Soft tissue Cephalometric Norms for Orthognathic Surgery

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Cephalometric norms are different for different ethnic groups. They help making the deformity assessment and surgical planning procedures more appropriate for a particular individual. Hence, the present study was aimed at the development of the soft tissue cephalometric norms for orthognathic surgery for north India.

The study sample consisted of fifty adult males and fifty adult females. Standardized lateral cephalogram was taken, traced and analysed for each subject. The statistical analysis involved calculation of mean and standard deviation for thirteen parameters. This data was compared with that reported by Legan and co-workers1 using Normal (z) test. Male and female subjects were also compared with each other.

For male subjects, all the parameters except facial convexity angle, lower vertical height to depth ratio, nasolabial angle and vertical lip chin ratio; the statistical difference varied from highly significant to most highly significant.

For female subjects, five parameters viz. facial convexity angle, maxillary prognathism, lower vertical height to depth ratio, nasolabial angle and maximum incisor exposure have not been found to be significantly different from Legan and co-worker's data1. For all the remaining parameters, the statistical difference varied from highly significant to most highly significant. Comparison between male and females also led to distinctive differences.

The soft tissue cephalometric norms for orthognathic surgery were derived for the population of eastern Uttar Pradesh region of north India. Hence, while planning combined orthodontic-orthognathic surgical approach for this particular population, it appears more appropriate to use the norms as developed or modified in the present study.

Key words: Soft tissue cephalometric norms.

The treatment goals for any patient who requires combined orthodontic treatment and orthognathic surgery are determined systematically through cephalometrics.

Therefore, the treatment planning for such patients should include both hard tissue and soft tissue analysis. In 1980, Legan and co-workers reported the soft tissue cephalometric norms for the caucasians[1]. However, with time it became apparent that the standards obtained from one ethnic group may not necessarily apply to the other ethnic groups[2,3,4].

Therefore, the present study was aimed at establishing the soft tissue cephalometric norms for Orthognathic surgery for the natives of eastern Uttar Pradesh region in north India.

MATERIAL AND METHODS:

The study sample consisted of hundred adult individuals. It comprised of fifty males and fifty females. The mean age was 24 years for males and 21.5 years for females. The following criteria were used in patient selection:

1. The patient is a native of eastern Uttar Pradesh, north India.
2. No previous orthodontic or orthognathic surgical treatment had been undertaken.

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3. All individuals had esthetically pleasing facial appearance.
4. Full compliment of dentition except permanent third molars was present.
5. Angle's Class I molar relationship, present bilaterally.
6. No crossbite in anterior and posterior segments.

An informed consent was taken from each of the selected subject for lateral cephalogram. This x-ray was taken in natural head position with teeth in occlusion and lips at rest. Cephalograms of all the subjects were traced by a single examiner using acetate paper and 0.3 mm lead pencil and a tracing board.

All reference points, landmarks and measurements were made according to 'Soft tissue cephalometric analysis for Orthognathic Surgery' as put forth by Legan and co-workers1 (Figure 1). Thirteen parameters were assessed for each individual. Angular and linear measurements were taken to the nearest 0.50 and 0.5 mm, respectively (Figure 2). Subsequently, the data was subjected to statistical evaluation (Table 1).

The statistical analysis involved calculation of mean and standard deviation for each parameter. This data was, subsequently compared with Legan and co-worker's data1 using Normal (z) test. Males and female subjects were also compared with each other in a similar manner (Table 1).

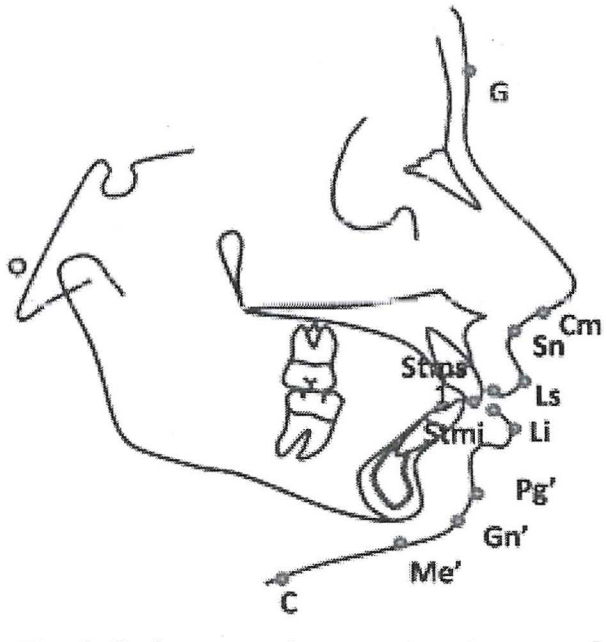


Fig. 1: Reference points, landmarks as used in the present study.

