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Developmental Stages of Permanent Mandibular Second Molars in 12 Year Old North Indian Population

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Abstract

The aim of this study was to investigate developmental stages of permanent mandibular second molars in 12 year old North Indian population by means of CT scans. The teeth were scanned and stage of development was assessed with 3D software imaging.

A retrospective analysis of CT scans of 30 patients aged 12 years at the time of their scan was conducted, and the developmental stages of the left second molars were evaluated using Demirjian's classification. Demirjian's classification system distinguished eight stages of crown and root development (Stages A-H) .The percentile distributions were recorded for each stage of development and variations for different stages were noted. The developmental and physiological changes of the tooth can be correlated to chronological age. The aim of the present study was to investigate the developmental stages of permanent mandibular second molars in 12 year old North Indian population.

Keywords: Root formation, second molars, children, odontology, dental age, tooth formation, age determination, juvenile. Forensic, orthopedic, pediatric, Demirjian's classification, tooth development, North Indian.

Introduction

The development of teeth can be broadly divided into two parts: Formation of crowns and roots and emergence of teeth. The formation of teeth is much more resistant to environmental factor than the emergence.[1] The root formation is not complete when the crown emerges and formation of root dentin and enamel continues. Since delay in ossification of hand and wrist bones often coincide with arrest in tooth formation a simple dental radiograph maybe useful in detection and diagnosis of pediatric orthopedic conditions. The development and formation of the teeth occur in a constant and gradual manner over a period of time, starting in the foetal stage and lasting up to the beginning of the second decade of life. It is a constant and universal process among populations of different origins, although there may be cross-population variations in the progress or delay of the mineralization process.[2,3]Teeth show great resistance to postmortem alterations caused by humidity, high temperature, microbial activities, and mechanical forces.[4] Also, developmental and physiological changes

of the tooth can be correlated to chronological age. Hence, for all of these reasons teeth can be better predictors of age compared to bone. [5] Dental age estimation has gained acceptance because it is less variable when compared to other skeletal and sexual maturity indicators.[The highest reliability for dental age estimation occurs when several teeth are in development (until the age of 12-14 years), and the most common methods in use have been tested by several researchers both theoretically and in practice. For accuracy in age estimation it is required to precisely stage the chronological development of teeth in various ethnic populations. This study aims to investigate the developmental stages of permanent mandibular second molars in 12 year old north Indian population

Materials and methods

Study design

This was a retrospective cross sectional study of CT scans of mandibular second molars of twelve year old patients. These were good quality scans of sections of left mandibular second molars in CT scans taken in the course of diagnosis and treatment at Maharaja Agrasen Medical College, Agroha. Haryana. Sample size of 30 children who age was stated as twelve years at the time of CT scan were selected. CT scan sections that were unclear or that showed gross pathology or previous treatment were excluded. Inclusion criteria were clear image of second molar and availability of age of patient at time of scan. Teeth with metal restorations were excluded on CT because of the possibility of artifacts. The teeth were scanned and stage of development was assessed with 3D software imaging.(figures1 and 2)

Scoring

We scored the degree of second molar development using the Demirjian's classification. Demirjian's classification system distinguished eight stages of crown and root development (Stages A-H). Stages A, B, C, and D represented crown formation from the appearance of the cusp to the crown completion, and Stages E, F, G, and H showed representative root formations from radicular bifurcation to apical closing(figure 3). The stages proposed by Demirjian were based on changes in shape rather than length measurements.[6]

In stage A cusp tips are mineralized but have not yet coalesced. Stage B mineralized cusps are united so the mature coronal morphology is well-defined. Stage C:end of the formation of enamel and beginning of the deposition of dentine. D: Formation of the crown to the enamel-cement junction. E: The longitude of the root is shorter than the latitude of the crown. F: The longitude of the root is equal to or greater than that of the crown. G:The growth of the root has ended; the apical orifice remains open. Stage H is closure of the apical orifice.

Results and Discussion

We investigated the development of the second molars in 12-year-old north Indian population by using the Demirjian's classification. For evaluating the degree of maturation of teeth Demirjian's method [7], have been widely used by many researchers because of its superior objectiveness by using only anatomical features.

Olze et al. validated five common classification systems for assessing the mineralization of third molars and concluded that Demirjian's stages should be used to evaluate third molars[8]. The various stages of root development of left mandibular second molars in our sample of 30 children of age 12 is recorded in Table 1.

According to Thevissen et al the estimation of dental age, particularly in young individuals, should be based on data collected from an appropriate population.[9]

In our current study despite variability, there was a clear correspondence between the developmental stage. As all teeth were already erupted there were no subjets in stages A to D. A high percentile of second molars roots in our

sample population are seen to be in stages F and G of Demirjian's Classification. (Figures 4 and 5)

Figures and Tables:

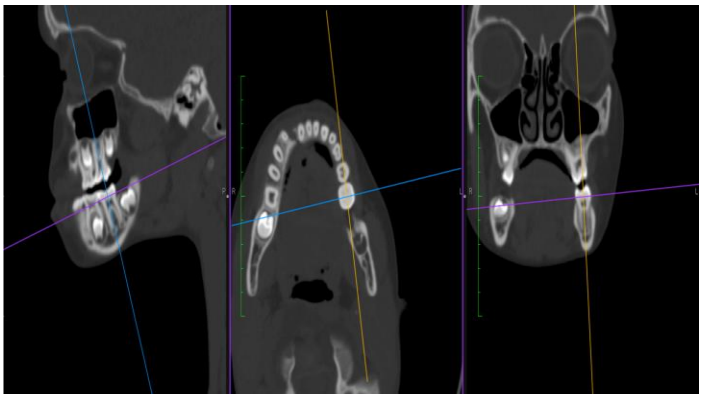

Figure1: 3D CT scan imaging of second molar with various axes

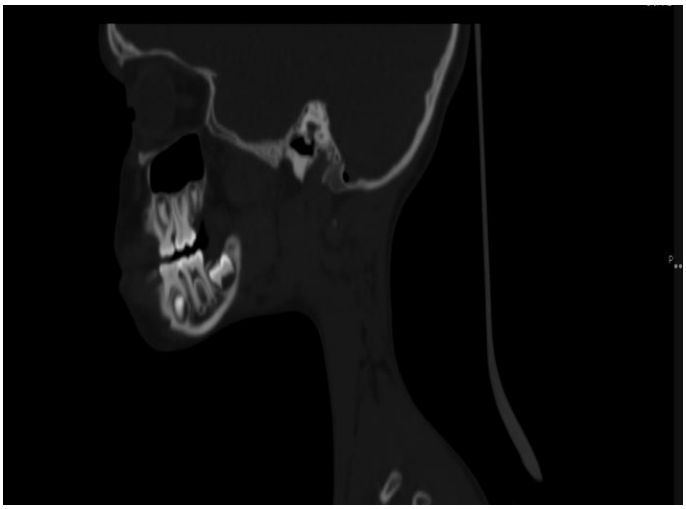

Figure 2: 3D CT scan imaging of second molar

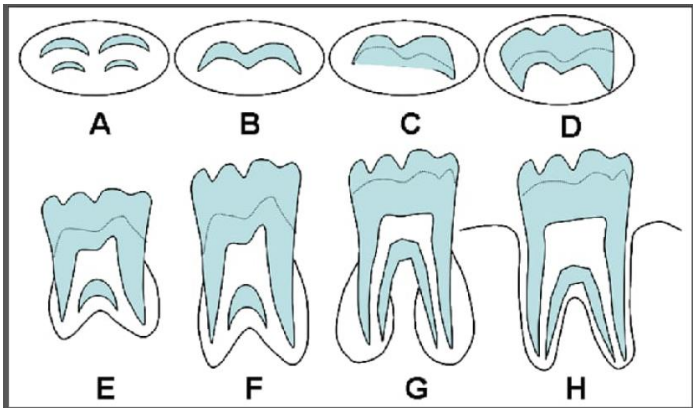

Figure 3: Demirjian's classification

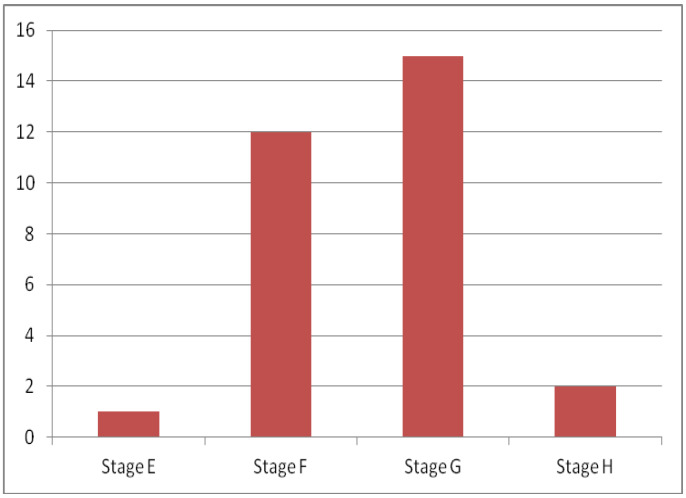

Figure 4: Distribution Graph

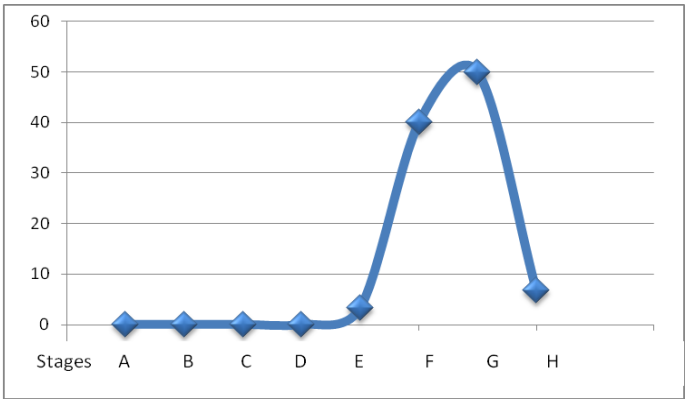

Figure 5 : Distribution Curve

Stage	A	B	C	D	E	F	G	H
(n=30)	0	0	0	0	1	12	15	2

Table 1: Distribution of number of subjects (n=30) in various stages of Demirjian's Classification for development of left mandibular second molar.

Conclusion

The developmental stage of the second molars clearly showed a high degree of uniformity in this age group and this maybe used for correlation with age.

In conclusion, the present investigation could provide reference data for second molar development in the North Indian population and maybe used in wider studies of tooth development and age prediction using dental radiographs for forensic and medico- legal purposes.

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