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Cephalometric evaluation of patients with convex profile using Steiner's analysis

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Abstract

Introduction: Steiner's cephalometric analysis has been one of the most widely used cephalometric analyses for orthodontic diagnosis, treatment planning, prognosis and predictions. However its norms are different for different populations. Steiner's cephalometric analysis has also been used to establish cephalometric characteristics of different skeletal malocclusions. Aim of this study was to assess the cephalometric features of patients with convex profile using Steiner's analysis.

Material and Methods: The study was conducted on 100 patients with convex profile as judged by orthodontists in consensus. Lateral cephalogram was drawn for each selected subject and Steiner's analysis was performed. SPSS 17.0 was used for statistical evaluation. Correlation coefficients(r) were determined among Steiner's variables.

Results: Patients with convex profiles have underlying skeletal class II pattern as shown by ANB angle (7.43° ± 2.46), mandibular retrognathia being the most common underlying skeletal pattern. SN-Mp angle showed that most of the patients were high angle cases. Patients exhibited bi-maxillary proclination (UI-NA angle 26.93° ±9.73, UI-NA distance 6.3 ±3.28 and LI-NB angle 3.6° ± 6.26 and LI –NB distance 6.86 ±2.91). Lower lip prominence was also evident.

Conclusions: Steiner's norms are different for different populations, so patients should be treated according the norms of their ethnicity and more preferably to macro-esthetic fundamentals. Steiner's characteristics for skeletal class II were assessed which revealed mandibular retrognathism being the primary cause of skeletal class II, high angle vertical pattern, prominent upper/lower incisors and lower lip.

Keywords: Retrognathic profile, skeletal malocclusion, lateral cephalogram

Introduction

Populations differ in their phenotypes and have been classified as Asiatic (Mongoloid), Black (Negroid) and White (Caucasian).[1,2] These differences are due to a complicated interaction of genetic and environmental factors.[2] It is thus illogical to apply the standards of one racial group to another.[3]

The achievement of harmonious and proportional craniofacial esthetics is one of the desired results of orthodontic treatment. Several diagnostic aids are available to help the clinician meet this goal including photographic assessment and cephalometric radiography.[4,5]

However norms established on one group or sub-group cannot be applied to a different ethnic group. Out of all the available different cephalometric analyses, the most widely used analysis is Steiner's. According to Steiner, the norms they obtained in a predominantly Caucasian population were to be used only as a guide and not as absolute values for every patient. With this concept they emphasized that there was an infinite variety of facial variations within a particular racial group.[6] Literature available supports that various sub groups have tried to establish their own cephalometric features and are thus being benefited from them in diagnosis, prediction tracings for growth and orthognathic surgeries.[7,10]

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In recent past attempts have been made to better understand the dento-facial deformities by studying their cephalometric features. Cephalometric features of bimaxillary protrusions, skeletal class II & III deformities, vertical maxillary dysplasia, facial asymmetries, cleft and syndromic patients have been studied to have a better understanding of underlying skeletal and dental features.[11-14] Attempts have also been made to assess the cephalometric features of patients with different profiles i.e. orthognathic, prognathic (concave) and retrognathic (convex).[15] As norms are different for different races, the pattern of dentofacial deformity is also different for different ethnic groups.

Aim of this study was thus to assess the cephalometric features of patients with convex profile using Steiner's analysis in a sample of patients from Lahore, Pakistan.

Material and Methods

The study was conducted on 100 orthodontic patients (65 females, 35 males) having age above 20 years, who reported at Orthodontic Department, University College of Dentistry, The University of Lahore. Subjects having convex profile as judged in consensus by orthodontists were selected and lateral cephalogram was taken after their consent. Patients with straight profile, concave profiles and with gross facial asymmetries were excluded from the study. Sample was collected using the non-probability convenience sampling technique.

Lateral cephalogram was drawn for each selected patient and Steiner's analysis was performed. SPSS 17 was used for statistical evaluation. Mean, standard deviation, variance, minimum & maximum value and range were calculated for each variable for each patient. Correlation coefficients(r) were determined.

Results

The study was conducted on 100 patients (65 females & 35 males) with mean age of 26.35±2.81. Patients with retrognathic profiles as assessed by orthodontists in consensus were included in the study and were assessed by Steiner's analysis. Descriptive statistics including mean, standard deviation and range of each variable for each patient were calculated (Table I). Correlation (r) was also calculated among the various parameters of Steiner's analysis (Table II).

