Original Research Article

Association of cephalometric measurements on lateral cephalograms between two groups of Rajasthan population

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Abstract

Background: Facial features differ amongst different races and ethnic groups. These different shapes of face are affected by ethnical, ecological, biological, geographical, gender, age, and nutritional factors. The lateral cephalometric radiograph is one of the diagnostic records in registering the antero-posterior and vertical configuration of the facial skeleton. This is used to produce standard mean value for skeleton, dental & soft tissue structures for different ethnic groups. **Aim and Objectives**

1. To study craniofacial features of both Rajputs and Meenas
2. To compare both features for assessing the differences in landmark identification

Material & Methods: A Cross-sectional descriptive type study was carried out in 100 lateral cephalograms of healthy male adults (50 Rajputs and 50 Meenas) whose age ranged between 15 to 40 years, belonging to Rajasthan. **Results:** Statistically significant difference was found in two linear measurements and one angular measurement between Rajputs and Meenas. **Conclusion:** It was concluded that two linear measurements related to facial skeleton namely Posterior facial height and maxillary base length were found to be statistically significant between Rajputs and Meenas. One of the angular measurements related to Facial Skeleton namely the Saddle Angle was also be found statistically significant.

Keywords: cephalometric, anthropometry, cephalogram

Introduction

Facial features differ amongst different races and ethnic groups. These different shapes of face are affected by ethnical, ecological, biological, geographical, gender, age, and nutritional factors[1-3].

The lateral cephalometric radiograph is one of the diagnostic records in registering the antero-posterior and vertical configuration of the facial skeleton. This is used to produce standard mean value for skeleton, dental & soft tissue structures for different ethnic groups.

Cephalometric standard values also provide useful guideline in orthodontic diagnosis & treatment planning. These are relative values in providing information for overall planning which varies from case to case, depending on the nature of the anomaly, the age of the patient & the possible forms of treatment[4].

The present study can be used in plastic surgery for beautification of the distorted face due to any accident or congenital anomalies. The data can be applied to evaluate and measure various parameters of the human body for the purpose of criminal investigation, sex differentiation & also in racial differentiation.

Aim and Objectives

1. To study craniofacial features of both Rajputs and Meenas
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Material and Methods

A cross-sectional descriptive type observational study was carried out in 100 lateral cephalograms of healthy male adults (50 Rajputs and 50 Meenas) whose age ranged between 15 to 40 years, belonging to Rajasthan.

Inclusion and exclusion criteria

Normal healthy male adults belonging to Rajput & Meena community, without any congenital anomalies of facial skeleton or any history of injury to facial skeleton were included in the present study, whereas those with congenital anomalies of facial skeleton/ history of any injury to facial skeleton were excluded from the study.

The following cephalometric parameters on the lateral cephalograms were measured by using scale, x-ray view box, marker, protractor and 3H pencil.

Linear measurements

These measurements can be measured by line joining the

Anterior Cranial Base Length
Two points Sella to Nasion

Posterior Cranial Base Length
Two points Sella to Articulare

Anterior Facial Height
Two points Nasion to Menton

Posterior Facial Height
Two points Sella to Gonion

Mandibular Base Length
Two pints Gonion to Pogonion

Maxillary Base Length
Two points Posterior Nasal Spine to Subspinale

Length of Ascending Ramus
Two points Gonion to Condylion

Angular measurements
These angles can be measured by line joining the
Saddle angle
Points Nasion, Sella & Articulare.

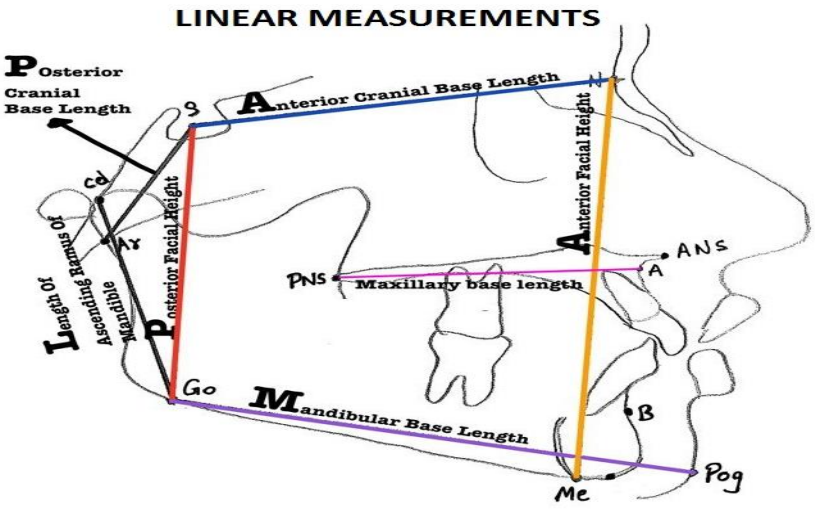
Gonial angle
Points Articulare, Gonion & Menton.

