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Dental Age In Turner Syndrome Karyotypes

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Abstract:
Introduction: *Dental maturity, expressed as dental age, is one of the common indices for age estimation. A complete or partial absence of an X chromosome in the karyotype of phenotypic females has an impact on dental maturation. The purpose of this study was to determine the dental age in patients with Turner's syndrome using Demirjian's method, and to determine the influence of various karyotypes on dental maturity.*
Material and methods: *The study population consisted of 40 Turner syndrome patients, aged from 9.2 to 18 y. The TS patients were subdivided according to karyotype (monosomy X, mosaic, and isochromosome) so that karyotypic phenotypic correlations could be studied. Only twenty-one panoramic radiographs of girls aged 9.2-15.3 years were evaluated using Demirjian's method. The other patients were not included in the calculation because their chronologic age exceeded the age at which all teeth have normally completed root development. The dental age was scored on all seven left mandibular teeth. As reference material the French-Canadian sample of normal girls presented by Demirjian was used. Dental age was compared to chronological age by using a Student's paired t-test. The Mann-Whitney test was used to test the differences in dental maturity between the karyotypes.*
Results: *The results showed significant differences between chronological age and dental age. The dental maturity of the Turner patients was 1 year advanced compared with the children in Demirjian's sample. The mean difference between dental and chronologic ages varied from 0.2 to 2.59 years. The investigation revealed no significant differences between the karyotypes.*
Conclusion: *The findings in this research can be explained by the fact that shorter roots occurred in all Turner patients leads to advanced maturity by earlier finished root formation. Age estimation plays an important role in orthodontics. Such information aids in diagnosis and treatment planning.*

Keywords: *Dental age, age determination, Turner syndrome, Demirjian's method, X-chromosome.*

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I. Introduction

Turner syndrome (TS) is a combination of characteristic clinical signs and the complete or partial absence of one of the X chromosomes in the karyotype of phenotypic females with gonadal dysgenesis. This condition occurs in about 1 in 2,000 to 5,000 newborns worldwide [1-2]. Several karyotypes responsible for the syndrome have been identified, the most common being monosomy X, found in 50-60% of the females and the less common are the mosaic and isochromosome for the long arm of the X chromosome [3].

Short stature, gonadal dysgenesis, pterygium colli and cubitus valgus are the main characteristics of this disease [4]. In addition to short stature, cranial growth reduction, thin enamel, short roots and small teeth have also been registered [5-12]. Females with TS have a tendency toward lateral crossbite, distal molar

occlusion, and open bite [13-15]. Taurodontism also has been registered in TS females [16-20]. Skeletal maturity was retarded by an average of 2.2 y. but dental maturity was accelerated [21-22]. Although dentition is characterized by accelerated development, the sequence of tooth eruption does not differ significantly from normal populations [21].

The aim of this study was to determine the dental age in a group of patients with Turner's syndrome using Demirjian's method, and to determine the influence of various karyotypes on dental maturity.

II. Material and Methods

This investigation was part of a systematic study whose purpose was to study development specific to children with Turner syndrome and determine the influence of various karyotypes on the study variables. The diagnosis of this syndrome was done by chromosome analysis of peripheral lymphocytes.

The study population consisted of 40 Turner syndrome patients, aged from 9.2 to 18 y, who were patients at the Pediatric Clinic, Medical Faculty, University of Skopje. Written permission has been obtained from the parents of the children included in the study. No patients had received previous orthodontic treatment. The TS patients were subdivided according to karyotype (monosomy X, mosaic, and isochromosome) so that karyotypic phenotypic correlations could be studied.

Only twenty-one panoramic radiographs of girls aged 9.2-15.3 years were evaluated using Demirjian's method [23]. The other patients were not included in the calculation because their chronologic age exceeded the age

at which all teeth have normally completed root development. The dental age was scored on all seven left mandibular teeth by one examiner (CBM). As reference material the French-Canadian sample of normal girls presented by Demirjian was used. Dental age was compared to chronological age by using a Student's paired t-test. The Mann-Whitney test was used to test the differences in dental maturity between the karyotypes.

