

Original Article

Age Estimation by Stages of Eruption of Third Molar in Male Population of Rajasthan

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ABSTRACT

The present study was conducted on 200 healthy males among the age group of 17–25 years from Rajasthan state to observe the stage wise pattern of eruption of third molar for purpose of age estimation. Only those subjects were included in the study that did not show any diseased teeth or chronic illness in the form of endocrinal disorder or nutritional disorder or muscle skeletal disorder. The examination was done in good light with the help of torch and the teeth were considered erupted, in four stages with stage 0: No eruption with occlusal plane covered with alveolar bone; stage 1: When tip of crown of tooth penetrated the gum margin; stage 2: Partial eruption but not full occlusion; stage 3: Full eruption or full occlusion. All the data collected was entered into the excel sheet and the statistical analysis was done. The results were as follows: the mean age of eruption of left maxillary third molar was 21.0 ± 2.2 years, the mean age of eruption of right maxillary third molar was 21.0 ± 2.2 years, the mean age of eruption of left mandibular third molar was 21.0 ± 2.2 years, the mean age of eruption of right mandibular third molar was 21.0 ± 2.2 years.

Keywords: Age estimation, Eruption, Identification, Odontology, Odontostomatology, Third molar

INTRODUCTION

Forensic odontology, forensic dentistry and forensic odontostomatology are the terms used for that branch of forensic medicine, which in the interest of justice deals with proper handling, examination, evaluation and presentation of dental evidences. Though the primitive forms of dental identification had been used in prehistoric times but interest in forensic dentistry gained importance in the later part of the nineteenth century.

First application in the field remained dormant until the first formal instructional programme in Forensic dentistry given in the United States at the Armed forces institute

of Pathology in the 1960s. Since then, the term 'Forensic: odontology' is familiar not only to the medical and dental professions but also to the law enforcement agencies and judiciary^[1].

So in concise, the forensic medicine acts as a ropeway between the medicine and law. The law regulates the human activities, whereas medicine ensures justice both for the victim and the accused through a scientific and meaningful interaction between law and medicine.

Identification is the first and most important aspect to determine the individuality and age determination is the basic soul of it.

It is important in civil and criminal cases, for example, marriage, rape, disputed sex, consent, murder, wills, criminal responsibility, exchanged and stolen babies, missing persons, inheritance, insurance, accidents (air crash, railway, bus, conflagration) and so on.

There are important reasons which compel us to look towards teeth, which are as follows:

When no other better way of identification and age estimation is available. Because, the teeth have typical characteristics of an individual with age changes, the teeth have high resistance to physical and thermal injuries and decomposition. They are well protected in the oral cavity. Even if crowns are lost, the roots may still be available.

It has been found that chronology of dental development is less variable than bone development and the methods applied for particular period of life are more accurate indications of age. Development of female skeleton precedes that of a male by 1 year, whereas dental development differs only by 1 to 4 months^[3].

Progress has been made in the last 15 years in regard to age estimation from germination, calcification of roots and periodic eruption of teeth; Second, progress has been made in standardisation and identification of dental records. These two features are generally taken separately but on occasions, both may be taken in common use.

Variations in the sequence of dentitions create difficulties in establishment of dental age. So a count of total number of teeth is only one of the useful means for evaluating dental development but the reference values of age at the emergence of various number of deciduous and permanent teeth in a well-defined representative sample are not available.

The eruption of teeth as well as secondary physiological changes may be affected by dietary, climatic, racial, geographical and endocrinal variations. Various workers have worked out an average period of eruption of permanent in India. India being a vast country with great diversity of populations, no uniform data can be applicable to the whole country^[3,4].

AIMS AND OBJECTIVES

The aim in the present study is to find out average age from eruption of third molar between the age of 17 to 25

years in males and the objective is to find out difference in age of eruption of third molar teeth in upper and lower jaws.

MATERIALS AND METHODS

The present study comprises of total of 200 healthy males from 17 to 25 years of age. The study was done on students of NIMS University, Jaipur. Their age from eruption of third molar was compared with available date of birth record from schools and colleges, birth certificate and so on.

Only Indian bona fide healthy males from Rajasthan state, who do not show any diseased teeth or chronic illness in the form of endocrinal disorder or nutritional disorder or muscle skeletal disorder, were included and all cases who had chronic illness or growth-affecting diseases of teeth were excluded from study. The grouping of students is done as shown in Table 1.