RESULTS

Descriptive statistics are presented in Table 1. It also denotes the significantly different values at 5%, 1% and 0.1% level of significance by symbols *, **, ***; respectively.

For male subjects, all the parameters except facial convexity angle, lower vertical height to depth ratio, nasolabial angle and vertical lip chin ratio; the statistical difference varied from highly significant to most highly significant.

For female subjects, five parameters viz. facial convexity angle, maxillary prognathism, lower vertical height to depth ratio, nasolabial angle and maximum incisor exposure have not been found to be significantly different from Legan and co-worker's data1. For all the remaining parameters, the statistical difference varied from highly significant to most highly significant.

Each parameter is further elaborated as follows:

Parameter 1: Facial Convexity Angle. Males and females of the present study when compared independently with the caucasian norms, did not demonstrate significant differences. The difference between males and females was also insignificant. Hence, the norms as developed by Legan and co-workers1 could be directly applied to both the sexes in the present study (Table 2).

Parameter 2: Maxillary prognathism. The difference between the mean value for the caucasians and that of the males of the present study was highly significant. It was, however, insignificant for females. Difference between males and females of the present study was insignificant. Hence, for males, the norms were modified in accordance with the results of the present study while for females, the mean ± standard deviation as obtained from the males was adopted (Table 2).

Parameter 3: Mandibular prognathism. Male and female subjects when compared independently with the caucasian norms, demonstrated most highly significant differences. This calls for the need to modify their norms. Insignificant difference, however, between male and female group led us to develop such norms by calculating combined mean ± standard deviation for the hundred subjects (Table 2).

Parameter 4: Vertical height ratio. The difference was highly significant for males and most highly significant for females. Males also differed from females significantly. Hence, mean ± standard deviation as obtained for each sex was adopted as norm for this particular parameter (Table2).

Parameter 5: Lower Face throat Angle. Most highly significant differences resulted in each of the three comparisons made (Table 1). Hence, the norms were modified as for parameter 4 (Table2).

Parameter 6: Lower vertical height to depth ratio. The norms were modified as for parameter 1 (Table 2).

Parameter 7: Nasolabial Angle. The norms were modified as for parameter 1 and 6 (Table 2).

