ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Clinical Signs and Panoramic Radiographs as a Diagnostic Tool for Eruption Disturbance of Permanent Maxillary Canines.

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ABSTRACT

Ectopic eruption of the permanent teeth is a developmental disturbance in the permanent dentition. Ectopically or non-erupting canines can lead to impaction, resorption of the roots of the adjacent permanent teeth, or even bone loss. Aim of the study was to find a reliable diagnostic method that enables the dental practitioners to predict and intercept the ectopic eruption and impaction of the permanent maxillary canines. The position of maxillary canines and their erupting path were radiographically investigated in a group of 30 children (13 males and 17 females) aged 8-14 years old, using the method for angular measurement (method by Taguchi, Kobayashi and Noda) and method of sector classification (method by Ericson and Kurol). Results show almost equal distribution of ectopic canines in sectors 1 and 2 (47.3%) and only 5.2% in sector 3, with 78.9 % having an angulations between (15°-30°). In cases with impacted canines results show angulations more than 30° in 78.9%, distributed in sector 3 (47.6%), 28.5% in sector 4 and 19% in sector 5. The sector and angulation measurement on the panoramic radiographs could be used as an index for prognosis, to predict the ectopic eruption of maxillary canines at age 8-11 years,and to give the opportunity for interception and early orthodontic intervention and treatment.

Keywords: ectopic eruption, canine impaction, radiographic assessment

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ISSN: 0975-8585

INTRODUCTION

The transition from the primary to the permanent dentition is not always a smooth sailing process . The eruption process is a very complex phenomenon in which multiple factors act synchronously to achieve a normal eruption.(1) Among the disorders related to dental eruption, most occurred during the tooth transition stage. Permanent maxillary canines have a longest eruptive path, they are the last teeth to erupt in the maxillary dental arch, and the crown sometimes moves too far in a labial or palatal direction. Disturbances in theire eruption, ectopic eruption and the impaction of upper canines are are quite commonly presented problems by population (2-7).Ectopically or nonerupting canines can lead to impaction, resorption of the roots of the adjacent permanent teeth, or even bone loss (8,9).

The aim of this study is to assess the radiographic localization of non-erupted upper canines using panoramic radiographs, detecting radiological signs of developmental instability, and to analyze the prevalence and distribution of displaced maxillary canines in children with clinical signs of disturbance in eruption.

MATERIAL AND METHOD

This study was approved by Teaching and Science Research Council of "Ss. Cyril and Methodius" University of Skopje. The examination was based on a combination of careful clinical and radiographic examination. The position of maxillary canines and their erupting path were radiographically investigated in a group of 30 children (13 males and 17 females) aged 8-14 years old, in whom clinical investigation had indicated a disturbance in eruption.

Clinical examination include bimanual digital palpation of canine bulge from both site (right and left) and visual inspection. Children were referred for radiographic examination in following suspected clinical signs as:

- the lateral incisor was late in eruption or shows a pronounced displacement
- distal tipping or angulation of the permanent lateral incisors
- missing permanent lateral incisors and/or lateral incisors with atypical form
- the canines could not be palpated in the normal positions and occlusal development was advanced
- asymmetry on palpation or a pronounced difference in eruption of canines between the left and right side
- prolonged retention of the decidous maxillary canine

The positions of the permanent tooth buds of maxillary canines and their erupting paths were assessed on panoramic radiographs based on sectors, and angular measurement.

Using the method for angular measurement we measured the vertical length to the occlusal line (d) and the axial angulation to the midline (a) of the canine, which determined the status of the affected canine (Fig. 1).

