JHGD
Journal of Human Growth and Development
www. jhgd.com.br

ORIGINAL ARTICLE

Dental age assessment in children and teenagers with different craniofacial skeletal patterns

Fábio de Freitas Quintino[a], Caio Luiz Bitencourt Reis[b], Fabrício Fernandes Ferreira[a], Mirian Aiko Nakane Matsumoto[b], Maria Bernadete Sasso Stuani[b], Fábio Lourenço Romano[b], Liz Helena Moraes Pinheiro[c], Bárbara Alves da Fonseca[c], Leonardo Santos Antunes[c], Lívia Azeredo Alves Antunes[c], Erika Calvano Küchler[d], Daniela Silva Barroso de Oliveira[a]

[a]Departamento de Clínica e Cirurgia, Faculdade de Odontologia, Universidade Federal de Alfenas, Brasil

[b]Departamento de Clínica Infantil, Faculdade de Odontologia de Ribeirão Preto, Universidade de São Paulo, Brasil

[c]Departamento de Formação Específica em Odontologia, Instituto de Saúde de Nova Friburgo, Faculdade de Odontologia, Universidade Federal Fluminense, Brasil

[d]Faculdade de Odontologia, Universidade Tuiuti do Paraná, Brasil

Corresponding author
caioluizreis@usp.br

Manuscript received: november 2024
Manuscript accepted: december 2024
Version of record online: april 2025

Abstract

Introduction: dental development assessment may help in diagnosis of development disruptions and in orthodontic treatment planning. Disturbances of dental and craniofacial development share similar risk factors. In this way, dental development assessment may be a useful method to also predict skeletal malocclusion.

Objective: This study investigated the relationship between dental development and skeletal patterns.

Methods: patients of both genders, aged 7 to 16 years old, who presented cephalometric and panoramic radiographs before orthodontic treatment were included. Calibrated examiners blinded for sex and age defined the dental age by analyzing the radiographs using the Demirjian method (1973). ANB, SNA and SNB angles were obtained by cephalometric tracing. The dependent variable of the study was the subtraction of dental age (DA) by chronological age (CA) (DA-CA). The agreement between dental age and chronological age was determined by the Bland-Altman method. The relationship between CI-ID and skeletal patterns was analyzed by Spearman's correlation tests and the Generalized Linear Model adjusted for age and sex.

Results: 145 patients were included in the study and the Bland-Altman test showed agreement between dental and chronological ages. In the correlation test, no association was found between DA-CA and skeletal patterns (p>0.05). In the multivariate analysis adjusted for sex and age, it was also not found a significant association.

Conclusion: our results suggest that there is no relationship between dental development and skeletal patterns.

Keywords: dental development, dental age, dental maturation, skeletal patterns, skeletal malocclusion.

Suggested citation: Quintino FF, Reis CLB, Ferreira FF, Matsumoto MAN, Stuani MBS, Romano FL, Pinheiro LHM, Fonseca BA, Antunes LS, Antunes LAA, Küchler EC, Oliveira DSB. Dental age assessment in children and teenagers with different craniofacial skeletal patterns. *J Hum Growth Dev. 2025; 35(1):68-75.* DOI: http://doi.org/10.36311/jhgd.v35.15505

Authors summary

Why was this study done?
The knowledge whether different craniofacial growth patterns present different DA is of clinical importance in determining the timing of the orthodontic treatment intervention. Thus, this study aimed to investigate the association between skeletal malocclusion patterns, cephalometric measurements and DA in a group of Brazilian children.

What did the researchers do and find?
We recruited children and teenagers who presented cephalometric and panoramic radiographs. We defined the dental age by analyzing the radiographs using the Demirjian method (1973). ANB, SNA and SNB angles were obtained by cephalometric tracing. Our results suggest that there is no relationship between dental development and skeletal patterns.

What do these findings mean?
Although dental maturation imbalances and malocclusion share the similar etiological factors, dental age may not be a good biological indicator for malocclusion, as previously suggested.