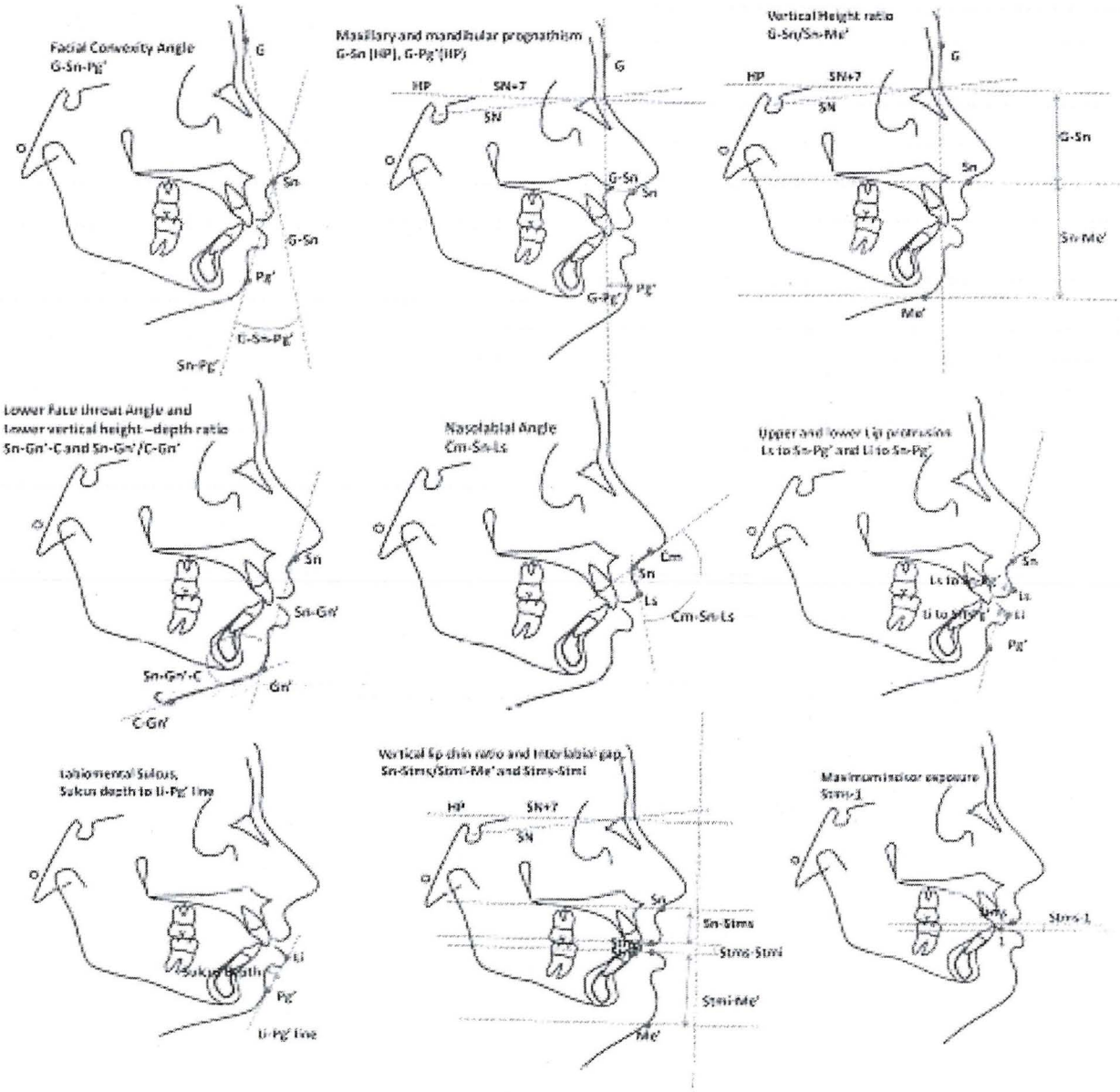


Fig. 2: Angular and linear measurements as used in the present study.

Table 1: Means, Standard Deviations and z Values for thirteen parameters.

S. No.	Measurements@	Present Study (mean ± Standard deviation)		Z value#		
		Males	Females	Comparison (i) between Legan and co-worker's data and present study:Males	Comparison (ii) between Legan and co-worker's data and present study:Females	Comparison (iii) between males and females subjects of the present study:
1.	Facial Convexity Angle, G-Sn-Pg'	11.1°±11°	13.1°±7.3°	0.5	0.81	1.07
2.	Maxillary prognathism, G-Sn (IIHP)	9±6.8mm	8.2±6.4mm	2.6**	1.95	0.61
3.	Mandibular prognathism, G-Sn (IIHP)	6.7±8.0mm	5.6±7.7mm	4.6***	4.0***	0.70
4.	Vertical height ratioG-Sn/Sn-Me' (^ HP)	1.05±0.12	1.1±0.13	2.95**	5.44***	2.00*
5.	Lower Face throat angle, Sn-Gn'-C	120.8°±7.0°	114.2°±6°	11.2***	8.0***	5.06***
6.	Lower vertical height to depth ratio, Sn-Gn/C-Gn'	1.19±0.5	1.21±0.40	0.14	0.18	0.22
7	Nasolabial Angle, Cm-Sn-Ls	104.5°±12.4°	99.6°±13.7°	1.0	0.91	1.88
8.	Upper Lip protrusion, Ls to Sn-Pg	4.4±2.7mm	4.2+2.3mm	3.1**	3.04**	0.40
9.	Lower Lip protrusion, Li to Sn-Pg'	3.2+2.7mm	4.2±2.1mm	2.7**	5.9***	2.07*
10.	Labiomental Sulcus, Sulcus depth ^ to Li-Pg' line	8.2±1.8mm	6.6±1.5mm	8.2***	5.3***	4.82***
11.	Vertical lip chin ratio, Sn-Stms/Stmi-Me'	0.62±0.6	0.43±0.16	1.41	3.04**	2.16*
12.	Interlabial gap, Stms-Ī	0.7±0.7mm	0.9±0.73mm	13.13***	10.66***	1.40
13.	Maximum incisor exposure, Stms-Stmi	3.5±1.4mm	2.7±2.8mm	7.58***	1.77	1.80

@All landmarks and measurements are made according to Legan and co-workers study[1].

