographs and in dental casts were compared, and no significant differences were present.
Early intervention of ectopically erupting first permanent molars is very crucial to avoid complex orthodontic treatment later on. Ectopic eruption of individual teeth tend to occur as often bilaterally as unilaterally in the same arch, except for mandibular central incisors, first molars and mandibular canines. Early diagnosis and interception of ectopically erupting teeth will allow us in preventing more complicated malocclusions in future.
Keywords: Eruption problems, Ectopic eruption, Permanent teeth, etc.

Introduction

Tooth eruption is a process in tooth development in which the teeth enter the mouth and become visible. It is currently believed that the periodontal ligament plays an important role in tooth eruption. The first human teeth to appear, the deciduous (primary) teeth (also known as baby or milk teeth), erupt into the mouth from around 6 months until 2 years of age, in a process known as "teething". These teeth are the only ones in the mouth until a person is about 6 years old creating the primary dentition stage. At that time, the first permanent tooth erupts and begins a time in which there is a combination of primary and permanent teeth, known as the mixed dentition stage, which lasts until the last primary tooth is lost. Then, the remaining permanent teeth erupt into the mouth during the permanent dentition stage.

Although researchers agree that tooth eruption is a complex process, there is little agreement on the identity of the mechanism that controls eruption.[1] There have been many theories over time that have been eventually disproven.[2] According to Growth Displacement Theory, tooth is pushed upward into the mouth by the growth of the tooth's root in opposite direction. Continued Bone Formation Theory advocated that a tooth is pushed upward by the growth of the bone around the tooth. In addition, some believed teeth were pushed upward by vascular pressure or by an anatomic feature called the cushioned hammock. The cushioned hammock theory, first proposed by Harry Sicher, was taught

widely from the 1930s to the 1950s. This theory postulated that a ligament below a tooth, which Sicher observed under a microscope on a histologic slide, was responsible for eruption. Later, the "ligament" Sicher observed was determined to be merely an artifact created in the process of preparing the slide.[3]

The most widely held current theory is that while several forces might be involved in eruption, the periodontal ligament provides the main impetus for the process. Theorists hypothesize that the periodontal ligament promotes eruption through the shrinking and cross-linking of their collagen fibers and the contraction of their fibroblasts.[4]

There is good evidence from experimental animals that a traction force is unlikely to be involved in tooth eruption: Animals treated with lathyrogens that interfere with collagen cross-link formation showed similar eruption rates to control animals, provided occlusal forces were removed.

Inherent in most of the theories outlined above, is the idea that a force is generated in the periodontal ligament beneath unerupted teeth, and that this force physically drives teeth out through the bone. This idea may have been superseded by a further recent theory. This new theory proposes firstly that areas of tension and compression are generated in the soft tissues surrounding unerupted teeth by the distribution of bite forces through the jaws. These patterns of tension and compression, are further proposed to result in patterns of bone resorption and deposition that lift the tooth into the mouth.[5] This theory is based on Wolff's Law, which is the long established idea that bone changes shape in accordance with the forces applied.[6] Significantly, a recent finite element analysis study, analysing the distribution of force through the jaw of an 8-year-old child, observed overall compression in the soft tissues above, and tension in the soft tissues below, unerupted teeth. Because bone resorbs when compressed, and forms under tension, this finite element analysis strongly supports the new theory.[5] Further work is required, however, to confirm this new theory experimentally.