We have used type-IV examination according to WHO.

- The examination was done in good light with the help of tongue depressor and torch. The teeth were considered erupted, in four stages as mentioned below:
- The following will be the stages of eruption:

Stage 0: No eruption, occlusal plane covered with alveolar bone.

Stage 1: When tip of crown of tooth penetrates the gum margin.

Stage 2: Partial eruption but not full occlusion.

Stage 3: Full eruption or full occlusion.

After collection, all data were entered into Microsoft excel sheet which was analysed. The results were tabulated and statistically analysed using ANOVA test and chi-square test.

OBSERVATION AND RESULTS

The present study was conducted on 200 males falling in the age group of 17–25 years from Rajasthan state in the Department of Forensic Medicine & Toxicology, NIMS Medical College, NIMS University, Jaipur, to observe the stage wise pattern of eruption of third molar for purpose of age estimation.

The subjects selected were those who had a valid certificate of date of birth. In college-going subjects, date of birth of subjects was confirmed from birth certificate, record of institute and that of students of college verified by secondary school certificates. Informed, expressed written consent was obtained from each subject before his/her dental examination.

Table 1: Age wise distribution of the subjects

Age Group (in years)	Male
17–18	25
18–19	25
19–20	25
20–21	25
21–22	25
22–23	25
23–24	25
24–25	25
Total	200

The subjects were selected in such a manner that they could be categorised in eight groups, that is 17–18 years, 18–19 years, 19–20 years, 20–21 years, 21–22 years, 22–23 years, 23–24 years, 24–25 years according to their age recorded from birth certificates and their secondary school certificate, voter's card/aadhar card (Table 1).

Table 2: Mean age of study subjects for stage wise eruption of left maxillary third molar tooth

Gender	Left Maxillary	Mean	N	Std. Deviation
Male	0	19.9	66	2.1
	1	19.8	13	2.1
	2	21.2	52	2.0
	3	22.2	69	2.0
	Total	21.0	200	2.2

The ascending stage wise pattern of eruption of left maxillary third molar in males is such that the mean age of eruption of this tooth in males was 21.0 ± 2.2 years (Table 2).

The ascending stage wise pattern of eruption of right maxillary third molar in males is such that the mean age of eruption of this tooth in males was 21.0 ± 2.2 years (Table 3).

Table 3: Mean age of study subjects for stage wise eruption of right maxillary third molar tooth

Gender	Right Maxillary	Mean	N	Std. Deviation
Male	0	20.0	67	2.2
	1	20.1	20	2.3
	2	21.1	47	1.9
	3	22.3	66	1.9
	Total	21.0	200	2.2

Table 4: Mean age of study subjects for stage wise eruption of left mandibular third molar tooth

Gender	Left Mandibular	Mean	N	Std. Deviation
Male	0	19.9	56	2.1
	1	19.7	15	2.1
	2	21.1	24	2.2
	3	21.8	105	2.0
	Total	21.0	200	2.2

The ascending stage wise pattern of eruption of left mandibular third molar in males is such that the mean age of eruption of this tooth in males was 21.0 ± 2.2 years (Table 4).

Table 5: Mean age of study subjects for stage wise eruption of right mandibular third molar tooth

Gender	Right Mandibular	Mean	N	Std. Deviation
Male	0	20.0	72	2.2
	1	20.0	13	2.2
	2	21.5	15	2.1
	3	21.8	100	2.0
	Total	21.0	200	2.2

The ascending stage wise pattern of eruption of right mandibular third molar in males is such that the mean age of eruption of this tooth in males was 21.0 ± 2.2 years (Table 5).

The percentage of stage wise eruption of left maxillary third molar in males is such that in stage 0, that is no eruption, occlusal plane covered with alveolar bone, 66 subjects (33%) were males; in stage 1, that is when tip of crown of tooth penetrated the gum margin, 13 subjects (6.5%) were males; in stage 2, that is partial eruption but

Table 6: Stage wise distribution of eruption of left maxillary third molar tooth

Crosstab				
			Sex	
			Male	
Left maxillary	0	Count	66	
		% of subjects	33.0%	
	1	Count	13	
		% of subjects	6.5%	
	2	Count	52	
		% of subjects	26.0%	
	3	Count	69	
		% of subjects	34.5%	
	Total		Count	200
			% of subjects	100.0%

not full occlusion, 52 subjects (26%) were males and in stage 3, that is full eruption or full occlusion, 69 subjects (34.5%) were males (Table 6).

