Dental Age Estimation Using the Cameriere Method in Children with Down Syndrome in Jember

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Abstract

Down syndrome is a disorder caused by chromosomes. This condition needs to be considered by a dentist in carrying out an action either for research or clinical purposes such as orthodontic treatment and age estimation in a forensic identification process. Age estimation through teeth in someone who is still alive generally uses non-invasive methods that do not involve tooth extraction, namely clinical and radiographic examinations. The process of estimating a person's age can use Cameriere method which is entirely accurate when applied to the age 6-13 years. This study aimed to assess the prediction of dental age using the Cameriere method in children with Down's Syndrome.

Cross-sectional study using to this research subjects being Down's Syndrome with an age range of 10-16 years, totaling 8 girls and 10 male sample. Panoramic photos were taken, then chronological age and dental age were calculated using the cameriere method.

Result shows there was no significant difference between girls and male samples using paired t test ($P>0.05$). The R value 0.21 (girl sample) and 0.85 (boy sample).

The application of the Cameriere method results to estimates of dental age that are not significantly different from the chronological age for both samples.

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Introduction

Down syndrome is a disorder caused by chromosomes. Chromosomes in normal people consist of 46 chromosomes, whereas in people with Down's Syndrome, there are 47 chromosomes. This disorder occurs because chromosome 21 fails to divide, causing trisomy on chromosome 21.[1,2] The estimated incidence of Down's Syndrome is between 1 in 800 live births.[3] The prevalence of children with Down's Syndrome in Indonesia has increased 0.12% in 2010 to 0.13% in 2013 and then increased again to 0.21% in 2018.[4]

Patients with Down syndrome mostly found mutations in the receptor Anaphlastic Lymphoma Kinase 2 (ALK-2) on chromosome 21. ALK-2 is a receptor of the gene Bone Morphogenesis Proteins (BMPs) which can cause delays in the eruption of teeth.[5] The average patient with Down's syndrome experiences a delayed eruption of 2-3 years.[6] This condition needs to be considered by a dentist in carrying out an action either for research or clinical purposes such as orthodontic treatment and age estimation in a forensic identification process.

Age estimation through teeth can be done by clinical, radiographic, histological, and biochemical examination methods. Age estimation through teeth in someone who is still alive generally uses non-invasive

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methods that do not involve tooth extraction, namely clinical and radiographic examination.[7] The process of estimating a person's age can be done using various methods, one of which is the Cameriere method. This method is quite accurate in the age range of 6-13 years compared to other methods. The Cameriere method has suitable criteria for determining age estimates in patients with Down syndrome.[8] This method also does not yet have a reference when applied to Down's Syndrome sufferers. From these conditions,

The purpose of this study was to assess the prediction of dental age using the Cameriere method in children with Down's Syndrome.

Materials and methods

This research was conducted by cross sectional. This research was conducted at the Faculty of Dentistry, University of Jember with research subjects coming from students from Patrang State SLB, TPA SLB, and Bintoro Orphanage Foundation, who are sufferers of Down's Syndrome with an age range of 10-16 years. Of the total population that met the criteria, 18 research subjects were obtained with details of 8 women and 10 men. Panoramic photos were taken of all research subjects and then chronological age and dental age were calculated using the cameriere method.

Calculating Chronological Age

Calculating chronological age is based on the time of birth and the time the panoramic X-ray was taken (i.e. date, month, and year). Then the number of days starting from the time of birth until the time of taking the panoramic X-ray is calculated and the known number of days is divided by 365 days.[9]

Use of the Cameriere Method

This method was discovered by Roberto Cameriere in 2006. This method uses panoramic radiography by applying it to the seven boydibular harvesters on the left side. The part examined is the length of the tooth (L) and the distance between the apical openings (A). Teeth with complete root development whose root tips were completely closed were scored (N0). Teeth with exposed or incomplete roots are graded (Ai, i is the number on the tooth element). Teeth with roots one distance away (Ai, i=1,..., 5) the inside of the open peak is measured. Teeth with two roots (Ai, i=6, 7), the sum of the distances between the inside faces of the two exposed roots will be evaluated. To account for the effect of differences in magnification and angulation between x-rays, the measurements were normalized by dividing the tooth length (Li, i=1,..., 7). The final result, namely age based on measurement, will be obtained using the normalization of the seven left boydibular teeth (xi= Ai/li, i=1,.7), the sum of the normalized open roots (s) and the sum (N0) namely teeth with complete root development, namely Age $= 8.971 + 0.375g + 1.631x5 + 0.674N0 − 1.034s − 0.176.sN0$. The symbol g is a variable, 1 for male and 0 for girls. X5 is the result of A5/L5. N0is the number of teeth with closed roots. S is the sum of the open roots ($S = x1 + x2 + x3 + x4 + x5 + x6 + x7$).[8]