Highlights
Dental age assessment is crucial to detect the maturation level of children and teenagers;
Some craniofacial growth patterns are associated with skeletal malocclusion, which may affect the quality-of-life of the individual;
Dental age can be detect previously of skeletal malocclusion establishment;
We aimed evaluate if dental age assessment may be a predictive factor to craniofacial skeletal pattern.

INTRODUCTION

Dental development is a prolonged and highly complex biological process that occurs from birth to about 16 years old[1,2]. Dental age (DA) estimation uses the development and calcification of the tooth to estimate the chronological age. The method proposed by Demirjian et al (1976)[3] is the method widely used to DA estimation in dental research[4]. Several factors are associated with delayed dental maturation-dental age, such as malnutrition[5,6], non-syndromic tooth agenesis[7,8] and hormonal deficiency[9,10]. Others factors are also associated with earlier dental maturation, such as obesity[6,11] and genetic mutations[12].

Several studies in different populations investigated if DA may be a biological predictor for skeletal malocclusion patterns development, however, the association between these two traits are still controversial[13-24] In fact, the skeletal complex, including maxilla and mandible, development share the same etiological factors with dental development[12,25-28].

The knowledge whether different craniofacial growth patterns present different DA is of clinical importance in determining the timing of the orthodontic treatment intervention; for example, if specific craniofacial growth pattern shows a link to delaying or advancing dental development, the DA may be a tool to malocclusion predicting, once that DA can be estimate from three years old, and skeletal malocclusion can be developed until the end of growth peak[3]. In this way, DA may be a biological predictor for skeletal malocclusion estabilishment and aids the early diagnosis. The results between the current studies[13-24] are divergent, which makes it impossible to reach a robust conclusion on the topic. Thus, this study aimed to investigate the association between skeletal malocclusion patterns, cephalometric measurements and DA in a group of Brazilian children.

METHODS

This cross-sectional multicentric study was delineated through the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) checklist.

A sample size calculation was performed through the software G*Power Version 3.1.9.7. The parameter to calculate was obtained from the study of Esenlik et al (2014)[16]. Considering the r = 0.20516, $\alpha = 0.05$ and $\beta = 0.80$, the sample size calculation predicted a minimum of 145 individuals for this study.

The sample was recruited by convenience in orthodontic clinics of Faculdade de Odontologia de Ribeirão Preto, Univerisdade de São Paulo, and Universidade Federal Fluminense, Nova Friburgo. Healthy children and teenagers biologically unrelated, both of sexes, no history of orthodontic treatment or dental extraction, and aged ranged between 7 and 16 years old were recruited by a simple invitation. None remuneration or benefits was offered, and none impact occurs on the orthodontic treatment of patients who did not accept to participate in the research. Patients with dental agenesis of the seven permanent teeth (central and lateral incisors, canine, first and second premolars, and first and second molars) in both sides of the mandible were excluded. Patients with significant geometric distortion and numerous artifacts in their radiography were also excluded. The informed consent was obtained from both parents (or legal guardians) and children (informed assent) included in this study by handwritten signature. Children received an age-appropriate document and also indicated their assent with a handwritten signature. All patients were capable of reading and writing.

Dental age (DA) determination

DA was estimated according to Demirjian (1976)[3]. The development of the seven permanent teeth (central and lateral incisors, canine, first and second premolars, and first and second molars) of the mandibular left side was assessed using panoramic radiographs. If a missing tooth/tooth agenesis was founded in the mandibular left side, the right side was evaluated. If bilateral missing tooth/tooth agenesis was founded, the child was excluded. Third molar agenesis was not an exclusion criterion, as Demirjian's method does not assess this tooth. Two observers were previously trained by an orthodontist and calibrated to standardize the evaluations. Ten percent of the sample was randomized selected to calibration. Weighted Cohen's Kappa was performed twice, to test the intra and inter-observers' reliability (concordance) of dental age estimation. The concordance tests (Kappa scores) ranged from 0.80 to 1.00[29].