III. Results

The results showed significant differences ($p < 0.001$) between chronological age and dental age. The dental maturity of the Turner patients was 1 year advanced compared with the children in Demirjian's sample (Tab. 2). The mean difference between dental and chronologic ages varied from 0.2 to 2.59 years (Tab. 1). The biggest difference (2.59 years) is present in 12.11 year-old girl; in three girls this difference is more than 2.1 years, in four cases it is between 1.1 - 2 years, and in the largest number of cases (fourteen) this difference is up to 1 year.

The investigation revealed no significant differences between the karyotypes.

Table 1. Comparison of chronologic and dental age on the basis of maturity scores in Turner syndrome patients.

N	Chronologic age (years)		Dental age (years)		Difference c.a. / d.a.		t-test	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	t	p
21	12.73	2.13	13.73	2.16	1.00	0.71	6.51	p<0.001

Table 2. Mean difference of chronologic and dental age in Turner syndrome patients.

Patient No.	Chronologic age (years)	Dental maturity (scores)	Dental age (years)	Difference
1.	9.2	88.6	9.5	0.3
2.	9.3	89.2	9.6	0.3
3.	9.8	94.4	10.8	1.0
4.	10.3	95.8	11.3	1.0
5.	10.5	98	12.7	2.2
6.	10.11	95.1	11.1	0.99
7.	11.4	97.6	12.4	1.0
8.	12.4	97.7	12.5	0.1
9.	12.11	99.5	14.7	2.59
10.	13.2	99.5	14.7	1.5
11.	13.7	99.5	14.7	1.0
12.	13.11	100.0	15.5	2.39
13.	14.0	99.8	15.1	1.1
14.	14.3	99.8	15.3	1.0
15.	14.4	100.0	15.5	1.1
16.	14.8	100.0	15.5	0.7
17.	14.10	100.0	15.5	1.4
18.	15	100.0	15.5	0.5
19.	15	100.0	15.5	0.5
20.	15.3	100.0	15.5	0.2
21.	15.3	100.0	15.5	0.2

IV. Discussion

The concept of physiological age is based on the degree of maturation of four different systems. Radiographic assessment of bone maturation, tooth mineralization stages, secondary sexual characteristics, body height and body weight are used as developmental indicators.

Growth and its mechanisms are strongly influenced by the genes on the X-chromosome, which has impact on the tooth size. Numerical aberrations of the X chromosome affect the the quantitative and qualitative excretion of amelogenin, which results in reduced dimensions of tooth crowns and roots.

Dental maturity, expressed as dental age, is one of the common indices for age estimation. Tooth formation is widely used to assess maturity and to predict age. The X-chromosome affects the size of the teeth, the thickness of the enamel and the root morphogenesis. In our investigation dental maturity was advanced 1 year. This is in accordance with several authors [21-22,24-25].

The largest difference between the chronologic and dental age in the examined group is about 2.5 years, but in the largest number of cases were up to 1 year.

Examining dental maturity in girls with Turner syndrome using Demirjian's methods, Midtbo & Halse [21] found the dental maturity in a group of Norwegian Turner girls to be 1 years advanced, whereas Simmons [25] reported a mean advance of 0.63 years. Ogiuchi et al. [22] found that the mean dental age estimated from the maturity stages was 1.22 years advanced and this can be explained by the fact that shorter roots occurred in all their patients. Nystrom et al. [24] using Demirjian's method for assessing dental maturity, found that the Finnish girls were on an average 3.5 months ahead of the French-Canadian girls at the age of 4-9 years and 9 months ahead in the 10- to 14-year age group. Although dental maturity is accelerated, the timing of clinical eruption does not differ significantly from normal populations [21].

Among the different karoytypes, the dental age did not show significant differences which is in accordance with the findings of Midtbo et al. [21].

The findings in this research can be explained by the fact that shorter roots occurred in all Turner patients leads to advanced maturity by earlier finished root formation. Age estimation plays an important role in orthodontics. Such information aids in diagnosis and treatment planning.

V. Conclusion

Our findings show that the reduction of X chromosomal genetic material in Turner syndrome patients results in advanced dental development. Among the different karoytypes, no statistically significant differences were determined in the dental maturation.

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