ISSN: 0975-8585

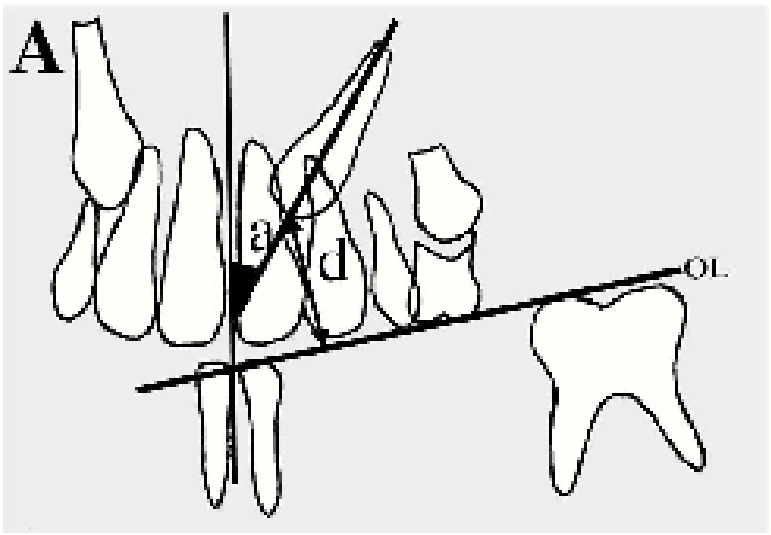


Fig. 1 Angular Measurement ***Method by Taguchi, Kobayashi and Noda***

d - Vertical length to the occlusal line
a – axial angulation of the canine to the midline
OL – occlusal line (line connecting the midpoint of both mandibular central incisors and mesial cusp top of the mandibular first molar, according to Ericson and Kurol)

When the difference between each side was beyond 5 mm in length to the occlusal line or more than five degrees in axial angulation to the midline, the canine was diagnosed as having an aberrant path of eruption.
d > 5mm and a > 5° - aberrant path of eruption

We used the Ericson and Kurol's method of sector classification for determining to what extent the cusp tip of the canine overlapped the adjacent lateral or central incisor root (Fig.2). When the cusp tip was situated in Sector 2 to Sector 5, the canine could easily be diagnosed as anomalous.

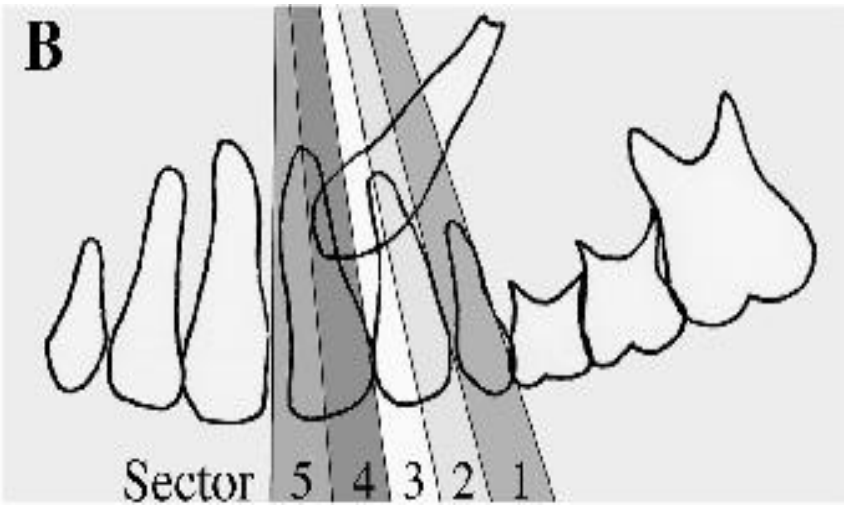


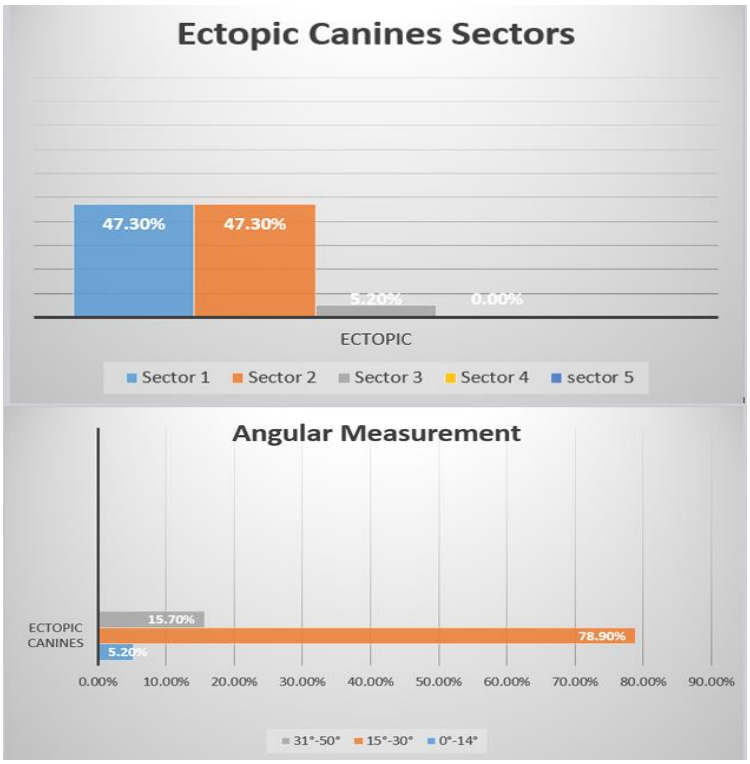
Fig. 2 Sector Measurement ***Method by Ericson and Kurol***