Table 7: Stage wise distribution of eruption of right maxillary third molar tooth

Crosstab				
			Sex	
			Male	
Right maxillary	0	Count	67	
		% of subjects	33.5%	
	1	Count	20	
		% of subjects	10.0%	
	2	Count	47	
		% of subjects	23.5%	
	3	Count	66	
		% of subjects	33.0%	
	Total		Count	200
			% of subjects	100.0%

The percentage of stage wise eruption of right maxillary third molar in males is such that in stage 0, 67 subjects (33.5%) were males; in stage 1, 20 subjects (10%) were males; in stage 2, 47 subjects (23.5%) were males and in stage 3, 66 subjects (33.%) were males (Table 7).

Table 8: Stage wise distribution of eruption of left mandibular third molar tooth

Crosstab				
			Sex	
			Male	
Left mandibular	0	Count	56	
		% of subjects	28.0%	
	1	Count	15	
		% of subjects	7.5%	
	2	Count	24	
		% of subjects	12.0%	
	3	Count	105	
		% of subjects	52.5%	
	Total		Count	200
			% of subjects	100.0%

The percentage of stage wise eruption of left mandibular third molar in males is such that in stage 0, 56 subjects (28%) were males; in stage 1, 15 subjects (7.5%) were males; in stage 2, 24 subjects (12%) were males and in stage 3, 105 subjects (52.5%) were males (Table 8).

Table 9: Stage wise distribution of eruption of right mandibular third molar tooth

Crosstab				
			Sex	
			Male	
Right mandibular	0	Count	72	
		% of subjects	36.0%	
	1	Count	13	
		% of subjects	6.5%	
	2	Count	15	
		% of subjects	7.5%	
	3	Count	100	
		% of subjects	50.0%	
	Total		Count	200
			% of subjects	100.0%

The percentage of stage wise eruption of right mandibular third molar in males is such that in stage 0, 72 subjects (36%) were males; in stage 1, 13 subjects (6.5%) were males; in stage 2, 15 subjects (7.5%) were males and in stage 3, 100 subjects (50%) were males (Table 9).

DISCUSSION

In a developing country like India, scientific determination of age by third molar of an individual is very important for law-enforcing agencies in matters such as criminal responsibility, identification, judicial punishment, consent, rape, marriage, employment, attainment of majority.

Age can be determined from skeletal development, weight and height, eruption status of teeth and secondary sexual characters. Out of this, eruption of teeth gives a very good idea of estimation of age. There is evidence that dental development is less affected than skeletal development by malnutrition, hormonal disorders.

Age estimation is an important activity that is frequently required to be carried out in medico-legal work. An individual is often referred to a medical man by the court or investigating authority in criminal as well as civil cases to give the opinion regarding his/her age. Assessment of age of the individual dental examination is one of the commonly employed methods^[5,6].

It is known that chronology of dental development is less variable than bone development and the method applied for this particular period of life is a reliable indicator of age. Though eruption of teeth may be affected by dietary, climatic, racial and geographic variation, the eruption of time for permanent teeth is fairly constant. Eruption of teeth is one of the changes observed easily among the various dynamic changes that occur from formation of teeth to the final shedding of teeth. There is a significant time lag between cutting of a tooth into the mouth and completion of eruption (i.e. completion of bite) in both deciduous and permanent teeth^[7].

Out of various methods described in literature, radiographic method made it possible to follow the formation of crowns and roots of tooth. But we have chosen the study of various stages of third molar eruption where only visual or clinical examination is required as this method is easy to perform and cost-effective and does not require any special equipment as compared with all the other methods.

Clinical methods to assess dental age are based on emergence of teeth in the mouth. Although 'eruption' incorporates the entire journey of the tooth from its formation in the alveolar crypts to full occlusion,

'emergence' is restricted to the time when any part of the tooth finally clears the gingival margin and becomes visible in the mouth until the stage when the tooth finally comes into occlusion with its partner tooth from the opposing jaw^[8].

