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The Assesment of Tooth Apical Closure Between Males and Females of Indonesian Subjects Using Digital Panoramic Radiograph

Endah Mardiati[1], Eky S. Soemantri Soeria SE[2], Edeh Rolleta Haroen[3], Bergman Thahar[4], Bambang Sutrisna[5]

[1, 2, 3, 4]Padjadjaran University, Department of Orthodontic, Faculty of Dentistry, Sekeloa Selatan I No.1, Bandung, Indonesia

[5]University of Indonesia, Department of Public Health

Abstract: ***Background: Tooth calcification is one of physiological maturation indicator for determine thegrowth of tooth maturation.Tooth calcification was an independent maturation and not influence byclimate, nutrition, race, dental health, socio-economic, educational and health status. The aim of this study is to analyze the differences of the tooth apical closure between males and females of Indonesian subject. Meterial and Methods: This study was an obeservational study conducted as cross sectional study, the population was digital panoramic radiograpg of patients who visiting Orthodontic Clinic Faculty of Dentristy Universitas Padjadjaran. The data consit of 229 digital panoramicradiographs of femalesage 8-18 years and119males, aged9-18years. Canine, firstand second premolar, second and third molar of leftlower jaw, was assesed using Demirjian'smethod. The differences between males and females was analysed using t-test (p-value <0.005). Result: tooth calcification in femalesearlier than males, with significantly differences for canines, first premolar, second premolar and third molar, no significant differences for second molar. Conclusion: Tooth apical closure in females earlier than males except for second molar.***

Keyword: Tooth apical closure, Demirjian methods, Indonesian subjects

1. Introduction

The stage of dental development is one of importand physiological maturation indicators in dentistry, such as in orthodontic, prosthodontic,endodontic, andin forensic dentistry. There are two types of dental development indicators for determine thestage of tooth maturation in relation to the chronological age, the first is tooth eruption and the second is the stage of tooth calcification. Tooth eruption is influenced by many factors such as climate, nutrition, race, dental health, socio-economic, educational and health status.[1,2]Emergence is one of the prossess of tooth eruption, that often misunderstood with the eruption of teeth. The emergence of tooth to the gum can be influenced by many factors such as the presence of ankylosis, persistence of deciduous teeth, impacted or impeded of crowded teeth,whereastooth calcification is an independent process.[2]

Tooth calcification is easy to observe on panoramic radiographhasdiagnostic tools that commonly used in dentistry.We knows that, Demirjian method is a most widely usedfor determining dental maturation.Up to now there were several studies have been undertaken for determined the differenciation of tooth calcification between males and females, especially the study of third molar calcification. Studies of third molar calcification have been undertaken in different population and in different race and ethnic groupfor estimation the chronological age of subjectsat late adolescence or early adulthood.[3,4,5,6] In this study we also assessing the differences of apical closure of third molar between males and females of Indonesian subject. The research of physiological maturation, shows that female mature 2 years earlier than male, but there were some variation in tooth calcification[7,8.] For this reason, in this study we will assess the differences of apical closurebetween males and females of Indonesian subject.

2. Material and Method

This study wasan observational study, conducted as a cross-sectional study. The population was panoramic radiograph from 220 females and 109 males subject aged8-17 years, from patients who visiting to Orthodontic Clinic Faculty of Dentistry, Universitas Padjadjaran.Inclusion criteria: Indonesian Deutero-malay race, without: history of systemic diseases, history of trauma of the face and jaw, any dental development disorder and extraction of lower permanent tooth. Tooth calcification was observe onpanoramic radiographon the left lower jaw, consist of 8 levels tooth calcification and the stage H is indicate to the apical closure. Panoramic radiograph was captured in digital format, and identification of apical closure was done on the computer.

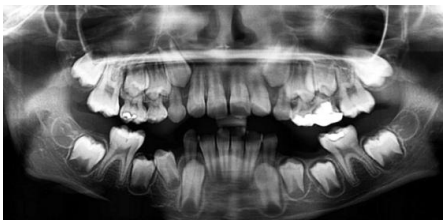
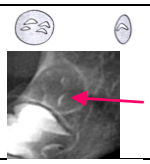
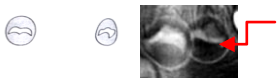
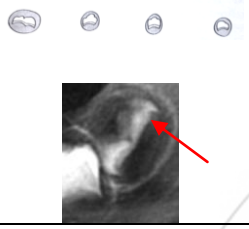
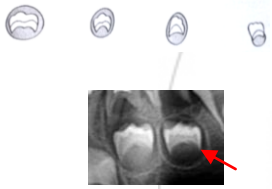
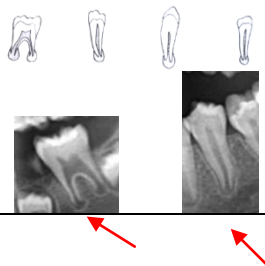


Figure 1: Digital Panoramic Photograph for Identification the Stage of Tooth Calsification.