Sector 1 – the cusp tip of the canine is distally to the root of the lateral incisor
Sector 2 - the cusp tip of the canine is overlapped on the distal half of the root of the lateral incisor
Sector 3 - the cusp tip of the canine is overlapped on the mesial half of the root of the lateral incisor
Sector 4 - the cusp tip of the canine is overlapped on the distal half of the root of the central incisor
Sector 5 - the cusp tip of the canine is overlapped on the mesial half of the root of the central incisor

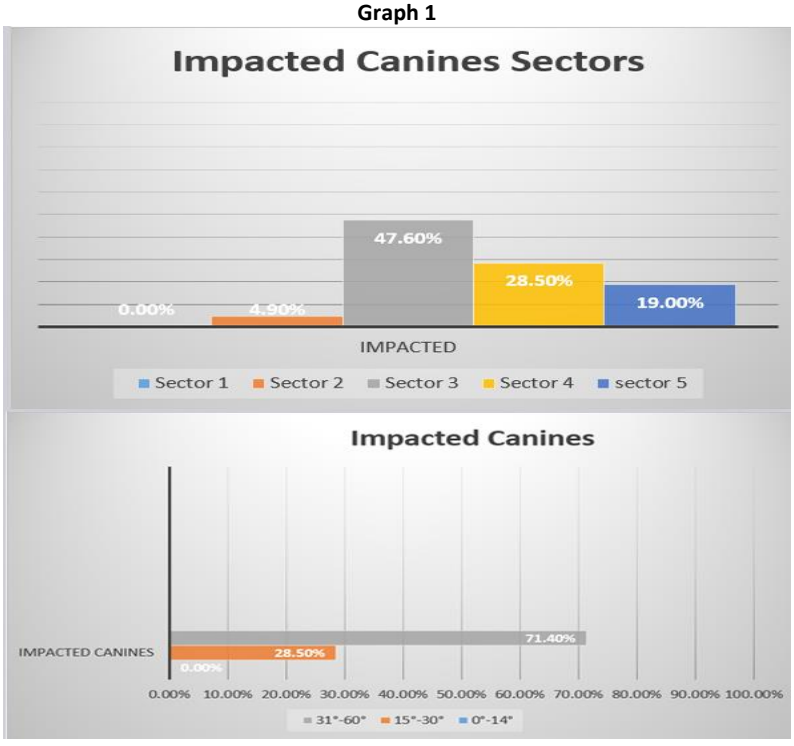
ISSN: 0975-8585

RESULTS AND DISCUSION

The angulation measurements and distribution of ectopic canines is showed in Graph 1. Results show almost equal distribution of ectopic canines in sectors 1 and 2 (47.3%) and only 5.2% in sector 3, with 78.9 % having an angulations between (15°-30°). Graph 2 shows angulation measurements and distribution of impacted canines in sector 3, 4 and 5. In cases with impacted canines results show angulations more than 30° in 78.9%, distributed in sector 3 (47.6%), 28.5% in sector 4 and 19% in sector 5.



Graph 1



Graph 2

Permanent maxillary canines are the pillars of functional occlusion and esthetics. Maxillary canines are exposed to ectopic eruption because they have the longest eruptive path, the longest time of eruption and therefore in most cases more than any other teeth encounter obstacles in eruption.

To date etiology of ectopic eruption is still quite unclear, but we known some of the possible factors: genetic, systemic or local factors (crowding, hypodontia or atipic lateral incisors).

