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Dental Science

AGE ESTIMATION FROM TEETH IN ADULTS: REVIEW LITERATURE

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ABSTRACT Age estimation from teeth in adults has greater importance as it helps in significant value to society. There are various methods are explained for estimation of age from teeth in adults. Basically In childhood and adolescence morphological method based on radiograph are recommended but in adults significant of morphological methods are reduced. Biochemical methods have more accurate value followed by morphological and skeletal methods. Recently Digital methods are more popular among age estimation method due to more accuracy, time saving and easy application.

KEYWORDS : Age Estimation, Forensic Odontology

INTRODUCTION:
Age estimation is for greater importance in identification of bodies, crimes, disaster victims and different social values like marriage, job issues, adopted children of unknown age etc. Verification of age is required for civil rights and social benefits. Estimation of age in conjuction with sex assessment, stature prediction, popular designation, assist in reconstructive identification[1] Criteria for age estimation in living individuals If the skeletal development of the hand is completed, an additional radiological examination of the clavicles should be carried out. In order to increase the accuracy dental examination including the dental status and X-ray of the dentition should be performed in each case.[2] Dental age prediction in adults is usually accomplished using a number of methods such as Gustafson's parameters, johanson's grading, dentinal translucency and cementum annulations.[3] Development in biochemistry have allowed precise age estimation. Third molar is the only remaining tooth that is still developing and consequently dental age estimation methods have to rely on the development of tooth until the age of 20.Visual examination, radiographic method, structural changes in teeth and chemical methods are other method after this period of age.

VARIOUS METHOD FOR AGE ESTIMATION
A. Morphological Method
Sample can be observed sectioned or unsectioned with the eye. At this method belong the methods suggested are
 .Gustafson (1950)
 . Dalitz (1962)
 . Bang and Ramm (1970)
 . Johanson (1971)
 . Maples (1978)
 . Solheim (1993)
B. Radiographic Methods
C. Biochemical Methods

GUSTAFSON METHOD (1950)[5]
It is first method described by Gustafson for estimation of age based on statistical approach. He described the age changes occurring in the dental tissues like attrition of enamel, dentine sclerosis, denticles in the pulp, cementum deposition, Root Resorption, Transparency of the root, eruption of teeth and periodontitis. Gustafson suggested the mostly root resorption and transparency of the root. In this method proposed sign were ranked as **0, 1, 2, 3 points** according to degree of development. Later points are modified as **0, 0.5, 1, 1.5, 2, 2.5, and 3**

The error estimation as calculated by Gustafson method was **3.6 years**

Gustafson method was used in various cases but at the same time this methods are criticized to various reason because
• *It is restricted to dead person only where extraction of a tooth is allowed.*
• *Time consuming*
• *Due to decomposition of soft tissue, Periodontitis is impossible to determine.*

DALITZ METHOD (1962)[6]
Dalitz re-examined the Gustafson method and suggested a 5 point system from 0 to 4. It has greater accuracy as compare to Gustafson method. He suggested that it is unnecessary and time consuming to determine all the teeth. He preferred to use up to four out of twelve anteriors.

Limitations of this method are
It is critical to use as in many cases because only teeth left after external forces are premolars and molars which is ignored in this method.

JOHANSON METHOD (1971)[7]
Gustafson's technique was improvised by Johanson. He differentiated for seven different stages instead of four.

Johanson made a more detail study of root transparency when thickness of ground section was 0.25 mm.

GISEL BANG AND ERNA RAMM (1970)[8]
Root Dentine appears to become transparent during the third decade starting at the tip of the root and advancing coronally with age. This is believed to be caused by reduction in diameter of the dentinal tubules and increase intratubular calcification.

The total length of the root measured was measured buccally in the midline from cemento-enamel junction to the apex. The transparent root dentin was measured from the apex of the root in coronal direction to the borderline between transparent and opaque dentine.

Many following advantages are in this method such as
• *Good results are obtained by measuring intact roots only.*
• *This method is simple and fast compared to previous method.*
• *There are no many differences between living and dead persons in the degree of root transparency.*

Reppien in 2006 suggested that root transparency increases in diabetes and drug addicts' patient.