Apical closure of canine, first premolar, second premolar, second and third molar of left mandibularwas identified using Demirjian'smethod (1973) by one researcher. The intra examiner reliability was done by assessing 10 panoramic photograph three times at 7 days of interval. No significant differences between measurement.T-test was usedto

analyzethe differences of apical closure between males and females subject (p-value<0.005).

Table 1: ToothCalcificationStage of Demirjian's Method

Stage	Picture	Description
O		no evidence of calcification
A		cusp tips are calcified but have not yet fused
B		united of calcified cusp andand outline of occlusal surface is well defined
C		enamel formation is complete at the occlusal surface. Dentinal deposition has commenced The outlines of the pulp chamber are curved
D		Crown formation is complete to cementoenamel junction. The pulp chamber in the uniradicular teeth beeing curve. Pulp chamberof molars has trapezoid form and the pulp horns are beginning to differntiate. Root formation is seen.
E		The wall of the pulp chamber are stright and the pulp horns are more differentiated. The rooth length is less than the crown height. In molar, the radicular bifurcation is visible.
F		The walls of the pulp chamber now form an isosceles triangle. The apex ends in funnel shape. The rooth lenght is equal to or greater that the crown height. In molars, the bifurcation has developed sufficiency to give the roots a distinct outline with funnel shaped endings.
G		The walls of the root canal are now parallel and its apical end is still partially open (distal root in molars)
H		The apical end of the rooth canal is completely closed (distal root in molars). The periodontal membrane has a uniform width around the rooth and the apex

3. Result

The result of this study, presented in the tablesas follows:

Table 2: The Age Distribution of Males and Females Subject (years)

Stage	Female (age)	Male (age)	p-value
Stage F	15,92±0,675	15,95±0,998	0.740
Stage G	16,20±0,299	-	

Table 3: The Stage of Apical Closure (stage H) Between Females and MalesSubject (Age)

Age (years)	Male (n)	Female (n)
8 – 8, 9		6
9 - 9,9	11	27
10 – 10,9	24	26
11 – 11,9	16	37
12 – 12,9	12	28
13 – 13,9	18	32
14 – 14,9	9	29
15 – 15,9	12	19
16 – 16,9	7	16
Total	109	220

Table 4: The Stage of Third MolarApical Closure (Stage H) of Females and Males Subject

Tooth	Female (age/years)	Male (age/years)	Differences in year	p-value*
Canine	13,75 ±1,595	14,80 ± 1,554	1.05	0.000*
First Premolar	14,02 ±1,531	14,81 ± 1,511	0.79	0.004*
Second Premolar	14,33 ±1,427	15,02±1,509	0.69	0.013*
Second Molar	15,20 ±1,034	15,69±1,257	0.49	0.093

Results showed, there is no significant differenceof apical closure of canine, first premolar and second premolar, and significant diferenceof second molar. For third molar, both femalesand malesreached different stage of tooth calcification. Females has reached stage G at 16,20 years while males subject stage F at 15,95 years. This resultsindicate that the stage of third molarcalsificaton females mature earlier than males.

4. Discussion

Human growth is less appropriate if it is determined by chronological age, because chronological age does not always give the real of growth stage[7]. Biological changes at prepubertal growth periode occurs as weight, height, ossification of the bones, appearance of secundery sex character and eruption of the teeth. The acuracy of growth determination is much more accurate up to 20 years of age, and drastically decline after this age.[9]The development tof

tooththis parallel with others structure of the body. Research shows that the development of the tooth is more related to the chronological age thanto the other growth indicators such as height, weight, sex and skeletal maturation indicators[10] In orthodontic,the development of toothis very important, which isthe maturation and eruption of the tooth plays an importand role in masticatory function and the growth of alveolar bone. The growth of maxillary and mandibular alveolar bone effect on vertical growth ofnaso-maxillary complex, as well as vertical growth of mandibular condyle.[11]

The assessment of tooth calcification stage was done on digital panoramic radiograph and determination the level of apical closure was done in computer. The advantage of digital panoramicradiograph to determined the stage of tooth calcification are: clearly visible, more easier than manufacturing of intra-oral dental radiograph, require less radiation than X-rays "full mouth" and the distortion on mandibular panoramic radiograph was not a problem, becauseDemirjian's scoring system determined based on scoring criteria, not based on absolute value (rating system).Panoramic radiographs due to their ability to enhance a wide view of the tooth and facial bonesare one of the best instruments to assess dental calcification[12,1]By using computer, the area of tooth calsification could be enlarged, sharpened, and if necessary could be invert so that the stage of calcification become clearer[13,5]Determination the stage of tooth calcification was not carried out on the maxilla, because the posterior teeth of the maxilla overlapping with bone structures, and the accuracy was difficult[1,3].