In the present study, the mean age of eruption of left maxillary third molar in males was 21.0 ± 2.2 years and the mean age of eruption of right maxillary third molar in males was 21.0 ± 2.2 years.

The mean age of eruption of left mandibular third molar in males was 21.0 ± 2.2 years and the mean age of eruption of right mandibular third molar in males was 21.0 ± 2.2 years.

A similar study by Mishra *et al.* in 1994 showed that the mean age of eruption third maxillary molar was 17.60 years in males^[9]. Another study by Pathmanathan *et al.* in 1985 on Srilankan Tamils described the mean age of eruption as 19.61 years in males for left maxillary third molar^[10]. These findings are much lower as compared with our present study.

Rantanen *et al.* in 1967 investigated the clinical emergence of third molars in a total of 2,218 Finnish males and females ranging in age from 16 to 24 years. The median age of upper and lower third molar eruption in the male subjects was determined to be 21.7 and 21.8 years, respectively.

Muller *et al.* in 1983 analysed third molar emergence in 823 male and female German subjects of ages ranging from 16 to 40 years. The median ages of third molar emergence were found to be 20.36 and 20.29 years, respectively. No emergence of third molars was observed in the group of 16-year olds; the presence of third molars was first detected in the group of 17-year olds. More than 50% of the complete set of third molars had emerged by the age of 21 years.

These findings are comparable to those found in our present study.

Various studies in literature have shown that various factors like geographic and nutritional factors can lead to variations in the determination of age on the basis of eruption of stages of teeth. The effect of geographical location may be due to difference in the environmental

factors, namely temperature, pollution levels; nutritional and dietary factors, namely dietary habits, type of water consumed (calcium content, fluorides etc.) and genetic difference, differing biological factors and socio-economic factors. All these factors should be explored in detail to find out the effect of each one of them on the eruption of teeth individually and in combination with other factors and area-wise and race-wise knowledge has generated for practical use^[11].

These findings are similar to a study done by Golovcencu *et al.* in 2009 who said that males achieved third molar development earlier than females and upper third molars exhibited a greater degree of development than lower third molars at the same chronological age^[2].

Gupta *et al.* in 2012 said that the prevalence of one or more third molars in young adults range from 85% to 92% but most have not yet erupted by the time a person is 20 years old. The number of impacted teeth also increased with increase in age. This could be due to the fact that with increase in age and tooth–jaw size discrepancy, the tooth is unable to occupy the space in the oral cavity resulting in impaction. They concluded that the number of erupted third molars gradually increased and then decreased with increase in age.^[10]

Panchbhai *et al.* in 2012 did a study to evaluate the development of third molar in relation to chronological age and also assessed the influence of age, gender and location on the development of third molar and concluded that the absence of crypt was observed more for maxillary third molars, contrarily, stages 1, 2, 3 were reached earlier in mandibular third molars. In case of presence of four completely developed third molars in a subject, the probability of an individual to be older than 18 years of age was 94.35% for females and 95.23% for males; thus, the significance of third molars in age determination is justified as no other reliable age indicator is available to determine the age in adults^[12].

CONCLUSION

The results of our study show the necessity of generating population-specific data for forensic age diagnostics in living individuals. Our results provide data on the age of alveolar, gingival and complete eruption of the third molars in the occlusal plane that can be used for dental age

estimation. As the mean values and medians of stage 3 of the third molar eruption depend on the upper limit of age of the investigated sample, the 50% probability value was also set for this stage. This value refers to the most probable minimum age of a person whose third molars show stage 3. Thus, to conclude, there exists a co-relation between the stages of eruption of a tooth with chronological age. There is time lag of few months to approx. 1 year in between the stage I & II and approx. 2 years difference is found between stages I and III which is a significant result. It is better to assess the age of an individual on the basis of the stages of eruption rather than by mere presence/absence. The mean age of eruption of left maxillary third molar tooth was 21.0 ± 2.5 years, right maxillary third molar tooth was 21.0 ± 2.5 years, left mandibular third molar tooth was 21.0 ± 2.5 years, right mandibular third molar tooth was 21.0 ± 2.5 years. Thus, the mean age of left and right maxillary and mandibular third molar was 21.0 ± 2.5 years. Hence, no difference between the mean ages of eruption was seen in maxillary and mandibular third molars.

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