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A Radiographic Assessment of 3rd Molar Development in Forensic Identification to Evaluate Age, Gender, Jaws, and Symmetry

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Abstract:*Age estimation in forensic odontology by radiographic means of third molar in human is the simplest and popular one. This study tested 250 patients of both sexes equally in the age group of 14 -25 years with intraoral periapical radiograph for age estimation, jaw, symmetry, and gender variation. The results were that significant radiographic grading predicts the age group, no variation in the right and left symmetry of both jaws. No association between grading and gender were established.*

Key words:*Age estimation ,forensic odontology, thirdmolar, radiograph*

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I. Introduction

The scope of Forensic Dentistry is broad and ever challenging; the field is demanding and intriguing.Forensic Odontology usually is the best method to identify burned or decomposed bodies. Records of mass disaster indicate the dental identification is the most successful means of identification.[1]Forensic Odontology includes two distinct areas - identification and bitemarks.

There are two basic types of identification, the unknown and the confirmation. The identification of children and adolescent age becomes important to assess whether the child has attained the age of criminal responsibility such as rape ,employment,marriage and adoption and when birth certificate is not available.[2]Various methods are used for age estimation from dentition. [3] 1)Clinical methods 2)Radiographic 3)Histologic 4)Physical and chemical methods.One major criterion for dental age assessment is the evaluation of 3rd molar mineralisation.[4]Radiographic assessment of teeth plays an important role in age estimation.[5]

It is perhaps the most poignant when a forensic practitioner is requested to perform an assessment of age in a living individual for the purpose of providing information that carries significant evidentiary value in legal decisions that determine future outcomes for individuals displaced from their original background.[6]As the permanent dentition completes the age of 18 years, the age estimation by radiographic method becomes difficult. However, thedevelopment of 3rd molar is taken as aguide in age estimation. [7]

II. Aims and Objective

1. To assess the degree of development of Third mo
2. lars of individuals radiographically.
3. To assess the left and right symmetry of development of Third molars of individuals radiographically.
4. To assess the development of Third molars in maxilla and mandible radiographically.
5. To assess the development of Third molars in male and female at same age group.
6. To evaluate any particular degree of development of Third molar in relation to age estimation.

III. Methodology

Sample Selection

Two hundred and fifty individuals, who reported Tamilnadu Government Dental College & Hospital, Oral Medicine and Radiology department for dental consultation were randomly taken up for assessing the development of Third molars radiographically.

Inclusion criteria

Individuals with chronological age between 14 to25 years of age at the time of examination. Both sexes were equally taken for the study.

Exclusion criteria

Those individuals with developmental deformities with Anodontia or partial Anodontia or any history of previous surgery involving the third molars were not taken up for the study

Radiograph investigation

Third molar developments were assessed by using periapical film. Intraoral periapical radiographs were taken using FIAD, Italy intraoral X-ray machine. Agfa Dentus M-2 comfort, E speed, size 2 films were used in the present study. The machine has a standard KVP setting of 50, tube current of 10 MA and exposure time set to 0.8 seconds. The unit is of the short cone type. The films are held in position by the patient and the tube is aligned using the bisecting angle technique.

The exposed films were manually processed with the visual method and examined by a single radiographer.

Radiographic Assessment

The radiographs were assessed by eight-grade scheme developed by Demirjian and coworkers for the degree of third molar development as follows.

A – cusp tips are mineralized but have not yet coalesced.
B – mineralized cusps are united so the mature coronal morphology is well defined.
C – the crown is about half formed, the pulp chamber is evident and dentinal deposition is occurring.
D – crown formation is complete to the dentinoenamel junction. The pulp chamber has a trapezoidal form
E – formation of inter-radicular bifurcation has begun. Root length is less than the crown length.
F – root length is atleast as great as crown length. Roots have funnel shaped endings.
G – root walls are parallel, but apices remain open.
H – apical ends of the roots are completely closed, and the periodontal membrane has a uniform width around the root.

The 250 films were evaluated with the above guidelines by a single examiner, and the results were tabulated in reference to symmetry of maxilla and mandible, jaws, and gender in the following tables 1,2,3 and 4 respectively.