In this study, the central incisor, lateral incisor and first molar was not included in this research, becausethe apical closure had been completed.Demirjian's method consists of eight levels of tooth calcification with each tooth calcification stage were coded A to H, starting from the deposition email at the crown of the tooth, tooth root calcification rates, and changes in pulp cavity to form a complete root formation. Stage A indicates the earliest levels of tooth calcification, while stage H indicate the closure of apical root. If there are missing teeth, it can be replaced by the same tooth on the right side of the lower jaw. Demirjian'sscoring system is universal, so it can be used in all populations.Research indicate that growthof height, skeletal maturation, dental calcification rates, and sexual maturation runs parallel with the chronological age, but the growth of height, skeletal maturation, and sexual maturation have higher correlation than correlation of dental maturation with other growth index[8.] In order to assess dental maturation, tooth calcification due to progressive and continuous process it can be followed on panoramic radiograph.

Table 2, shows there were 6 femalessubject in group 8-8.9 years, and males are non. Table 3, there were significant differences of apical closure of canine, first prmolar, second premolar between females and males, which is apical closure of canine in female 1.05 years earlier than male, first premolar females 0,79 years earlier than males,and second premolars females earlier 0,69 years than males. No significant differences for apical closure of second molar between females and males(p>0.05).

Table 4, showsthird molar apical closure has not occurredboth females and males. No significant difference the stage G between males and females (p >0.05). Femaleshas reached stage G ealier than male. It is known that in skeletal maturation,femalesmature 2 years earlier than male[7]. Skeletal maturation of Indonesian subject showed that females mature 1,49 years earlier than male[14]This study shows thatapical closure in females earlier than males, and this result is in accordance to the skeletal maturation of Indonesian subjects which is females mature earlier than males.

Recently, calcification stage of third molar was used as feasible biological tools for estimating chronological age, from juvenile to adult status[5,15,16]The study of black African Brazilians population, shows that third molar calcification of females mature earlier than males[4],but other reasearch shows that males mature earlier than females[4,18]. Research in North Indian showedthat third molar calcification in femalesalso earlier than males[19]. The study of Attar et al, shows that the third molar calsification males rached at stage E while females reached at stage D[20]. In this study,canine, first premolars, second premolars, molars second and third molars, females earlier than males. The differences of the results could be due to differences in sample size, methodology, geographic, race, and ethnicity.

5. Conclusion

There are significant differences of apical closure of canine, first premolar and second premolar,between females and males, which is females earlier than males.There is no significant differencesof apical closure of second molar between females and males subject. For third molar both females and males not yet reach apical closure and females reach at stage G, while males reached at stage F.

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Author Profile

Endah Mardiati (Indonesia) did DDS from Universitas Padjadjaran in 1983. Magister Science from Gajah Mada University 1989. Orthodontist spesialist from Universitas Padjadjaran 1999.. Doctorate degree from Universitas Padjadjaran 2010. Lecturer in Orthodontic Departement Faculty of Dentistry Padjadjaran University since 1985 – now. Member of Indonesian Dentist Association. Member Indonesian Association of Orthodontist. Member of World Federation of Orthodontist

Eky S Soeria Soemantri did DDS from Universitas Padjadjaran in Orthodontist spesialist from Universitas Padjadjaran 1999. Doctorate degree from Universitas Padjadjaran 2010. Profesor and lecturer in Orthodontic Departement Faculty of Dentistry Padjadjaran University since now. Member of Indonesian Dentist Association. Member Indonesian Association of Orthodontist. Member of World Federation of Orthodontist

Bergman Thahar did DDS from Universitas Padjadjaran in 1967-1977. Orthodontist spesialist from Universitas Padjadjaran 1985-1988. Doctorate degree from Universitas Padjadjaran 1993-1998. Profesor and lecturer in Orthodontic Departement Faculty of Dentistry Padjadjaran University since Professor 2006 - now, Lecture 1974 – now. Member of Indonesian Dentist Association 1977 – now. Member of Indonesian Association of Orthodontist 1988 – now. Member of World Federation of Orthodontist 2000 - now

Edeh Roletta HaroenM.S did DDS from Universitas Padjadjaran in 1981. S2 from Universitas Padjadjaran 1986. Doctorate degree from Universitas Padjadjaran 1992. Profesor and lecturer in Physiology Departement Faculty of Dentistry Padjadjaran University since Prof 2004, Emiritus 2012. Member of Indonesian Dentist Association.

Bambang Sutrisna, MD, MHSc, DrPH. MD fromUniversitas Indonesia. MHScEpidemiology from Johns Hopkins University. Doctorate degree from Universitas Indonesia. Profesor and lecturer of Public Health in University of Indonesia since 1976 – now. Member of Indonesian Medical Association since 1974 – now. Member of Society for Epidemiologic Research (USA) since 1979 – now. Member of The Indonesian Public Health Association since 1980 - now