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Dental Science

A COMPARATIVE ANALYSIS OF AGE DETERMINATION USING LATERAL CEPHALOGRAM AND ORTHOPANTOMOGRAPH.

Dr.Pratik Chandrakant Malusare*	MDS Senior Lecturer, Oral medicine & Radiology Department ,G.D Pol Foundation Y.M.T Dental College, Kharghar, Navi Mumbai.*Corresponding author
Dr. Abhishek Ghule	MDS [OMDR] Private practice, Baramati, Maharashtra
Dr. Bhakti Patil	MDS Senior Lecturer, Oral medicine & Radiology Department ,G.D Pol Foundation Y.M.T Dental College, Kharghar, Navi Mumbai.
Dr. Mudita Rawal	MDS [OMDR] Private practice. Ahmedabad,Gujarat.

ABSTRACT **Aim & objective-** To compare between OPG& lateral cephalogram for age determinatio using linear dimensions of mandible on lateral cephalogram and age using Demirijan's classification system for 3rd molar on OPG and comparing the accuracy of both methods for age determination

Material & methods-500 OPGs and 500 Lateral Cephalograms of the same patients were randomly selected retrospectively from oral radiology department. These included 212 males & 272 females.

Results & conclusion-Data was subjected to regression analysis. Lateral cephalogram analysis can predict age better than OPG analysis & is more reliable. Age determination using body length on lateral cephalogram gave most accurate results. Thus in conclusion it can be said that by comparing lateral cephalometric and OPG parameters we found that lateral cephalometric parameters are more reliable for age estimation as compared to OPG and the derived formulas were matching nearly accurately with the known age of the subject.

KEYWORDS : Age determination, OPG, Lateral Cephalograph.

INTRODUCTION

The forensic age estimation of unidentified skeletons and corpses for the purpose of identifi-cation has been a conventional feature of forensic science.[1]Age estimation is of paramount importance in medico-legal issues. The age estimation process has to be highly accurate in predicting the individual's age and easy to use. In the current scenario, most of the age estimation modalities are invasive, requiring lengthy processing times, use of expensive instruments and the services of an experienced pathologist to deduce the age of the person. But the biggest pitfall had been the lack of the usability of these methods in-vivo.[2] Forensic age estimation can combine methods based on 3rd molar development and sociopsychological maturity, physical appearance, secondary sexual development, radiologically observed secondary dentin apposition, degree of ossification of hand wrist bones,medial part of collar bone, costal cartilage of 1st rib.[3-4]Compared to bone mineralization, tooth mineralization stages are much less affected by variation in endocrine and nutritional status, and developing teeth therefore provide a more certain indication of chronological age. Tooth formation is used often to assess maturity and predict age. [5]Age estimation becomes difficult after 14 years of age since all permanent teeth except 3rd molar have completed development. Hence, 3rdmolar offers a unique advantage over other teeth because its development continues over a longer period and until a later age.[6-7]

Considerable attention has been paid to mandibular growth because it has been reported that this bone enlarges the most during adolescence.It has also been observed that the mandible grows in a posteriorsuperior direction resulting in at anterior inferior displacement.It has been demonstrated that mandibular sagittal growth is due to posterior deposition and anterior resorption in the ramus. In the mandible, growth spurts may occur, but not in a uniform amount and duration.[8] On cephalometric radiographs, the developmental changes of cervical vertebrae were utlised for evaluation of age. Also the development of mandibular bone was registered and used as a preditor for age estimation.[9]

The current study was done to evaluate and compare the 3rd molar development on an OPG and various Cephalometric markers on lateral cephalogram for age estimation.

Materials and Methods

The study was carried out on 500 digital orthopantamograms (OPG) and 500 lateral cephalograms of the same patient s in the age group of 7–20 years (males = 212; females = 272) which were predominantly pre-treatment orthodontic radiographs from patients without any developmental anomalies,suffering from malnutrition or other diseases that would affect the skeletal growth and general development of the individual and subjects with history of third molar extraction The radiographs were taken from the archives of patients visiting our college during the years 2016-2017. The soft copy of these radiographs were retrieved from the computer attached to the digital OPG machine .To assess the developmental stages of third molars from the mandible, Demirjian`s classification system was adopted.10 [Figure 1]

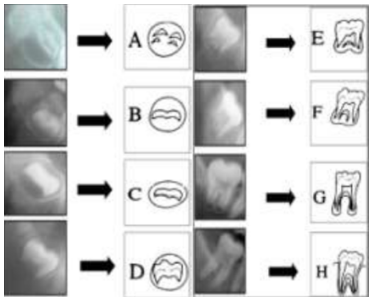


Fig. 1: Demirjian`s classification system

Stage A: Cusp tips are mineralized but have not yet coalesced,
Stage B: Mineralized cusps are united so the mature coronal morphology is well defined;
Stage C : The crown is about half formed ;the pulp chamber is evident and dentinal deposition is occurring;
Stage D : Crown formation is complete to the dentino-enamel junction. The pulp chamber has a trapezoidal form;
Stage E : Formation of the inter-radicular bifurcation has begun .Root length is less than the crown length;
Stage F : Root length is at least as great as crown length .Roots have funnel shaped endings;
Stage G : Root walls are parallel but apices remain open; Stage H : Apical ends of the roots are completely closed

For the lateral cephalogram Rai et al method was adopted.[Figure 2] Three linear measurements for the determination of mandibular growth were; mandibular body length (distance between Go and Gn) mandibular length (distance between Co and Gn) and mandibular height (distance between Co and Go.