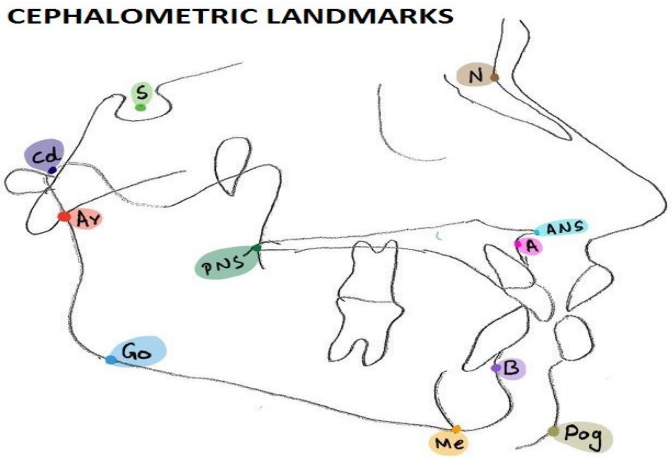
Articulare Angle
Points Sella, Articulare & Gonion.

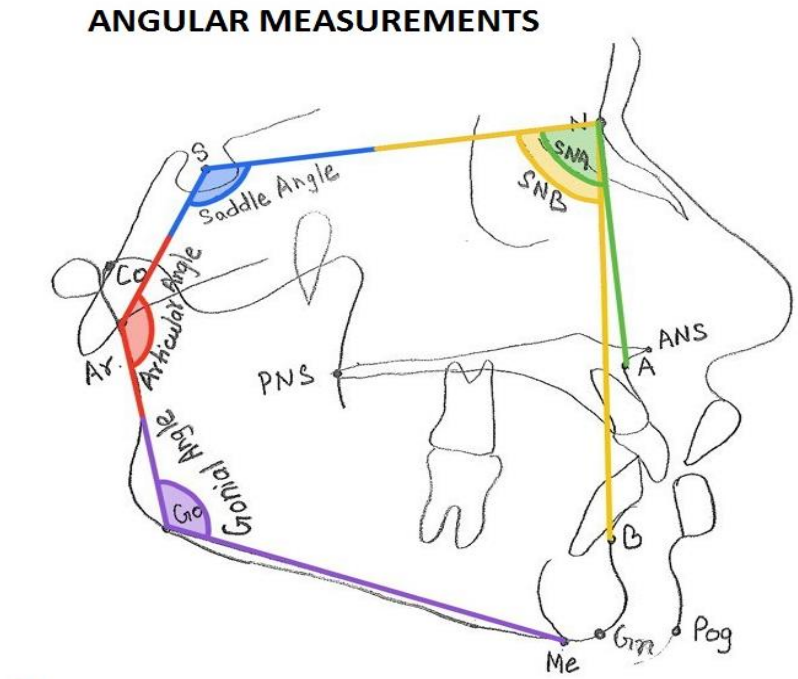
SNA angle
The SNA angle expresses the sagittal relationship of the anterior limit of the maxillary apical base as a related to the anterior cranial base.

S.No.	Name	Definition
1.	Nasion (N)	Most anterior point on frontonasal suture
2.	Sella (S)	Midpoint of sella turcica
3.	Subspinale (A)	Most concave point of anterior maxilla
4.	Supramentale (B)	Most concave point on mandibular symphysis
5.	Pogonion (Pog)	Most anterior point of mandibular symphysis
6.	Gonion (Go)	Most posterior inferior point on angle of mandible. Can also be constructed by bisecting the angle formed by intersection of mandibular plane and ramus of mandible
7.	Menton (Me)	Lowest point on mandibular symphysis
8.	Articulare (Ar)	Junction between inferior surface of the cranial base and the posterior border of the ascending rami of the mandible
9.	Condylion (Cd)	Most posterior/superior point on the condyle of mandible
10.	Posterior Nasal Spine (PNS)	Posterior limit of bony palate or maxilla
11.	Anterior Nasal Spine (ANS)	Anterior point on maxillary bone