Although tooth eruption occurs at different times for different people, a general eruption timeline exists. Typically, humans have 20 primary teeth and 32 permanent teeth.[7] The dentition goes through three stages.[8] The first, known as primary dentition stage, occurs when only primary teeth are visible. Once the first permanent tooth erupts into the mouth, the teeth that are visible are in the mixed (or transitional) dentition stage. After the last primary tooth is shed or exfoliates out of the mouth, the teeth are in the permanent dentition stage. Each patient should be assigned a dentition period to allow for effective dental treatment.[8]

Primary dentition stage starts on the arrival of the mandibular central incisors, typically from around six months, and lasts until the first permanent molars appear in the mouth, usually at six years.[9] There are 20 primary teeth and they typically erupt in the following order: (1) central incisor, (2) lateral incisor, (3) first molar, (4) canine, and (5) second molar.[10] As a general rule, four teeth erupt for every six months of life, mandibular teeth erupt before maxillary teeth, and teeth erupt sooner in females than males.[11] During primary dentition, the tooth buds of permanent teeth develop inferior to the primary teeth, close to the palate or tongue.

Mixed dentition stage starts when the first permanent tooth appears in the mouth, usually at five or six years with the first permanent molar, and lasts until the last primary tooth is lost, usually at ten, eleven, or twelve years.[12] There are 32 permanent teeth and those of the maxillae erupt in a different order from permanent mandibular teeth. Maxillary teeth typically erupt in the following order: (1) first molar (2) central incisor, (3) lateral incisor, (4) first premolar, (5) second premolar, (6) canine, (7) second molar, and (8) third molar. Mandibular teeth typically erupt in the following order: (1) first molar (2) central incisor, (3) lateral incisor, (4) canine, (5) first premolar, (6) second premolar, (7) second molar, and (8) third molar.[13] While this is the most common eruption order, variation is common.

Since there are no premolars in the primary dentition, the primary molars are replaced by permanent premolars.[14][15] If any primary teeth are shed or lost before permanent teeth are ready to replace them, some posterior teeth may drift forward and cause space to be lost in the mouth.[16][17] This may cause crowding and/or misplacement once the permanent teeth erupt, which is usually referred to as malocclusion. Orthodontics may be required in such circumstances for an individual to achieve a functioning and aesthetic dentition.

The permanent dentition begins when the last primary tooth is lost, usually at 11 to 12 years, and lasts for the rest of a person's life or until all of the

teeth are lost (edentulism). During this stage, permanent third molars (also called "wisdom teeth") are frequently extracted because of decay, pain or impactions. The main reasons for tooth loss are decay or periodontal disease.[18]

Active eruption is known as eruption of teeth into the mouth towards the occlusal plane. This is a natural path of eruption of all the teeth as they emerge from gingiva and continue erupting until they make contact with the opposing tooth.

Passive eruption is known as movement of the gingiva apically or away from the crown of the tooth to the level of Cementoenamel junction (CEJ) after the tooth has erupted completely. Problems in gingival tissue migrating apically can give rise to what is known as Altered or Delayed passive eruption.[19] In this phenomenon, the gingival tissues fail to move apically and thus lead to shorter clinical crowns with more square-shaped teeth and appearance of what is known as Gummy smile.

Coslet et al.[20] classified delayed passive eruption into two types which related the bone crest of a tooth to the Mucogingival junction (MGJ) of that tooth. These two groups were further divided based on the position of the alveolar bone crest to the cementoenamel junction.

Nikiforuk who also classified ectopic eruptions, defined them as “a condition in which the permanent teeth, because of deficiency of growth in the jaw or segment of jaw, assume a path of eruption that intercepts a primary tooth, causes its premature loss and produces a consequent malposition of the permanent tooth.[21] Failure to treat ectopic eruption can result in loss of arch length, inadequate space for the succedaneous premolar, and malocclusion. Ectopic eruption of first permanent molars, an example of an eruption anamoly, is most often diagnosed from the periapical and bitewing radiographic survey. In instances of an otherwise ideal occlusion, the first permanent molar may be positioned too far mesially and may become impacted against the distal root of the second primary molar. The impacted permanent molar may cause premature root résorption, pulp obliteration, neuralgic pain, or premature exfoliation. The chief goal in correcting ectopic eruption is distal displacement of the permanent molar to its normal position in contact with the distal aspect of the second primary molar. Even if the second molar is subsequently prematurely lost, a space maintainer can be used to prevent untoward tooth movement until eruption of the second premolar. Sometimes, the primary second molar can be retained even with extensive resorptive damage.”