MAPLES METHOD (1978)[9]
Maples suggested only two criteria of total six Gustafson methods such as *Secondary dentine formation* and *root transparency,* Elimination of root resorption improved the results and error of the estimation was reduced. Periodontitis was not used because it was difficult to determine.

Advantages of this method are
• *In this method broken crown, periodontal attachment loss, cementum loss may still give accurate estimation of age.*
• *Easier procedure to estimate with lessened observer error*

METHOD OF AVERAGE STAGE OF ATTRITION [3]
A new method of age estimation using permanent molars, the method of average stage of attrition is described. It is very convenient method

and accurate method. It includes all 28 teeth excluding third molars. Enamel attrition is gradually advancing process and visible attrition gradually appears and becomes more obvious with age. Changes occur in cusp are seen like facet, depression, exposing dentine or pulp cavity. Due to consistency of enamel wear rates, distinct wear facets many scientist regard the molars as excellent sources of age. Average Stage of attrition method is average attrition of the whole occlusal surface of the cusps for estimation of age.   The Average age estimation is the average stage of all cusp of a molar when evaluating the attrition degree from stages 0 to 7 for each cusp.

STAGE	CHARACTERISTICS
0	No attrition , Cusp is sharp, ridges are clear
1	Slight attrition on the top and ridge of the cusp
2	Cusp appears obtuse or limited oblique facet appears on it.
3	The greater part of cusp is worn away. The wear facet may connect with one or more other facets.
4	Dentine appears as a spot (Average diameter : less than or equal to 1mm)
5	Dentine appears as a spot (Average diameter : more than or equal to 1mm)
6	One exposed dentine spot coalesces with another one. Cusp is almost entirely worn away.
7	One exposed dentine spot coalesces with two others.
8	Exposed dentine appears as a circle and small island of enamel within it. Secondary dentine may also be exposed.
9	Dentine is exposed on entire Occlusal surface and secondary dentine exposed.

Sex was not a factor in this Average age of estimation method because sex has no any significant influence on molar. Pulp exposure is not criteria for this method as pulp cavity exposure is very low even after older age. Attrition process is more in mandibular molar as compare to maxillary molar.

Diet and manner of food preparation has a major role in dental wear. Other factor that influences the attrition are concentrated masticatory forces and it has greater influence on worn away of enamel.

RADIOGRAPHIC METHOD
Solheim and **Kvaal**[10] presented a method where radiographic method is combined with morphological method to estimate the age. Using this radiograph pulp length and width was measured and then compare the ratio to root length and width.

These methods should be used to increase accuracy of estimation of age and enhance the identification of age-relevant. This method mostly used in older age group where morphological characters are not to be considered. If there is no confirmation in radiographic method then Biochemical methods are considered.   Average regression error estimation of **2.1** years. Maxillary first premolars and molars are excluded.

CONE –BEAM CT METHOD[11]
Estimation of age through volume matching of teeth which is imaged by Cone-beam CT. A custom made voxel counting software for calculating the ratio between pulp canals versus tooth volume based on cone-beam CT. In this method correlation between chronological age of individual to pulp tooth volume ratio were established.

This developed technique showed promising result.

NEW DIGITAL TECHNOLOGY[1]
With the help of new digital technology forensic age estimation by measuring the root dentin translucency area. The 250 micrometer thick tooth sections ensured the best visualization of translucency. Commercially available software were used to estimate the age which is very simple and comparatively more accurate. The entire area of root dentinal translucency has been selected. Crown and root dentine have been separated by a line.

SUMMARY / CONCLUSION
For estimation of the age in adults are required to different purposes like jobs, Identify criminal Victim, Natural disaster body identification, age identification for labour worker, Rape victims, social activity like marriage. Various methods are developed and discussed to increase the accuracy of age identification. Age estimation concern biology where variability is rule. Every individual shows different age patterns; so correct age estimation must consider with unavoidable limits.

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