TECHNICAL NOTE

AGE ESTIMATION FROM MANDIBLE BY LATERAL CEPHALOGRAM: A PRELIMINARY STUDY

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ABSTRACT

Age estimation is an important aspect of forensic investigation and is considered as one of the "Big Four" of Forensic Anthropology. One hundred and twenty (120) cephalograms of individuals aged 7-20 years were examined with reference to mandibular body length (distance between Gonion and Gnathion) mandibular length (distance between Co and Gn) and mandibular height (distance between Co and Go). An attempt has been made to assess the utility and dependability of these three linear parameters for age estimation. The mandibular body length, ramus height and mandibular length were increased by 2.23, 3.26, 4.26 mm/years respectively. There are no significant differences in mandibular linear growth between the two sexes though the female mandible has a higher growth rate compared to males. These parameters might prove to be of importance in age determination for medico-legal purposes.

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Keywords: forensic anthropology, forensic odontology, age estimation, mandible, lateral cephalogram

INTRODUCTION

Research into facial growth and development is essential in orthodontics as well as in forensic medicine for diagnosis and identification. Among several maturational indicators, skeletal development appears to be quite a simple and accurate one. Skeletal age can be determined by radiographs, relating the appearance and development of certain bones with given maturational stages.[1,2] Various studies have been conducted on the estimation of age from teeth and facial dimensions and their possible use in the forensic case work.[3-29] Considerable attention has been paid to mandibular growth because it has been reported that this bone enlarges the most during adolescence.[30,31] It has also been observed that the mandible grows in a posterior-superior direction resulting in at anterior inferior displacement.[32] 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.[33] The aim of the present study was to determine mandibular growth in different stages of adolescence in North India for age estimation in forensic science.

MATERIALS AND METHODS

The study was conducted on randomized 120 (57 males and 63 females) lateral cephalograms; aged 7-20 years of age from the Department of Orthodontics, Government Dental College, Pt. Bhagwat Dayal Sharma, Post Graduate Institute of Medical Sciences, Rohtak, Haryana, India. The criteria for sample selection demanded an ANB angle between 0 and 4 (the angle between the most anterior point of maxilla, A, and the most anterior point of mandible, B, to nasion, N, the deepest point of the nasal root in the mid-sagittal plane). In this manner, subjects with skeletal class II or III were excluded. Furthermore, patients with missing teeth or with syndromes, cleft lip or palate, or other craniofacial pathology, were

also excluded. Patients were asked whether they had used any medication that may have affected their growth or development. Also included were patients who had undergone minor orthodontic treatment that did not seem to influence linear mandibular growth and development.[34] Each cephalogram was computerized, traced and cephalometric points were measured. The study used the following cephalometric landmarks; point A (the most posterior point on the curve between anterior nasal spine and superior prosthion), point B (the most posterior point of the bony curvature of the mandible below infradentale and above pogonion), nasion (N), condylon (Co), Gonion (Go) and gnathion (Gn). 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) (Fig. 1). These data were analyzed by using Statistical Package for Social Sciences (SPSS), Version 7.0.

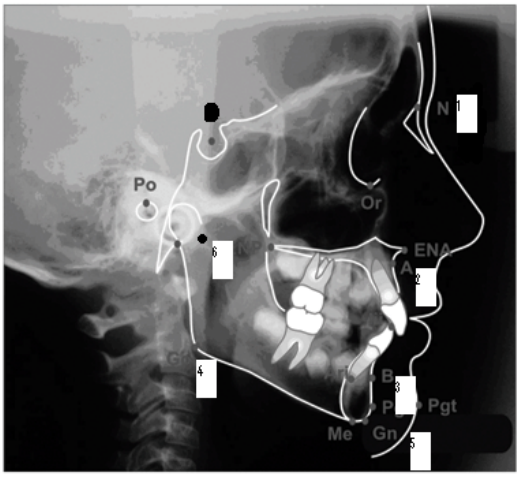

Figure 1. Cephalometric points

Fig.1: *Parameters of cephalograms.*

RESULTS AND DISCUSSION

Table 1 presents the mandibular growth rate (Mean ± SD) between skeletal class I and class II in both the sexes. In class I and class II skeletal as well as in gender, no significant difference in growth rates (Table I) is found, though growth rate is higher in female as compared to male except in mandibular length.

Table I shows the mandibular annual growth rate in adolescence phase was 2.35 mm of the mandibular body length, 3.66 mm for the ramus height, and 3.95 mm for the mandibular length. While the mandibular length annual growth rate was less (1.78 mm/y) as compared to Japanese population studies by Sato *et al.*[35] It has been recently reported that ramus growth rate was 2.06 mm/y in males and 1.42 mm/y in females less as compared to present study.[34] There are no significant differences in mandibular linear growth between two sexes. The age can be determined from the cephalograms by above equations (equation 1,2,3). This method of age determination can be applied up to 20 years of age. Hence, these linear parameters can act as growth spurt. The increase in linear parameters due to mandibular growth i.e. mandibular jaw grows in a posterior superior direction resulting in at anterior inferior displacement.[31-33]

Table 1: *Mandibular growth rates (mm/year) between skeletal class I and class II in both genders.*

Parameters	**Skeletal types**	**Sex**	**Growth rate (in mm/years) mean ± SD**
Mandibular ramus height	Class I	M	2.71 ± 0.13
		F	3.08 ± 0.12
	Class II	M	3.98 ± 0.23
		F	3.99 ± 0.21
Mandibular body length	Class I	M	2.42 ± 0.14
		F	2.82 ± 0.13
	Class II	M	1.97 ± 0.14

		F	2.01 ± 0.13
Mandibular length	Class I	M	3.42 ± 0.17
		F	3.31 ± 0.12
	Class II	M	4.72 ± 0.13
		F	4.32 ± 0.15

$p<0.05$ at all levels.

$$\text{Age (in years)} = \frac{\text{Calculated mandibular body length by cephalometric}}{2.35} \quad (1)$$

$$= \frac{\text{Calculated ramus height from cephalograms}}{3.66} \quad (2)$$

$$= \frac{\text{Calculated mandibular length from cephalograms}}{3.95} \quad (3)$$

All above formulae can be applied up to 20 years of age.

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