Skeletal malocclusion patterns determination

Digital cephalometric tracings were performed by two orthodontists previously calibrated. Steiner's angles were measured to diagnoses skeletal malocclusion patterns. The relationship of maxilla to the cranial base was assessed by the angle formed by the landmark's SNA (Sella, Nasion and subspinale point A), and the sample was classified as well-positioned maxilla (80°-84°), maxillary retrusion (<80°), or maxillary protrusion (>84°). The relationship of the mandible to the cranial base was assessed by the angle formed by the landmark's SNB (Sella, Nasion and supramentale point B), and the sample was classified as well-positioned mandible (78°-82°), mandibular retrusion (<78°), or mandibular prognathism (>82°). The relationship of maxilla to the mandible was assessed by the angle formed by the landmark's ANB (subspinale point A, Nasion and supramentale point B), and the sample was classified as class I (0°-4°), class II (>4°) or class III (<0°). Ten percent of the sample was randomized selected to calibration. The Intraclass Correlation Coefficient (ICC) was performed twice, to test the intra and inter-observers' reliability of cephalometric tracings. The ICC scores ranged from 0.79 to 0.87[29].

Statistical analysis

Chronological age (CA) was considered as the decimal number obtained by subtracting a patient's birthdate from the date of radiograph accessed. To determine the agreement between the DA estimation and the CA, Bland-Altman analysis was performed according to Esan and Schepartz (2018)30. Firstly, a linear regression was performed to evaluate proportional bias between CA and DA, and bias was not observed in the regression (p>0.05). After, a Bland-Altman plot was generated (figure 1).

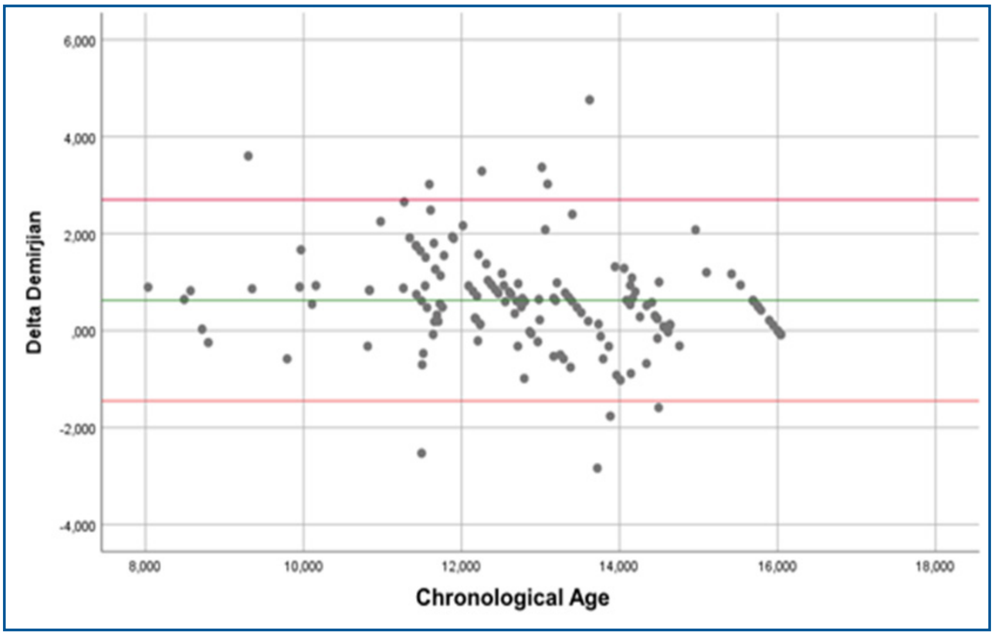

Figure 1: Bland-Altman Graph to evaluate proportional bias between Chronological Age and Dental Age

The difference (delta) between DA and CA was the dependent variable (DA-CA). The normality of the data was assessed by the Shapiro Wilk test. None variable has normal distribution (p<0.05), thus, the non-parametric tests Mann-Whitney and Spearman correlation test were performed. Also, Generalized Linear Regression adjusted by sex and age was performed29.