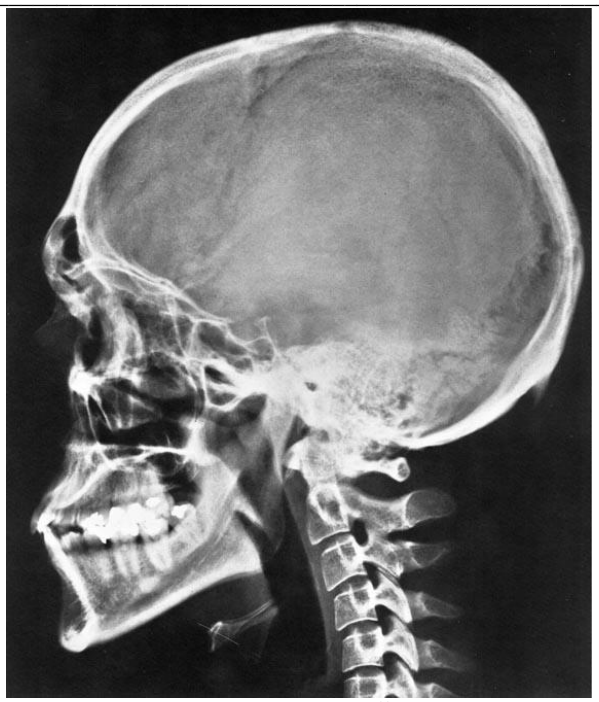
Statistical analysis
Data were recorded in a predesigned study proforma and were entered in Microsoft excel spreadsheet to prepare master chart. It was further subjected to statistical analysis. All the Linear variables were summarized as mean and standard deviation and Unpaired‘t’ test was used for analysis.‘p’ value <0.05 was taken as significant. SPSS 22 version software was used for all statistical calculations.







- **Saddle Angle.**
- **Articular Angle.**
- **Gonial Angle.**
- **SNA Angle.**
- **SNB Angle.**



Results and observation

A statistically significant difference was found for two linear measurements viz. Posterior Facial Height and Maxillary Base Length between Rajputs and Meenas (Table: 1).

The difference in Saddle angle between Rajputs and Meenas was also found statistically significant. (Table: 2)

Table: 1 Showing linear measurements and their statistical analysis

S.NO.	Linear measurements	Group of subjects		P-value Rajputs/Meenas
		Rajputs MEAN±S.D	MEENAS MEAN±S.D	
1	Anterior Facial Height (N-Me)mm	119.6±7.71	118.18±7.11	0.3407>0.05[NS]
2	Posterior Facial Height (S-Go)mm	95.86±9.51	91.92±8.57	0.0319<0.05[S]
3	Anterior Cranial Base Length (Se-N)mm	67.18±5.16	68.56±4.23	0.1468>0.05[NS]
4	Posterior Cranial Base Length (S-Ar)mm	38.72±4.97	38.36±5.24	0.7252>0.05[NS]
5	Mandibular Base Length (Go-Po)mm	77.5±8.16	80.24±7.84	0.0900>0.05[NS]
6	Maxillary Base Length (PNS-Subspinale)mm	53.96±3.53	55.86±4.93	0.0290<0.05[S]
7	Length of ascending ramus of mandible (Go-Co)mm	69.28±5.71	67.16±6.08	0.0754>0.05[NS]

Table: 2 Showing angular measurements and their statistical analysis

S.NO.	Angular measurements	Group of subjects		P-VALUE Rajputs/Meenas
		Rajputs MEAN±S.D	Meenas MEAN±S.D	
1	Saddle Angle (N-S-Ar)	115.68±7.37	111.82±7.19	0.0094<0.05[S]
2	Gonial Angle (Ar-Go-Me)	117.18±7.20	118.68±6.56	0.2789>0.05[NS]
3	Articulare Angle (S-Ar-Go)	153.26±5.16	154.04±10.18	0.6300>0.05[NS]
4	SNA Angle	92.44±5.32	91.96±5.31	0.6526>0.05[NS]
5	SNB Angle	88.96±4.96	88.52±5.16	0.6647>0.05[NS]