Normal (z) test,*Significant at 5% level, ** Significant at 1% level, *** Significant at 0.1% level.

Parameter 8: Upper Lip protrusion. The norms were modified as for parameter 3 (Table 2).

Parameter 9: Lower Lip protrusion and Parameter 10: Labiomental Sulcus: The norms were modified as for parameter 4 and 5 (Table 2).

Parameter 11: Vertical lip chin ratio. Females demonstrated highly significant differences when compared to caucasian norms. Hence, their norms

were modified according to the present study. Males did not differ significantly from the caucasians. Despite this, the norms for the males were also modified. This was because the difference between male and female group was significant (Table 2).

Parameter 12: Interlabial gap. The norms were modified as for parameter 3 and 8 (Table 2).

Parameter 13: Maximum incisor exposure. The norms were modified as for parameter 2 (Table 2).

Comparison between male and female subjects led to statistically significant difference with respect to vertical height ratio, lower lip protrusion and vertical lip chin ratio while most highly significant difference with respect to lower face throat angle and labiomental sulcus (Table 1).

DISCUSSION

Craniofacial characteristics vary not only from one ethnic group to the other but also with each sex[2,3,4,6]. This led us to ascertain whether the caucasian norms as developed by Legan and co-workers1 could be directly applied to a particular group of north Indian population. Legan and co-workers1 gave common norms for both the sexes. An attempt was made in the present study to determine if such norms differ between the sexes.

Distinctive soft tissue facial characteristics of north Indian subjects:

Both male and female subjects when compared with the caucasian norms demonstrated more prognathic mandible, higher vertical height ratio, more obtuse lower face throat angle, deeper labiomental

Table 2: Soft tissue cephalometric norms for Orthognathic surgery for North Indian (Eastern Uttar Pradesh) population:

S. No.	Measurements@	Norms for North Indian (Eastern UP) population: (Mean ± Standard deviation)	
		Males	Females
1.	Facial Convexity Angle, G-Sn-Pg'	$12^0 \pm 4^{0\$}$	$12^0 \pm 4^{0\$}$
2.	Maxillary prognathism, G-Sn (IIHP)	9±6.8mm	9±6.8mm
3.	Mandibular prognathism, G-Sn (IIHP)	6.2±7.7mm	6.2+7.7mm
4.	Vertical height ratioG-Sn/Sn-Me'(^ HP)	1.05±0.12	1.1 I 0.13
5.	Lower Face throat angle, Sn-Gn'-C	$120.8^0 \pm 7.0^0$	$114.2^0 \pm 6^0$
6.	Lower vertical height to depth ratio, Sn-Gn/C-Gn'	$1.2^\$$	$1.2^\$$
7.	Nasolabial Angle, Cm-Sn-Ls	$102^0 \pm 8^{0\$}$	$102^0 \pm 8^{0\$}$
8.	Upper Lip protrusion, Ls to Sn-Pg	4.3±2.4mm	4.3±2.4mm
9.	Lower Lip protrusion, Li to Sn-Pg'	3.2±2.7mm	4.2±2.1mm
10.	Labiomental Sulcus, Sulcus depth ^ to Li-Pg' line	8.2±1.8mm	6.6±1.5mm
11.	Vertical lip chin ratio, Sn-Stms/Stmi-Me'	0.62±0.6	0.43±0.16
12.	Interlabial gap, Stms-Stmi	0.8±0.7mm	0.8±0.7mm
13.	Maximum incisor exposure, Stms-1	3.5±1.4mm	3.5+1.4mm

All landmarks and measurements are made according to Legan and co-workers study[1].

$ The norms as developed by Legan and co-workers[1] as directly applied to both the sexes of North India (eastern Uttar Pradesh).

sulcus, more prognathic upper and lower lips and decreased interlabial gap. In addition, males had more prognathic maxilla and higher maxillary incisor exposure while females had lower vertical lip chin ratio.

Comparison between male and female subjects led to the findings that males had more obtuse lower face throat angle, deeper labiomental sulcus and higher vertical lip chin ratio. In contrast, females had higher vertical height ratio and increased lower lip protrusion (Table 1).

CONCLUSION

While planning combined orthodontic-orthognathic surgical approach for the natives of eastern Uttar Pradesh region of north India, it appears more logical to use the norms as developed or modified in the present study. The norms have been independently derived for the male and female subjects.

This would help us serve our patients in a more appropriate manner.

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