All analyses were made using IBM SPSS version 25.0 (IBM Corp. Armonk, USA), and values of p<0.05 indicated a statistical significance difference.

Ethical clearance

This study was previously approved by the Research Ethics Committees of the Faculdade de Odontologia de Ribeirão Preto, Universidade de São Paulo (protocol 01451418.3.0000.5419) and the Universidade Federal Fluminense, Nova Friburgo (protocol 33791314.3.0000.5243).

RESULTS

One hundred forty-five children were included, 61 (42.1%) boys and 84 (67.9%) girls. The characteristics of the studied sample are showed in table 1. When evaluated the CA-DA per sex, the mean for the boys was 0.73 (SD=0.88), and for the girls was 0.55 (SD=1.17). The difference between sexes was not statistically significant according to Mann-Whitney test (p=0.267) (table1).

Spearman correlations was performed between DA-CA and cephalometric measurements and are presented in the table 2. No statistical significant association was founded (p > 0.05) (table2).

The mean of DA-DA was compared between sexes and skeletal malocclusion patterns groups (table 3). No statistical difference between groups was observed (p>0.05) (table 3).

Table 1: Characteristics of sample recruited in southern of Brazil, during 2016 to 2018

	Chronological Age (CA)	Dental Age (DA)	Delta DA-CA	SNA	SNB	ANB
Mean	12.55	13.18	0.62	82.69	79.20	3.48
Standard Deviation	1.93	1.78	0.60	4.29	4.56	3.01
Median	12.49	13.00	0.60	82.70	79.10	3.20
Minimum	7.49	8.48	-2.83	94.20	93.80	-3.90
Maximum	16.08	16.00	4.75	72.00	66.50	11.50

Table 2: Correlation between DA-CA and cephalometric measurements

	r² (95% Confidence Interval)	p-value
SNA	0.006 (-0.16 to 0.17)	0.937
SNB	-0.019 (-0.18 to 0.15)	0.815
ANB	0.089 (-0.08 to 0.25)	0.289

Note: Spearman correlation test was performed.

Table 3: Comparison between DA-CA and groups (southern of Brazil, during 2016 to 2018)

	n (%)	Mean	Standard Deviation	Median	p-value
Male	61 (42.1)	0.73	0.88	0.63	0.267
Female	84 (57.9)	0.55	1.17	0.57	
Well-Positioned Maxilla	52 (35.9)	0.66	0.81	0.60	Reference
Maxillary Protusion	44 (30.3)	0.56	1.13	0.59	0.805
Maxillary Retrusion	49 (33.8)	0.65	1.24	0.62	0.870
Well-Positioned Mandible	40 (27.6)	0.79	1.10	0.64	Reference
Mandibular Retrognathism	61 (42.1)	0.65	1.06	0.61	0.662
Mandibular Prognathism	44 (30.3)	0.43	1.03	0.53	0.387
Class I	69 (48.9)	0.61	0.85	0.60	Reference
Class II	55 (39.0)	0.71	1.28	0.64	0.627
Class III	17 (12.1)	0.62	0.84	0.52	0.965

Table 4: Multivariate Analysis adjusted by gender and chronological age with DA-CA as a dependent variable

Skeletal Pattern	p-value	Coefficient	Standard Error
SNA	0.940	0.001	0.017
SNB	0.967	-0.001	0.016
ANB	0.859	-1.059	0.479

Note: Generalized Linear Regression was performed.

The multivariate analysis adjusted by sex and chronological age evaluated the impact of cephalometric measurements on the DA, however, no significant association was observed (table 4).

DISCUSSION

The main findings of this study indicate that dental maturation, assessed by Demirjian's method, is not associated with skeletal malocclusion patterns according to Steiner's cephalometric measurements (ANB, SNA, and SNB angles). To the best of our knowledge, only Esenlik *et al.* (2014)[16] investigated the association between DA and the same parameters. Just like us, the authors did not find any association. This result suggests that DA estimation may not be a reliable biological predictor for the development of skeletal malocclusion in Brazilian children and adolescents.