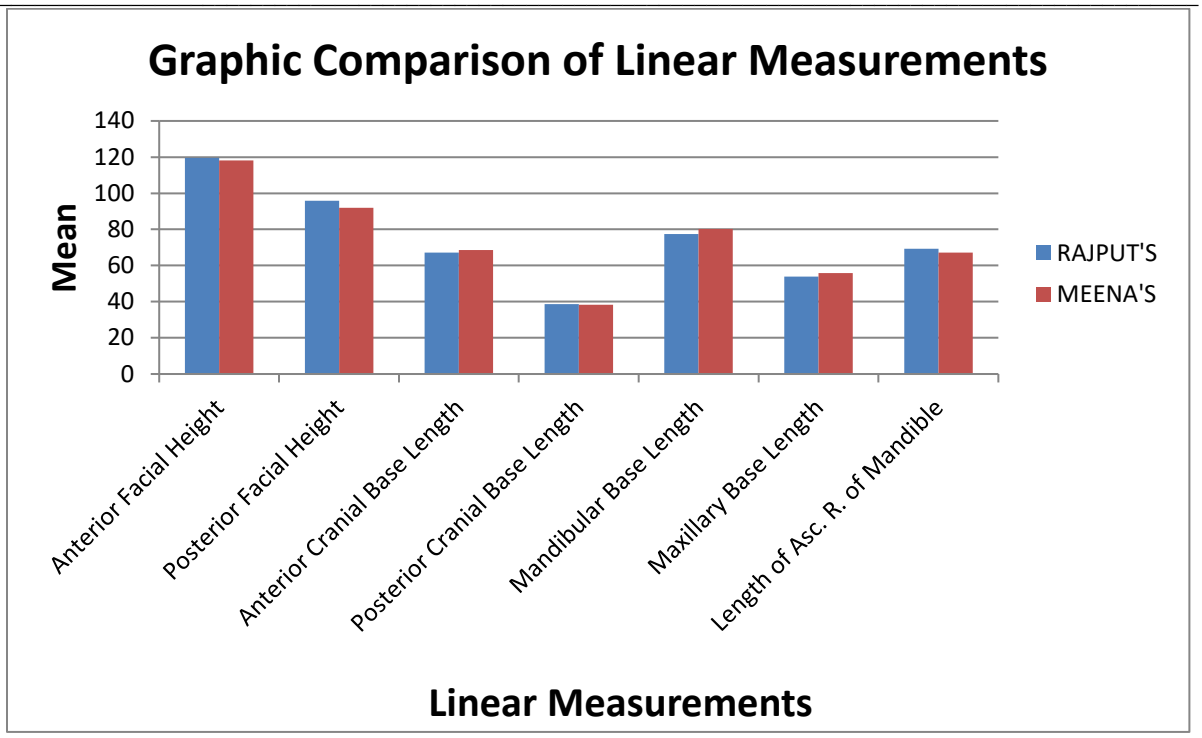


Figure 1- Linear Measurements

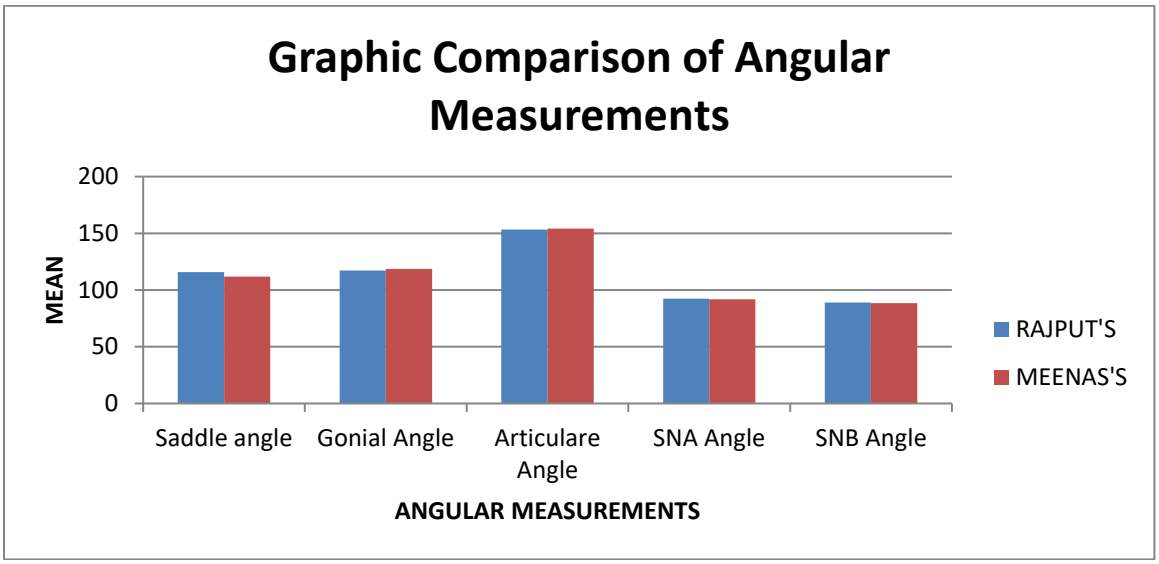


Figure 2-Angular Measurements

Discussion

Many goals of physical anthropology such as studying the evolution of human body's anatomic structures, individual identification based on human remains, research of physico-racial features are all as important as analyzing the anatomic functioning of some structures like the face that plays a key role for better understanding of the evolution of human variability.