The eruption can be assessed upon radiographic examination, either with bite-wing radiographs or panoramic radiograph. Radiographically, the offending ectopic molar can be seen to be erupting with a mesial angulation, often underneath the distal portion of the adjacent primary molar. This may result in external root resorption at best and encroachment on the pulp of the anterior tooth in more severe cases.

Of all first permanent molar ectopic presentations, approximately 66 percent will self correct. Some advise a three to six month observation period after early diagnosis to allow for spontaneous self correction and subsequent normal eruption. Cases that self correct usually do so prior to the age of seven.3 An ectopically erupting molar with a clinical crown that is submerged below the distal of the second primary molar is not able to self-correct and requires intervention.

Treatment is advised to guide the tooth into a more favorable path of eruption to minimize damage to affected dentition, preserve arch length, and to maintain function. Without intervention, sequelae can include premature loss of the anteriorly affected tooth, tipping and rotation of the ectopic molar, space loss and malocclusion. Treatment will depend upon the severity of the impaction. Mildly to moderately impacted molars can be guided easily with elastic orthodontic separators. More severe impactions require more complex treatment options, including potential extraction of the anteriorly affected tooth, removable or fixed appliances, or surgical uprighting. [22]The present study was planned for evaluation of Evaluation of Ectopic Eruption in Teeth’s of Childrens from 5 to 12 Years Age Group.

Methodology:

The present study was planned in Department of Orthodontics, Patna Dental College and Hospital, Patna. Total 50 childrens referred to Department of Orthodontics were evaluated for the ectopic eruptions. All the radiographs were compared in each patient, along all the usual followup time. To rule out the possibility of error due to radiographic magnification, the crown measurements in bitewing

radiographs and in dental casts were compared, and no significant differences were present.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.Children suffering from any syndrome or craniofacial malformations, systemic disease with oral repercussions, or those with atypical resorption of primary molars for reasons other than the permanent molar were excluded.

Results & Discussion:

Tooth eruption is defined as the movement of the tooth from its intra-osseous site of development to its functional position in the oral cavity. [23] Eruption is a complex process in which many factors contribute for a successful normal eruption. Furthermore, Although permanent teeth eruption is under significant genetic control, various general factors such as gender, socioeconomic status, craniofacial morphology, body composition can influence this process. [24] Ectopic Eruption may be defined as the eruption of permanent tooth, which takes place in such a manner that partial or total resorption of the root(s) of an adjacent primary tooth occurs and can be noted during routine dental radiographic evaluation. [25]Nikiforuk defined ectopic eruption as a process in which the permanent successor, due to deficient jaw growth or part of the jaw, takes a path of eruption that affects the predecessor tooth, leading to its premature loss resulting in malposed permanent tooth. [26] Ectopic eruption of the first permanent molars is a local disturbance characterized by their eruption under the distal part of the second primary molars and failure of the first permanent molars to erupt normally. [27] It occurs 25 times more often in the maxilla than mandible. [28]

Table 1: Age & Sex of Patients

Sex	**No. of Cases**
Males	15
Females	35
Total	50
Age	**No. of Cases**
5 – 7 years	7
7 – 9 years	18
9 – 11 years	10
11 – 12 years	15
Total	50

Table 2: Ectopically Erupted Teeth's

Ectopically Erupted Teeth's	21
Lateral Incisors	
In Males	7
In Females	14
Direction:	
Unilateral	15
Bilateral	6