Our study included 145 children and teenagers, being sixty-nine (48.9%) skeletal Class I malocclusion, 55 (39%) skeletal Class II malocclusion, and 17 (12.1%%) skeletal Class III malocclusion. The mean difference between Chronological age and Dental age (CA-DA) for this study was 0.62 (0.73 for the boys and 0.55 for the girls). These findings indicate an overestimation of the Demirjian's method on Brazilian population, highlighting the need for specific adjustments when applying this method to the Brazilian population.

Our study is relevant to clinical practice and contributes to improving the oral health care of children and teenagers, especially in determining the ideal timing for orthodontic interventions. We suggest, according to our study, that orthodontists should focuses on other indicators, such as genetic polymorphisms, to predict the skeletal malocclusion development.

Previous similar and divergent results

The overestimation between CA-DA showed by this study is according to a previous study[31], which also explored the DA in children from Southeastern Brazil. Besides that, a systematic review with the global population showed that Demirjian method overestimate the age of children by more than six months[32]. Several factors can explain this overestimation: the method by Demirjian *et al.* (1976)[3] was created according to a French–Canadian data set. The inconsistency of this method when applied in other populations may be due to genetic, socioeconomic, and environmental variations between the nations[32].

Several studies[13,14] subdivided the results between DA and skeletal malocclusion per sexes. In our study, we observed that the difference between CA-DA and sexes was not statistically significant (p=0.267). Demirjian's method contain a previous adjust to obtain the dental age differently for the boys and girls, which may explain the absent of statistical difference between sexes.

In this way, we chose not to perform a stratified univariate analysis to avoid that some subgroup be underrepresented. We consider the sex as a confounding variable in multivariate analysis.

Our aim was to investigate whether imbalances in dental maturation could serve as a biological indicator for skeletal malocclusion. Some studies have already investigated this topic[13-24] using another skeletal malocclusion diagnosis parameters. We decided use the skeletal malocclusion diagnosis according to Steiner's (ANB, SNA, and SNB angles) because it is the method most widely used worldwide. Esenlik *et al.* (2014)[16] was the only study that also investigated these same parameters. They also found no statistically significant association between dental age and skeletal malocclusion patterns. Some studies[13-15,17-24] that founded statistical association between DA and skeletal malocclusion containing several bias that prevent a robust conclusion on the topic, such as absent of sample size calculation, exclusion criteria and skeletal malocclusion diagnosis poorly defined, and absent of multivariate analysis. In this way, the conclusion about this topic is limited.

Erudition of the authors and strengths of this study

Several studies by our research team have investigated factors that can predict the establishment of malocclusion[6,12,33-35]. Our research team have evaluating the impact of single nucleotide polymorphisms, a type of genetic variation, in dental and skeletal maturation[12]. We showed that polymorphisms associated previously with skeletal malocclusion were associated with skeletal maturation delayed. In this way, we hypothesized that dental maturation and skeletal malocclusion share of similar risk factors, and we decided to investigate this hypothesis here. Our study distinguishes of previous study in some aspects: we performed a sample size calculation, evaluated a population not yet explored, the researchers were adequately calibrated, and we performed a multivariate analysis. This strengths contribute to a result similar to the population reality.

Study's limitations and suggestions for future research

Several factors were associated with dental development disruptions, malnutrition or obesity, hormonal deficiency, and genetic mutations[5-11]. Some local factors, such as early tooth extractions, absence of space to tooth permanent eruption, endodontic infections, or bruxism, can alter tooth maturation and do not necessarily change the development of malocclusions. Due to the difficulty in obtaining the patient's oral health history, the information about local factors was not collected, and it can be considered a limitation of this study. Another limitation is that dental maturation is a long process that would be better investigate in cohort studies.