In the present study, analysis of angles that may influence facial morphology reveals substantial trends. In order to achieve an objective analysis of the anatomic features of the facial morphology, another more detailed analysis should take into account the ethnic group or the race[5].

The Anterior facial heights of Rajput's were found 119.6±7.71 where as that of Meena's were found to be 118.18±7.11 which is statistically non significant (p value-0.3407). The posterior facial heights of Rajput's is 95.86±9.51 where as that of Meenas were found to be 91.92±8.57 which is statistically significant (p-value 0.0319). Similiarly Miyajima K et al in 1996 also compared two groups i.e. 54 Japanese adults with 125 European American adults. They found significant difference in Anterior and Posterior Facial Heights in both groups[6].

The Maxillary Base Length of Rajputs was found 53.96±3.53 where as that of Meena's measured 55.86±4.93 which is ones again statistically significant (p-value 0.0290). Zeng et al in 1998 conducted their work on 20 Chinese and 20 Swedish boys. They found

significant difference in Maxillary Base Length in Chinese and Swedhish Boys[7].

The Anterior cranial base lengths of Rajput's were found 67.18±5.16 where as that of Meena's measured 68.56±4.23 which is statistically non significant (p-value 0.1468).

The Posterior cranial base lengths of Rajput's were found 38.72±4.97 where as that of Meena's measured 38.36±5.24 which is statistically non significant (p-value 0.7252).

Like present study Zeng et al in 1998 also compared the cephalometric measurements in two groups' i.e. Chinese and Swedish boys but unlike present study they observed that Chinese boys have significant smaller Anterior and Posterior Cranial Base Length as compared to Swedish boys[7].

The Mandibular base lengths of Rajput's were found 77.5±8.16 where as that of Meena's measured 80.24±7.84 which is statistically non significant (p-value 0.0900).

The Lengths of ascending ramus of mandible of Rajputs was found 69.28±5.71 where as that of Meenas measured 67.16±6.08 which is ones again statistically non significant (p-value 0.0754).

Even the Angular Measurements (Saddle Angle) showed significant difference between Rajputs and Meenas (Table: 2). Rakosi (1982) reported that the mean value of saddle Angle as 123 degree ± 5[8].

The Gonial angle, Articulare angle, SNA and SNB showed no significant differences between Rajput's and Meena's. (Table: 2)

This study was matched with findings of Tanaporn Ruksujarit et al who made their observation on 67 Khon Kaen boys. They found the mean value of Gonial angle 118.7± 5.5[9].

Nobuyuki Ishil et al (2002) conducted their work on 49 Japanese and 75 British Caucasian and subjects. They found that Japanese has more obtuse Articular Angle with significant relation however we found no significant relation in both the groups[10].

This study also matched with the findings of Nakahara C and Nakahara R (2007) who worked on Japanese population. They found larger Articulare Angle in males with retrognathic position of the mandible[11].

This study also matched with the findings of the AM Hamdan et al (2001) who measured SNA and SNB angles on 65 subjects of Jordanian norms and Eastman population. They found no significant differences between two groups[4].

This study also matched with study of Nor Farid Mohd Noor et al (2020) who took linear and Angular measurements in Malays and Chinese population. They found significant differences in these two groups. They also observed significant gender disparities in the soft tissue cephalometric measurements among Malaysian Malay and Chinese subjects[13].

Elkaseh A et al 2022 conducted their work on Cephalometrics of Libyan adults. They also stated the the need to develop cephalometric norms for different ethnic groups, the Arab population in North Africa in particular[14].

Girhe V et al 2022 also established cephalometric norms for North Indian population. They found that the skeletal (or hard tissue) and dental cephalometric dimensions were greater in the Caucasians as compared to the North Indian population with increased cranial base length and mid facial height, retruded chin, and retrognathic maxilla and mandible, whereas, the North Indian females exhibited more proclined mandibular incisors than the Caucasian females.

These important parameters related to facial skeleton & Jaw bases gave critical information about characteristic facial features of Rajputs and Meenas.

Present study can be helpful in medico legal cases to identify unclaimed dead bodies & facial skeletal remains also useful for plastic surgeons during craniofacial surgeries.

Conclusion

These important parameters related to facial skeleton & Jaw bases gave critical information about characteristic facial features of Rajputs and Meenas.Present study can be helpful in medico legal cases to identify unclaimed dead bodies & facial skeletal remains and also useful for plastic surgeons during craniofacial surgeries.

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Nil

Conflicts of interest

There are no conflicts of interest.

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