Table I. Descriptive Statistics

Parameters	Range	Mean	Std. Deviation
SNA	18.00	83.02	3.65
SNB	21.00	75.51	3.92
ANB	13.50	7.43	2.46
SN-Go	35.00	35.10	7.39
SN-Occ	29.00	18.68	5.60
IIA	69.00	116.00	12.98
UI-NA Angle	43.00	26.93	9.73
UI-NA Distance	13.00	6.03	3.28
LI-NB Angle	28.50	30.6	6.26
LI-NB Distance	15.00	6.86	2.91
UL-S	15.00	1.41	2.78
LL-S	22.00	2.43	3.47

Table II. Correlation among variables

Correlations

	SNB	ANB	SN-Go	SN-Occ	IIA	UI-NA Angle	UI-NA Distance	LI-NB Angle	LI-NB Distance	UL-SN	LL-SN
SNA	.793**	.167	-.423**	-.328**	-.192	-.052	-.099	.311**	.135	.156	.196
SNB		-.459**	-.582**	-.367**	-.061	-.009	-.097	.219	-.115	.238	.243*
ANB			.350**	.130	-.148	-.073	.013	.079	.360**	-.155	-.102
SN-Go				.508**	-.123	.102	.058	.088	.298*	-.029	.016
SN-Occ					-.082	.044	-.020	.159	.001	-.017	-.038
IIA						-.688**	-.494**	-.433**	-.333**	-.093	-.172
UI-NA Angle							.711**	.155	.042	.124	.035
UI-NA Distance								-.058	.051	.180	.128
LI-NB Angle									.463**	.275*	.349*
LI-NB Distance										.059	.420*
UL-SN											.452*

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Discussion

Cephalometric evaluation of features in patients with convex profile in a sample of Pakistani (Lahore) population was assessed in this study. Convex / retrognathic profile is usually associated with Skeletal Class II malocclusion however a few might have skeletal class I with deficient chin only.[17] This

study showed that all the patients who exhibited convex profile had underlying skeletal class II malocclusion as depicted by ANB> 4°.

It is empirical in treatment planning to have an understanding of underlying pattern of sagittal discrepancy. Present study showed that patients with convex profiles primarily exhibited mandibular retrognathia, though prognathic maxilla was also evident. Asad and Hameed in their study concluded that out of a sample of class II patients, 62 % had short mandible, 35% exhibited prognathic maxilla while 3% showed composite skeletal class II.[18] Bokhari and Asad in their study showed that 52.4% of class II div 1 patients exhibited short mandible as the primary area to be addressed. Another 21.3 % of the patients showed short maxilla but mandible was further short again needing mandibular treatment only. 19.4% of the class II div 1 patients however showed prognathic maxilla.[19] Rosenblum however in his study concluded that only 27% of the sample had mandibular retrusion while 56.3% of the sample had maxillary protrusion.[20] Lau and Hägg in their cephalometric study on Chinese Skeletal Class II patients exhibited more prognathic maxillae and less retrusive mandibles.[21]

Patients with convex profile with underlying skeletal class II can exhibit normal angle, high angle or low angle vertical patterns, however high angle pattern shows greater prevalence.[22,23] Same is depicted in this study as assessed by SN-Mp (35.1°$\pm$7.39) which showed a tendency towards high angle.

Dental compensation for skeletal class II patients is usually proclination of lower incisors. Upper incisors have also been found proclined in skeletal class II patients with high angle. Similar findings were found in this study where patients exhibited bi-maxillary proclination as evaluated by Steiner's analysis.[24,25]

Lip prominence however in skeletal class II patients utilizing S-Line have not been extensively assessed. A deficient chin in such patients may also affect the lip prominence.[26,27] In this study, values of UL-S line and LL-S line distances were found to be increased suggesting that both upper and lower lips were more prominent in Skeletal Class II patients as compared to patients with skeletal class I.

Conclusions

Steiner's norms are different for different populations, so patients should be treated according the norms of their ethnicity and more preferably to macro-esthetic fundamentals. Cephalometric Steiner's characteristics for skeletal class II were assessed which revealed mandibular retrognathism being the primary cause of skeletal class II, high angle vertical pattern, prominent upper & lower Incisors and lower lip.

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