Bias selection was a limitation of our study, since only orthodontic patients were included in this study. Besides that, we could have made an specific adjustment to Demirjian analysis to our population to decrease the overestimation. We encourage that the future research focus in third molar development and skeletal malocclusion, to evaluate if the development of this tooth may be impacted by specific malocclusion. This research encourages the development of more accurate diagnostic tools tailored to local contexts. This ultimately enhances early diagnosis and personalized treatment planning, potentially reducing the risk of inappropriate interventions and improving overall orthodontic outcomes for young patients.

CONCLUSION

We concluded that:

1. Tooth maturation was not associated with skeletal malocclusion patterns according to Steiner analysis (ANB, SNB and SNA);
2. The dental age may not be a good biological indicator to predict the development of malocclusion;
3. Demirjian method overestimate the dental age of children and adolescents from southeastern Brazil.
4. Cohort studies should be developed to secure the certainty of this evidence.

Disclosures

Ethics approval and consent to participate: Informed consent/assent was obtained from all participants and/or their legal guardians where age-appropriate. This study was previously approved by the Research Ethics Committees of the Faculdade de Odontologia de Ribeirão Preto, Universidade de São Paulo (protocol 01451418.3.0000.5419) and the Universidade Federal Fluminense, Nova Friburgo (protocol 33791314.3.0000.5243).

Availability of data and material

The data generated in the present study are included within the manuscript.

Competing interests

The authors declare no conflicts of interest.

Funding

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de

Nível Superior - Brasil (CAPES) - Finance Code 001 and Alexander-von-Humboldt-Foundation (Küchler/ Kirschneck accepted in July 4th, 2019). This research was also financed in part by: "Jovem Cientista Nosso Estado" code E-26/201.337/2022) (LAAA) and "Jovem Cientista Mulher" (LAAA) code E-26/210.019/2024 from Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro(FAPERJ), and Pos doctor senior code 102385/2024-6 (LAAA) from The National Council for Scientific and Technological Development (CNPq). The São Paulo Research Foundation (FAPESP) financed individual scholarship (CLBR, process 2021/02704-1).

Authors' contributions

Conceptualization, C.L.B.R, D.S.B.O., E.C.K., Methodology, F.F.Q, C.L.B.R, D.S.B.O, E.C.K., Formal Analysis, F.F.Q., C.L.B.R; L.H.M.P., B.A.F Resources, M.A.N.M., M.B.S.S., F.L.R., L.S.A., L.A.A.A., E.C.K.; Data Curation, C.L.B.R.; Writing – Original Draft Preparation, C.L.B.R., F.F.Q., E.C.K Writing – Review & Editing, F.F.Q., C.L.B.R., M.A.N.M., M.B.S.S., F.L.R., L.H.M.P., B.A.F., L.S.A., L.A.A.A., E.C.K, D.S.B.O Funding Acquisition, E.C.K., M.A.N.M., L.S.A.