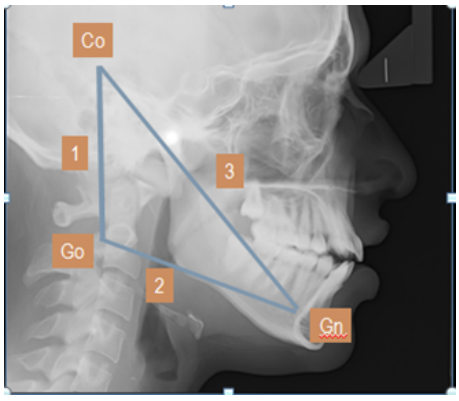


Figure 2: Co(Condylion), Go- Gonion , Gn- Gnathion; 1.The mandibular ramus height Co-Go;2. 2- The Body Length Go-Gn 3.The mandibular length Co-Gn;

These data were analyzed by using Statistical Package for Social Sciences (SPSS), Version 7.0

Results

Using the available data regression analysis was performed and formulas were derived

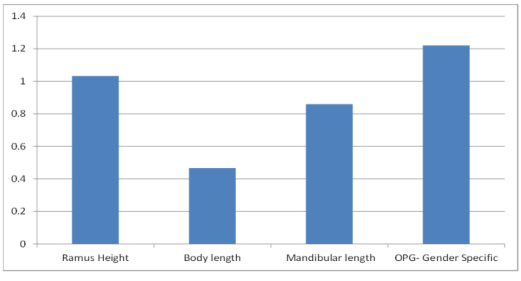
Table 1

Group	Formula
Males	Age=2.0198* (Ramus Height)+ 2.7364
	Age=2.423*(Body Length)- 4.324
	Age =0.9669*(Mandibular Length)+ 3.1528
Females	Age= 0.9952*(Ramus Height) + 9.1661
	Age=1.9112*(Body Length) + 0.8245
	Age=1.6692*(Mandibular Length) - 3.3308
Unknown Gender	Age=1.3596*(Ramus Height)+ 6.8496
	Age=1.6712(Body Length) + 1.9684
	Age=0.8559(Mandibular Length) + 4.8714

Table :2

For	P Type	P Value
For Ramus Height	P(T<=t) two-tail	0.249232042
For Body Length	P(T<=t) two-tail	0.56402703
For Mandibular Length	P(T<=t) two-tail	0.243756363
For OPG	P(T<=t) two-tail	0.176876779

Since p-value for the Comparison is greater than that of 0.05 indicates no significant difference between the actual age and estimated age using ramus height,body length,mandibular length & OPG



Graph showing the difference of values from the actual age

Discussion

Tooth development is an accurate measure of chronologic age that seems to be an independent of exogenic factors such as malnutrition or disease.The third molar calcification stage is one of the few tools that can be used to assess age when development is nearing completion. However, age estimates based on dental methods have shortcomings, especially during adolescence when the third molar is the only remaining variable dental indicator.10Our study indicates that the lateral cephalogram analysis can predict agebetter than OPG analysis and seem to be more reliable. This is contradictory to the findings of Thevissen et al [1] who stated that the Rai et al. method provided very little information on age and their regression models explained maximally 3% of the variability in age.11 Age determination using body length on lateral cephalogram gave most accurate results in our study . This is in contradictory to Jangam et al findings.They found that there was no significant difference among body lengh, mandibular body length and mandibular length measurements. They concluded that any one of these measurements can be reliably used for age prediction. Demirjian's method has good reproducibility and is based on the stages of tooth development, which are unaffected by systemic or endocrinal factors, thus making it a relatively reliable study adopted for age estimation.12 It was also found there was no significant difference for right and left side of 3rd molar development for age estimation which is similar to Darji et al findings who found that there was no significant difference in the third molar development between left and right side in all eight stages of development.The developmental stages and the substages on OPG are not considered whereas the readings in cephalogram are more accurate and can be measured successively as per the skeletal development.Formulas were derived for males, females and in cases where gender was unknown using the available data regression analysis.The regression formulas determine age nearly accurately and matched with the known actual age of the subject.

Conclusion

Very few studies for age estimation have been conducted with lateral cephlogram using linear dimensions of mandible with this sample size.It was found that that lateral cephalometric parameters(especially mandibular body length) are more reliable for age determination as compared to OPG since the derived formulas were matching nearly accurately with the known age of the subjects.But further studies need to be carried out over different demographics so as to make more standardised formulas for this newer technique.

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