Dental age measurement using the Cameriere method

a. Placing panoramic photos in the viewer.

b. Measure the length of the teeth (L) and the distance between the apical parts that are still open (A), then record them on the recording sheet. The measurement results recorded are the average of the measurement results of 2 observers. Measurements were made using an electronic digital caliper with an accuracy of 0.01 mm.

c. The results of measurements of tooth length and exposed apical distance that

have been obtained are entered into a formula:

Age = 8.971+0.375g+1.631x5+0.674N0-1.034s-0.176sN0

where the value of g if male is 1 and girls is 0. X5 is the result of A5/L5. N0 is the number of teeth with closed roots. S is the sum of the open roots (S = x1+ x2+ x3+ x4+ x5+ x6+ x7).[7]

d. The measurement results were then analyzed using the *T test.*

Results

From table 1 the results are obtained calculation of chronological age and dental age using the Cameriere method in girls samples, namely the existence of a negative age difference, which means that all dental ages experience a delay in the calcification process.

From table 2 the results are obtained Calculating chronological age and dental age using the Cameriere method in the male sample, namely the existence of a negative age difference, which means that all dental ages experience a delay in the calcification process.

From table 3, intermediate *T test* result obtained Chronological age and dental age in the girls sample was 0.212 (P>0.05) and in the male sample was 0.857 (P>0.05) which means there was no significant difference dental age between girls and male samples.

Discussion

Dental age prediction is often used in the forensic identification process through the tooth eruption method and the tooth development method. The tooth development method is often used through the evaluation of a radiograph.[10] Evaluation of an OPGs is the most suitable method for dental work in children, because a single radiograph provides a child's complete dentition status, including disjointed, impacted or missing teeth.[11]

The results of this study indicated that there was a delay in dental age for all study samples, both male samples (2.03 ± 0.24 years) and girls samples (1.75 ± 0.21 years), although this did not show a non-significant difference. The delay in dental age is in accordance with the research conducted by Apriyono, even though it was carried out using a different method.[9] This delay in the age of the teeth means that the process of calcification of teeth in patients with Down's Syndrome experiences disturbances and delays. Down syndrome is a genetic disorder that has an influence on tooth calcification and eruption. In children with Down syndrome, the eruption of primary and perboyent teeth is delayed from two to three years.[12] There are several causes for delayed tooth eruption, namely impaired bone resorption process, impaired periradicular connective tissue vascularization, poor peripheral circulation, and low birth weight.[13]

Another factor that might be one of the causes of delays in tooth eruption in patients with Down's Syndrome is nutritional disorders. As is well known, the size of the mouth of a Down Syndrome patient is smaller than that of a normal person as well as a thick, protruding tongue and an uneven arrangement of teeth make it difficult for Down Syndrome sufferers to receive nutrition.[11]

The results of this study also showed that the differences in the results of calculating chronological age and dental age were not significant. This is consistent with the use of the Camierre method in several studies which resulted in insignificant differences in chronological age and dental age[14,15] and recommended this method for use in the Deutero Malay sub-racial population.[16,17] This similarity may be due to the RAS of the population sample of the research subjects used in this study, namely the Mongolian race, and the Deutero-Malay

sub-race.[18] Each racial population has different characteristics of growth and development of teeth, especially perboyent teeth. Several variations of tooth morphology are prominent: arch pattern, occlusal root length, and bone relationships help in racial differentiation.[19]

children with Down syndrome resulted in estimates of dental age that were not significantly different from their chronological age between both sample.

Conclusions

From the results and discussion above, it can be concluded that the application of the cameriere method to