REFERENCES

1. Duke A, Paterson MP, Ashley M, MacNab L. The genetic basis of hypodontia in dental development. British Dental Journal, 2023;235(7):525-528.
2. Küchler EC, Kirschneck C, Marañón-Vásquez GA. et al. Mandibular and dental measurements for sex determination using machine learning. Sci Rep 2024;14: 9587.
3. Demirjian A, Goldstein H. New systems for dental maturity based on seven and four teeth. Annals of human biology. 1976;3(5):411-21.
4. Surendran S, Thomas E. Tooth mineralization stages as a diagnostic tool for assessment of skeletal maturity. American Journal of Orthodontics and Dentofacial Orthopedics. 2014;145(1):7-14.
5. Kumar V, Patil K, Munoli K. Evaluation of dental age in protein energy malnutrition children. Journal of Pharmacy & Bioallied Sciences. 2015;7(Suppl 2):S567.
6. Reis CL, Barbosa MC, Henklein S, et al. Nutritional status is associated with permanent tooth eruption in a group of Brazilian school children. Global Pediatric Health. 2021;8:2333794X211034088.
7. Ruiz-Mealin EV, Parekh S, Jones SP, et al. Radiographic study of delayed tooth development in patients with dental agenesis. American Journal of Orthodontics and Dentofacial Orthopedics. 2012;141(3):307-14.
8. Badrov J, Lauc T, Nakas E, et al. Dental age and tooth development in orthodontic patients with agenesis of permanent teeth. BioMed research international. 2017;2017.
9. Vallejo-Bolaños E, España-López A, Muñoz-Hoyos A, et al. The relationship between bone age, chronological age and dental age in children with isolated growth hormone deficiency. International Journal of Paediatric Dentistry. 1999;9(3):201-6
10. Krekmanova L, Carlstedt-Duke J, Brönnegård M, et al. Dental maturity in children of short stature, with or without growth hormone deficiency. European journal of oral sciences. 1997;105(6):551-6.
11. Nicholas CL, Kadavy K, Holton NE, et al. Childhood body mass index is associated with early dental development and eruption in a longitudinal sample from the Iowa Facial Growth Study. American Journal of Orthodontics and Dentofacial Orthopedics. 2018;154(1):72-81.
12. Reis CLB, Matsumoto MAN, Baratto-Filho F et al. Impact of genetic variations in the WNT family members and RUNX2 on dental and skeletal maturation: a cross-sectional study. Head Face Med 2023;19,26.
13. Gottimukkala P, Gandikota CS, Challa PL, et al. Assessment of skeletal and dental maturation of short and long-face children of South Indian Population. Journal of Indian Orthodontic Society. 2012;46(3):148-53.
14. Celikoglu M, Erdem A, Dane A, et al. Dental age assessment in orthodontic patients with and without skeletal malocclusions. Orthodontics & craniofacial research. 2011;14(2):58-62.
15. Durka-Zając M, Derwich M, Mituś-Kenig M, et al. Analysis of dental maturation in relation to sagittal jaw relationships. Polish journal of radiology. 2017;82:32-7.
16. Esenlik E, Atak A, Altun C. Evaluation of dental maturation in children according to sagittal jaw relationship. European journal of dentistry. 2014;8(01):038-43.
17. Jamroz GM, Kuijpers-Jagtman AM, Hof MAtet al. Dental Maturation in Short and Long Facial Types: Is There a Difference? The Angle Orthodontist. 2006;76(5):768-72.
18. Lauc T, Nakaš E, Latić-Dautović M, et al. Dental age in orthodontic patients with different skeletal patterns. BioMed research international. 2017;2017.