R MAXILLA (ROWS) VS L MAXILLA (COLUMN)						
Radiographic Grading	D	E	F	G	H	TOTAL
D	6	2	0	0	0	8
E	0	27	4	0	0	31
F	0	3	56	0	0	60
G	0	0	2	75	0	77
H	0	0	2	0	72	74
TOTAL	6	32	65	75	72	250

TABLE 1

R MANDIBLE (ROWS) VS L MANDIBLE (COLUMN)						
Radiographic Grading	D	E	F	G	H	TOTAL
D	10	0	0	0	0	10
E	0	37	0	0	0	37
F	0	6	57	1	0	64
G	0	1	2	78	0	81
H	0	0	0	1	57	58
TOTAL	10	44	59	80	57	250

TABLE 2

R MAXILLA (ROWS) VS RMANDIBLE (COLUMN)						
Radiographic Grading	D	E	F	G	H	TOTAL
D	6	2	0	0	0	8
E	4	19	8	0	0	31
F	16	37	7	0	0	60
G	0	0	19	53	5	77
H	0	0	0	21	53	74
TOTAL	10	37	64	81	58	250

TABLE 3

ASSOCIATION BETWEEN SEX AND GRADING				
Maxilla*			Mandible R *	
	Male	Female	Male	Female
D	3	5	3	7
E	17	14	17	20
F	24	36	34	30
G	44	33	47	34
H	37	37	24	34

TABLE 4

Statistical analysis

The results were evaluated with kappa test & Chi-Square test. Kappa test is used as measure of agreement. Table 1 kappa analysis shows that Kappa = 93.0 %, P < 0.001 significant and hence the agreement is good. It infer that both maxilla(R) and maxilla(L) are at same stage of development at same chronological age. It proved their symmetrical development. Hence either one side can be taken for assessing the age estimation Table 2 kappa analysis shows that Kappa is used as measure of agreement .Kappa = 94.2 %, P < 0.001 significant and agreement is very good.It infer that both mandible(R) and mandible(L) are at same stage of development at same chronological age. It proved their symmetrical development. Hence either one side can be taken for assessing the age estimation. Comparing Table 1 and 2, Left and Right symmetry was slightly higher in mandible.Table 3 kappa analysis shows thatKappa = 56.3 %, P < 0.001 significant and agreement is moderate.Since Kappa = 56.3 % both maxilla(R) and mandible (R) has to be taken to assess the age estimation.Table 4 Chi square test is applied to test the association between sex and grading.P> 0.05 Non significantIt shows there is no association between grading and sex in both maxilla and mandible.

	Maxilla		**Mandible**	
	P Value	**Conclusion**	**P Value**	**Conclusion**
D vs E	< 0.05	sig	< 0.01	sig
D vs F	< 0.001	sig	< 0.001	sig
D vs G	< 0.001	sig	< 0.001	sig
D vs H	< 0.001	sig	< 0.001	sig
E vs F	< 0.001	sig	< 0.001	sig
E vs G	< 0.001	sig	< 0.001	sig
E vs H	< 0.001	sig	< 0.001	sig
F vs G	< 0.001	sig	< 0.001	sig
F vs H	< 0.001	sig	< 0.001	sig
G vs H	< 0.001	sig	< 0.001	sig

TABLE 5

Thus, based on findings from development of third molar radiographically from individuals, it gave a specific indication that significant grade pattern can be used to predict the age estimation.

IV. Summary And Conclusion

Identification of an individual, living or dead is based on the theory that all individuals are unique. When an unidentified body is found, it is assumed that it could be anybody. By classifying the individual into characteristic groups,Eg, age, sex, race, height etc. the possibilities are narrowed. As more unique characteristics are noted, the comparison group becomes smaller until it reaches unique. At that point, identification can be made. Age assessment by using teeth are means of identification. This study evaluated the third molar development radiographically to assess the age estimation, symmetry, jaw and gender variation. From this study, it can be concluded that

1. Significant grade pattern can be used to predict the age.
2. Right and left maxillary symmetry is good and for mandible the symmetry is very good, hence either side can be taken for evaluation.
3. For both the maxilla and mandible, the difference is evident, hence bot the jaws should be taken for evaluation.
4. No association between radiographic grading and gender is found.

This study should be further evaluated in a large sample and modern methods.

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