Young observed in the 1619 children involved in his study that 3% were affected by the ectopic eruption of the maxillary first permanent molar. There was non-significant difference in the occurrence in the right or left side. He also reported that two-thirds of the ectopically erupting first permanent molars did not need any interceptive orthodontic treatment and erupted in their normal position in the oral cavity. A study by Carr & Mink (1965) reported that 25% higher prevalence in cleft lip and palate patients. [29]Bjerklin&Kurol (1981) studied the prevalence of ectopic eruption of the maxillary first permanent molar in 2,903 children and they found that it affects 4.3% for the population and 21.8% for cleft children. [30] Moyers (1992) reported that 3% of American children present with this eruption disturbance. Moreover, siblings of affected children experience this eruption disturbance five times more than the other population. [31]

Bierkline (1994) reported that siblings of those children who also had ectopic eruption showed a prevalence of 19.8%, indicating a genetic background. [32] This eruption disturbance showed gender predominance where it was observed more frequently in boys than in girls. [29-33] However, Chintakanon (1998) studied the ectopic eruption of maxillary and mandibular first permanent molars in 3612 children. It has been found that 27 children had ectopic eruption of the maxillary first permanent molar for a prevalence rate of 0.75%, which was higher in males than females, but the difference was not statistically significant ($p > 0.05$).

The cause of ectopic eruption of the maxillary first permanent molar is not well known and is considered to have a multifactorial etiology. [34-38] Before emerging, the tooth germ of the maxillary first molar is oriented downward, backward, and outward. As eruption continues, the tooth adopts a more vertical position. [39] Among the factors that could cause this anomaly are discrepancies in bone-tooth size or an alteration in the chronology of bone growth at the

tuberosity region in relation to the calcification and eruption of the molar.

Other dental causes are unfavorable second primary molar crown morphology or an abnormal eruption angle of the first permanent molar. Heredity is another of the factors considered.16–20 The diagnosis is usually done at a routine radiographic examination before the eruption of these teeth, usually between five and seven years of age. The maxillary first permanent molar is regarded as ectopically erupted if on the radiograph it appears in a superposed image and impacted in the distobuccal root of the deciduous tooth. The grade of impaction of the first molar and the resorption of the primary tooth may also be determined. [40-42] This pathology should be taken into consideration during a clinical examination. The unilateral or bilateral delay in the emergence of the maxillary first permanent molar [43] or an eruption path in which the distal cusps are emerging before the mesial cusps should make us think of this process. [44]

A follow-up radiograph through time will allow differential diagnosis between reversible and irreversible ectopic eruption. In both cases, a pathological resorption of the distal root of the deciduous second molars is produced. The irreversible form could cause exfoliation of the deciduous second molars with the resulting mesial migration of the first molar occupying the space of the second premolar. This will provoke a decrease in arch length and delay the eruption of the maxillary second premolars. [45-47]

A permanent molar with a minor degree of impaction, limited to the middle or less of its marginal border, usually will spontaneously correct. However, if there is a greater degree of impaction including the complete marginal border, it usually does not self-correct. In general, resorption is stopped once the first permanent molar corrects its eruption path and secondary dentin is usually deposited in the area of resorption, obliterating the exposed dentin. [48-50] When ectopic eruption is reversible, the eruptive path is self-corrected by seven years of age in the majority of cases. [51]

The pedodontist should correlate the dental age with chronological age of each patient for diagnosis of delayed eruption of teeth. The eruption guidance in development of the primary, mixed and permanent dentitions is an integral component of comprehensive oral healthcare for all children. Successful treatment of developing malocclusion after immediate diagnosis can have long term benefits in achieving the goal of occlusal harmony, function and dentofacialesthetics. [52] Limitations of this study indicate that longitudinal data should be employed in the future with full mouth radiographic surveys and study casts at every 6 months interval from about age 5 until eruption of all permanent teeth under consideration.

Conclusion:

Early intervention of ectopically erupting first permanent molars is very crucial to avoid complex orthodontic treatment later on. Ectopic eruption of individual teeth tend to occur as often bilaterally as unilaterally in the same arch, except for mandibular central incisors, first molars and mandibular canines. Early diagnosis and interception of ectopically erupting teeth will allow us in preventing more complicated malocclusions in future.

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