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Original communication

Estimating ages by third molars: Stages of development in Brazilian young adults

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ABSTRACT

The purpose of this study was to estimate age through the analysis of third molar stages of development in Brazilian young adults. A cross-sectional study was conducted by analyzing 659 panoramic X-rays. Two techniques were used to establish the stages: Modified Scoring (MST) and Demirjian (DT). Regression formulas were calculated. Statistical analyses were conducted by *t*, Kappa tests, and simple and multiple linear regressions (5% level of significance). Out of the participants, 40.7% were female and 59.3% were male, with ages from 15–22 years. The Kappa test showed good results for intra-observer (0.84 for MST and 0.95 for DT) and inter-observer examination (0.81 for MST and 0.92 for DT). Differences were found in the stages of tooth formation between male and female, but differences were not observed between the left and right sides. We found that both DT and MST underestimated the ages in about 6 months, depending on the used classification and number of teeth. These methods are appropriate for assessing the ages of young Brazilians, although the DT showed better reproducibility.
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1. Introduction

Estimating the ages of young individuals based on anatomical indicators is important for both corpse identification and establishing the age of penal responsibility. In forensic dentistry, one indicator of age is the formation of third molars, which at the age of eighteen years, are the only teeth still being formed. The development of these teeth is a long process, which may not be complete until the age of twenty-two years.[1–3]

Different techniques and methods have been proposed for the classification of different stages of tooth formation, which often involve panoramic X-ray analysis.[4–22] However, panoramic X-ray analysis must be expanded for use among different populations[23] to determine if the same techniques can be universally applied with confidence.

In this study, we conducted an analysis using the Modified Scoring Technique (MST)[4,8,17,22] and the Demirjian stage classification (DT)[6,7,9,11–16,18–22,24] in a Brazilian young adult population. Thus, we determined if it is possible to relate tooth formation with age. Differences between the sexes were also analyzed, because other studies have shown differences in the chronology of tooth formation between men and women.[2,4,7,14,15,25,26]

There are currently no studies on third molar formation of a Brazilian population using the DT or the MST. Thus, the aim of the present study was to use these two techniques to estimate the age of young adults according to third molar development. The stages of the chronology of tooth formation were also established.

2. Materials and methods

A retrospective, cross-sectional study was conducted with the analysis of 659 X-rays of both males and females aged between fifteen and twenty-two years. The X-rays were collected at a private radiology practice in the City of São Paulo, Brazil; São Paulo is the most important economic Brazilian center, with a population of 12 million of inhabitants.

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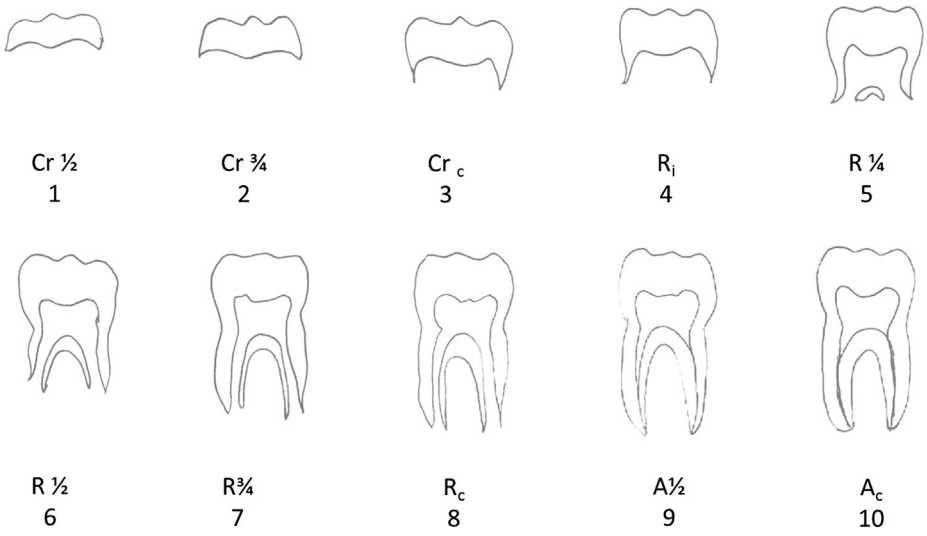