Genetic theory noted that the inheritance play a primary role in the appearance of impactions and include dental anomalies associated with impaction such as hypodontia or atypia of lateral incisors. (3,5)

Guiding theory of eruption, supported by. Becker A (6), presumably canines erupt along the roots of the lateral incisors, which is a guide of eruption. If the root of the lateral incisors is malformed or absent tooth (hypodontia, atypical), canines will not erupt.

Becker (6) reports 2.4 times greater incidence of palatal impacted canines neighboring country of otsattni lateral incisors'

The incidence of impaction, according to research by many authors and literature data ranged from 1.7 to 2% in the general population, but we must have in mind that it is probably much higher since the fact that registered only in patients who referred orthodontic treatment (2,4).

Impaction of the canine usually passes asymptomatic, the patient is not even aware that it has impacted canine ,until general dentists or orthodontists disclose in the initial radiographic tests.

Improper eruption of the tooth can do serious clinical consequences include impaction. Labial or palatal impacted canines cause migration of adjacent teeth shortening the dental arches. Furthermore, unerupted canines can increase the risk of occurrences of cystic lesions and infections, and resorption of the adjacent lateral incisors that threatens the survival of the same and leads to a premature loss of bone.

In a clinical study Ericson and Kurol, 1987 showed that 12.5% of ectopic maxillary canines provoke a degree of external resorption of the roots of the lateral incisors.(9)

According to Brin et al. (10) the prevalence of root resorption of lateral incisors among 10-13 year olds was 0.7%. They believe that the risk of occurrence of root resorption of the lateral incisors adjacent to the impacted canine is increased when the lateral incisors have a normal size.

Regarding the fact that impaction of the canine is an anomaly related with some type of malocclusions, and its frequency increases and is not negligible, the focus of attention of orthodontists and dentists should be directed towards early detection of irregularities in the development and eruption of teeth because it is the foundation that provides reasonable implementation of interceptivni measures.

The most appropriate roentgen diagnostic tool is ortopantomogram that can accurately locate the position of the crowns of both canines and the apex of the root in relation to the adjacent teeth in the dental arch. There are many angular measurements pointed put in the literature.(11-15). Warford et al (11) use bicondilar line that passes through the uppermost point of the condyles to determinate angulation of the maxillary canine. In our study we used angular measurements described by Taguchi Y, Kobayashi H. and Noda T, using the reference a - axial angulation of canines to mesial line.(12) For assessing the degree of overlap of the maxillary canine root of the neighboring lateral or central incisors utilized Ericson and Kurol (15), method of classification by sector. When the top of the maxillary canine is in sector 2 to 5 diagnose disorders eruptive path. Results show almost equal distribution of ectopic canines in sectors 1 and 2 (47.3%) and only 5.2% in sector 3. In cases with impacted canines results show distribution in sector 3 (47.6%), 28.5% in sector 4 and 19% in sector 5.

Sector measurements are superior prediction of ectopic eruption compared with angular measurements. Warford et al (11) found that the location of is the most important predictor of eventual

impaction. However, in borderline cases when canin is in sektorII, angulation of canines is additional aid for predicting eventual impaction.

For further radiographic studies, computed tomography and CT scan accurately localize the position of the canine and their relation with the surrounding structures.

Once ectopic eruption of the permanent canine will be detected, primary canines should be removed. Their extraction should be performed well planned and designed. Clinical studies (16-20) show that the extraction of the primary maxillary canines before age 11 has very positive impact of eruptive path of permanent canines. Eruptive ectopic permanent canines will change and normalize its eruptive path. (16)

CONCLUSION

The sector and angulation measurement on the panoramic radiographs could be used as an index for prognosis, to predict the ectopic eruption of maxillary canines at age 8-11 years,and to give the opportunity for interception and early orthodontic intervention and treatment.

Early diagnosis and the early start of treatment using the natural forces of eruption allow the prevention of more complicated malocclusions. A follow-up radiograph through time will allow differential diagnosis between reversible and irreversible ectopic eruption. The localization of non-erupted canines is fundamental to establish the treatment plan aiding in the surgical access and in the direction of orthodontic forces to be applied on the impacted tooth.

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