

Original Research Article

Evaluation of Demirjian stage of the third molar as a reliable predictor of 18 years age

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ABSTRACT

Background: In accordance with section 3(1) of the 1875 Indian majority act, any individual residing in India must reach the majority age when they reach the age of 18 and not before. Third molar formation begins approximately the age of 18. This study aims to distinguish the third molar Demirjian stage(s) indicate that the individual is under the age of 18, and which do not, we will be able to determine the person's age.

Methods: In this research, 202 patients' OPG radiographs aged 14-25 years were obtained. Their radiographs revealed 742 third molars in total. Third molar development was examined using Demirjian's eight-stage method, and average age was then calculated for each step of third molar growth. Stages under the age of eighteen and stages over the age of eighteen were analyzed.

Results: Data revealed that a person was in stage C most likely under the age of 18 (minor) and at stage H, a person was most likely over the age of 18 (major). Stages A and B were not evident in the age range studied. The age associated with stage C was less than 18 years, while the age associated with stage H was greater than 18 years.

Conclusions: Assessing third molar growth stages is a reliable non-invasive method for estimating an individual's age. Stage H indicates a likely age over 18 with completed root development, while stage C suggests an age under 18 with ongoing root development, making it a quick and useful approach.

Keywords: Demirjian, Medicolegal, Third molar, Major

INTRODUCTION

Ageing is a natural, inescapable, and irreversible process that affects all living things in the universe. Aging in animate creatures is marked by early developing stages, followed by growth and eventually tissue remodeling. Ageing is linked to a steady change in an organism's condition, and any stage of distinctive method can be linked to comparing age. This technique may be elevated to the level of research and may aid in the information about a person identification.¹⁻³ Biological indicators in young children such as pubic symphysis alterations, fusion of the epiphysis, wrist bones, and cranial suture

fusion are reliable. However, these biochemical signs are not reliable in late adolescence to early adolescence.

Teeth can be used to reliably determine age from roughly from 10 weeks in utero to old age.⁴ The dental age of children is determined by evaluating the child's dental development status, which is unknown, to established dental development graphs and tables.⁵⁻⁹ Except for the third molars, most teeth have finished growing and erupted by the early twenties. As a result, development of the third molar is the most crucial decision for determining age beginning in late adolescence to early adolescence.

The Indian majority act of 1875, section 3(1) specifies that anyone resident in India attains the age of majority when they reach the age of 18 and not before.⁸ Demirjian et al.⁸ described the eight stages of tooth formation. Around the age of 18, the third molars develop. Identifying which Demirjian stage/stages of the third molar indicate that a person is under the age of 18 and Demirjian stage(s) of third molar indicate that a person is over the age of 18 can be highly valuable in medicolegal circumstances where no legal document proving age is available.

Objective

The research’s purpose was to determine Demirjian stage(s) of the third molar appear before the age of 18 and which Demirjian stage(s) of the third molar emerge after the age of 18 so that we could reliably identify whether the individual is minor or major.

METHODS

This retrospective study includes orthopantomograms from our dental institution's archives of 202 people with a specified chronological gender and age from department of dentistry, Jawahar Lal Nehru medical college and hospital, Bhagalpur, Bihar, India.

The patient's age and gender were taken from the patient record. The average age was then calculated for each step of third molar growth. Then, stages under the age of 18 were reviewed, followed by stages over the age of 18. Data is analyzed descriptively. Each orthopantomogram also included a count of the number of third molars in total. The third molar from each quadrant was evaluated and classified into its developmental stage.

Inclusion criteria

The patient's age ranged from fourteen to twenty-five years and there was at least one third molar present were included in study.

Exclusion criteria

All the third molars were missing, the pathology of the third molar is presented, third molar fracture or broken fracture line in the mandible and/or maxilla passing through third molar and trauma history involving the mandible and/or maxilla were excluded.

Statistical tools

For the statistical analysis, numerical values were assigned to categories C through H and entered an excel 2016 table (Microsoft office®).

Each subject's chronological age on the day of the x-ray study was recorded in years (age was intentionally hidden from the observers).

The SPSS version 22® software package was used for the statistical analysis.