Fig. 1. Modified Scoring Technique (MST) stages of mineralization according to the modification technique of Gleiser and Hunt,[25] modified by Köhler et al.[26]

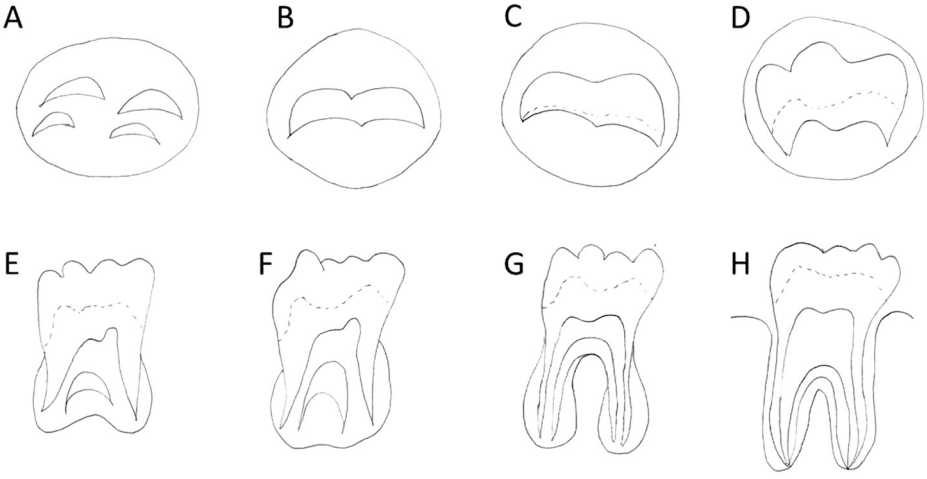

Fig. 2. Demirjian's stages of mineralization.[24]

The patients' records were from the North of the city, they had a known age, were leucoderms and, regarding the socioeconomic condition, they lived in this middle-class area of the city. We included the dental records in which there were no general health problems.

The examinations were performed during the year of 2010 and we used the MST[26] and the DT[24] to establish the stages of dental element formation. The investigator had no access to the patients' real age. Figs. 1 and 2 show the developmental phases.

The main criterion for including a panoramic X-ray in the study was the presence of at least one third molar. Exclusion criteria were a history of serious illness or abnormal dentition growth.

To make it easier to analyze the results, tooth nomenclature was assigned according to anatomic location. This nomenclature designated "UR" as the upper right third molar, "UL" as the upper left third molar, "LL" as the lower left third molar and "LR" as the lower right third molar.

For the classification of the MST[4,8,17,21] each stage of tooth formation was given a specific point count, on a scale from one to ten, following the classification from A to J, respectively.[4] The MST is a stage classification which was originally proposed by Gleiser and Hunt[25] and was modified by Köhler et al.[26] Stage A indicated that the crown was in the middle of its formation (C½), stage B indicated that the crown formation was almost complete, up to three-quarters formed ($C^3/_4$), and stage C indicated that the crown was completely formed (C c). The first stage in which root formation was observed was stage D (R i), followed by stage E, where there was evidence of the root dividing into two or three, with the root being one quarter formed (R ¼). Stage F indicated that the root was half its final size, and the separation of the roots had become more evident (R ½). In stage G, the root was almost complete and had

Table 1
Number of X-rays by sex and age.

	Gender		
	Female	Male	Total
15–16	38	34	72
16–17	43	38	81
17–18	42	41	83
18–19	48	44	92
19–20	52	41	93
20–21	60	32	92
21–22	52	21	73
22–23	44	29	73
Total	379	280	659

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