19. Mahmood HT, Fida M. Assessment of dental maturation on orthopantomograms among children with various dental malocclusions at a tertiary care hospital. Journal of the Pakistan Medical Association. 2018;68(12):1597.
20. Sop I, Mady Maricic B, Pavlic A, et al. Biological predictors of mandibular asymmetries in children with mixed dentition. CRANIO®. 2016;34(5):303-8.
21. Suda N, Hiyama S, Kuroda T. Relationship between formation/eruption of maxillary teeth and skeletal pattern of maxilla. American journal of orthodontics and dentofacial orthopedics. 2002;121(1):46-52.
22. Sukhia RH, Fida M. Dental maturity amongst various vertical and sagittal facial patterns. Journal of the College of Physicians and Surgeons Pakistan. 2010;20(4):225.
23. Uysal T, Yagci A, Ramoglu SI. Dental maturation in patients with unilateral posterior crossbite. World journal of orthodontics. 2009;10(4).
24. Janson GR, Martins DR, Tavano O, et al. Dental maturation in subjects with extreme vertical facial types. The European Journal of Orthodontics. 1998;20(1):73-8.
25. Rodrigues AS, Antunes LS, Pinheiro LHM, et al. Is dental agenesis associated with craniofacial morphology pattern? A systematic review and meta-analysis. European Journal of Orthodontics. 2020;42(5):534-43.
26. Sadeghianrizi A, Forsberg C-M, Marcus C, et al. Craniofacial development in obese adolescents. The European Journal of Orthodontics. 2005;27(6):550-5.
27. Anand K, Menka K, Maloth S, et al. Analyzing the role of malnourishment in malocclusion: A cross-sectional study. Journal of Pharmacy & Bioallied Sciences. 2021;13(Suppl 1):S452.
28. Kjellberg H, Beiring M, Wikland KA. Craniofacial morphology, dental occlusion, tooth eruption, and dental maturity in boys of short stature with or without growth hormone deficiency. European Journal of Oral Sciences. 2000;108(5):359-67.
29. Vieira, S. (2018). Bioestatística: Tópicos avançados-testes não paramétricos, testes diagnósticos, medidas de associação e concordância. Elsevier Brasil.
30. Esan TA, Schepartz LA. Accuracy of the Demirjian and Willems methods of age estimation in a Black Southern African population. Legal Medicine. 2018;31:82-9.
31. Eid RMR, Simi R, Friggi MNP, et al.. Assessment of dental maturity of Brazilian children aged 6 to 14 years using Demirjian's method. International Journal of Paediatric Dentistry. 2002;12(6):423-428.
32. Jayaraman J, Wong HM, King NM, et al. The French–Canadian data set of Demirjian for dental age estimation: a systematic review and meta-analysis. Journal of forensic and legal medicine, 2013;20(5):373-381.
33. Reis, CLB, Matsumoto MAN, Stuani MBS, et al. Single Nucleotide Polymorphisms in RUNX2 and BMP2 contributes to different vertical facial profile. PLOS ONE,2024;19(5), e0303551.
34. Brancher, JA, Silva LAMD, Reis, CLB, et al. Calcification Patterns and Morphology of Sella Turcica Are Related to Anteroposterior Skeletal Malocclusions: A Cross-sectional Study." Annals of Anatomy - Anatomischer Anzeiger 2024;254,152233.
35. Paddenberg-Schubert E, Küchler EC, Reis, CLB. et al. New insights into the genetics of mandibular retrognathism: novel candidate genes. J Orofac Orthop (2024) (doi.org/10.1007/s00056-023-00512-z)

Resumo

Introdução: a análise de desenvolvimento dentário pode auxiliar no diagnóstico de desequilíbrios de desenvolvimento e no planejamento do tratamento ortodôntico. Distúrbios de desenvolvimento dentário e craniofacial compartilham fatores de risco similares. Dessa forma, a análise de desenvolvimento dentário pode prever o estabelecimento de más oclusões.

Objetivo: este estudo investigou a relação entre o desenvolvimento dental e os padrões esqueléticos.
Método: foram incluídos pacientes de ambos os sexos, com idades entre 7 e 16 anos, que apresentaram radiografias cefalométricas e panorâmicas antes do tratamento ortodôntico. Examinadores calibrados, cegos quanto ao sexo e à idade, definiram a idade dental analisando as radiografias pelo método de Demirjian (1973). Os ângulos ANB, SNA e SNB foram obtidos por traçado cefalométrico. A variável dependente do estudo foi a subtração da idade dental (ID) pela idade cronológica (ID) (ID-IC). A concordância entre a idade dental e a idade cronológica foi determinada pelo método de Bland-Altman. A relação entre a ID-IC e os padrões esqueléticos foi analisada por testes de correlação de Spearman e pelo Modelo Linear Generalizado ajustado para idade e sexo.

Resultados: 145 pacientes foram incluídos no estudo e o teste de Bland-Altman mostrou concordância entre as idades dentais e cronológicas. No teste de correlação, não foi encontrada nenhuma associação entre ID-IC e padrões esqueléticos ($p>0.05$). Na análise multivariada ajustada para sexo e idade, também não foi encontrada uma associação significativa.

Conclusão: nossos resultados sugerem que não há relação entre o desenvolvimento dental e os padrões esqueléticos.

Palavras-chave: desenvolvimento dental, idade dental, maturação dental, padrões esqueléticos, má oclusão esquelética.