Declaration of Interest

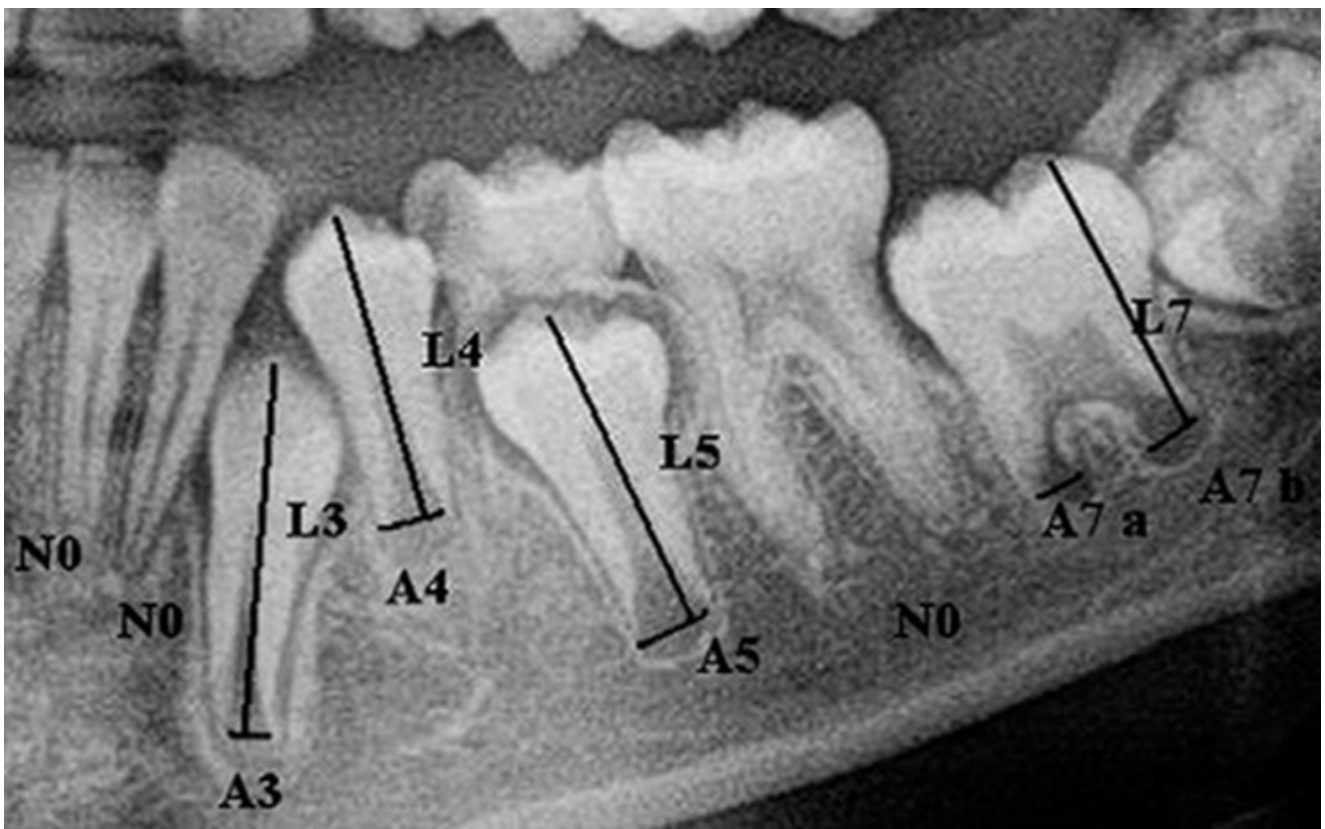The authors declared no conflict of interest regarding this investigation.

Figure 1. An example of tooth measurement. Ai, i=1,..., 5 (teeth with one root), is the distance between the insides of the exposed root apex; Ai, i=6, 7 (teeth with two roots), is the sum of the distance between the outer edges of the two exposed roots; and Li, i=1,... 7, is the length of the seven teeth.[8]

Age Group (Years)	N	Mean±SD		
		Chronological Age (Years)	Dental Age (Years)	Age Difference (Years)
10-10.99	2	10.46±0.34	8.6±0.42	1.86±0.08
12-12.99	3	12.53±0.27	10.89±0.095	1.63±0.24
16-16.99	3	16.55±0.27	14.77±0.50	1.78±0.24
10-16.99	8	13.52±2.66	11.77±2.67	1.75±0.21

Table 1. Results of calculating chronological age and dental age using the cameriere method in a girls sample.

Age Group (Years)	N	Mean±SD		
		Chronological Age (Years)	Dental Age (Years)	Age Difference (Years)
10-10.99	2	10.83±0.18	8.75±0.07	2.08±0.25
12-12.99	4	12.51 ±0.26	10.6±0.36	1.91 ±0.27
16-16.99	4	16.62±0.23	14.5±0.43	2.12±0.21
10-16.99	10	13.82±2.50	11.79±2.46	2.03±0.24

Table 2. Results of calculating chronological age and dental age using the Cameriere method for male samples.

Sample	Average Chronological Age+SD	Average Dental Age + SD	Sig.(2-tailed)
Girls	13.52±2.66	11.77±2.67	.212
Male	13.82±2.50	11.79±2.46	.857

Table 3. T-test results between Chronological Age and Dental Age in girls and male samples Using the Cameriere method.

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