RESULTS

Table 1 shows demographic data distribution among study (n=202).

Table 1: Demographic data.

Age (in years)	Male	Percent (%)	Female	Percent (%)
14-19	42	46	47	45
20-25	56	54	57	55
Total	98	100	104	100

Table 2 displays each of the 202 orthopantomograms' frequency distribution of third molars assessed.

Table 2: The frequency distribution of the occurrence of third molars.

No. of third molar	No. of individuals	No. of teeth evaluated
1	2	2
2	22	44
3	16	48
4	162	648
Total	202	742

Table 3 displays the outcomes. The age distribution and standard deviation for each stage were calculated. Stages A and B were not evident in the age range studied. The age associated with stage C was less than 18 years, while the age associated with stage H was greater than 18 years.

Table 3: The third molar stages and the mean age associated with each stage.

Third molar stage	No. of teeth	Mean (age) (In years)	SD
H	238	21.29	2.1
G	104	19.56	2.7
F	114	19.10	2.9
E	100	17	2.7
D	138	15.9	2.5
C	48	15.25	1.4
Total	742		

DISCUSSION

The most convincing argument to use is that there are very few alternatives to using third molar formation to estimate chronological age available between the ages of late adolescence and early adolescence. All the other teeth have emerged and developed roots.¹⁰ Every bone in the hand and wrist have matured, their pineal gland has united, and secondary sex has developed features have emerged.¹¹⁻¹³ As a result, there are no biological

parameters for estimating chronological age, apart from the ossification of some early-fusing cranial and postaxial sutures (which are quite varied in themselves).^{14,15}

Demirjian defined the four phases of crown development (A-D) and four root growth stages (E-H) in teeth. To avoid the various stages, indicate processes of the same duration, approach avoids any number stage identification. These authors observed stages based on changes in shape that were independent of length estimates.⁸ Dhanjal et al investigated the repeatability of different imaging stage evaluations of third molars and discovered that the technique created by Demirjian et al performed the best not only in terms of intra- and inter-examiner acceptance, but also in terms of the relationship between predicted and actual biological age.^{8,16}

Third-molar development was reported to occur at an advanced age in the north Indian population studied, compared to other populations, Indian patients were included in this investigation to minimize region-specific variances.¹⁷ The only compelling justification for depending on third molar growth for estimating chronological age (despite the variation in growth, eruption arrangement, dimensions, form, and relative positions) is that there are relatively few viable alternative solutions available throughout the teens and early twenties, due to all of the additional teeth have emerged and the root development is completed by that time. This is a vital period that necessitates age determination, notably in criminal law understanding and decision-making to distinguish between juvenile and adult status.¹⁸⁻²⁰

According to the current study, development of third molars was seen in this study at stage 'C' in the average age of 15.25 years. and in the range of 13.83 to 16.67.

Stage 'D' at an average age of 15.87 years and in range of 13.28 to 18.46. Stage 'E' at an average age of 16.5 years. and a range of 13.74 to 19.26 years. Stage 'F' has an average age of 19.11 years. and a range of 16.14 to 22.08 years. Stage 'G' has an average age of 19.56 years and range of 16.83 to 22.29 years. Stage 'H' with an average age of 21.33 years and range of 19.1 to 23.5 years.

These findings indicate that in during stage C, a person will most likely be under the age of 18 (minor), while at stage H, a person will most likely be over the age of 18 (major).

Limitations

One reason for a diverse and overlapping age range could be that the sample size was limited. A large sample study is required for more accurate results. All stages were a continuous phenomenon, distinguishing between them was difficult. Because of the tooth's deviated position, a clean picture of the tooth in the OPG radiograph was not

visible, making correct evaluation of stage difficult in that case. People from different regions may have varying timeframes for the development of third molar phases.

CONCLUSION

Third molar development phases might be used to predict a person's chronological age in his teen years till early twenties. At stage H, a person is likely to be older than 18 years old, indicating completion of the third molar root, but at stage C, a person is likely to be younger than 18 years old, indicating third molar crown development. As a result, third molar maturity is the highest among live persons greatest age assessment approach because it is non-harmful and quickly obtains useful dental images.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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