ORIGINAL RESEARCH PAPER

Orthopedics

ESTABLISHING CEPHALOMETRIC NORMS USING ARNETT'S AND BURSTONE'S SOFT TISSUE ANALYSIS FOR MALES AND FEMALES IN NORTH INDIAN POPULATION.

KEY WORDS: Cephalometry, soft tissue, standard values.

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ABSTRACT

This study was aimed to establish cephalometric norms using Arnett's and Burstone's soft tissue analysis for males and females in north Indian population with 100 male and 100 female samples which fall under selected inclusion criteria. Mild protrusion of incisors with upper and lower lip fullness is an acceptable treatment.

Material Method: Two hundred samples (100 males and 100 females) were selected on random basis with harmonious facial appearances, good functional occlusions and first permanent molars in Angle's class I relation in and around Moradabad city. Samples selected for the study were of age group between 18 to 25 years. Selected individuals were subjected to lateral head cephalometric radiography in the department of oral medicine and radiology. The cephalograms were tracaed and divided into two groups of males & females and analysed as described by Arnett's and Burstone soft tissue analysis using Digimiser software. Measurements were recorded and subjected to statistical analysis.

RESULTS: 1. Cephalometric norms using Arnett's and Burstone's Soft tissue Analysis were established for North Indian population of Moradabad city.

2. Intergroup comparison depicted slight difference in NLA, OR-Pg', Pg-TVL, Na-Me', OJ and OB which are not statistically significant.

3. Mild protrusion of incisors with upper and lower lip fullness is an acceptable treatment.

INTRODUCTION:

Esthetics is derived from the Greek word-"aestheticos", which means- perception to the senses. Throughout the recorded history and even earlier, human beings have been aware of and concerned about beauty and facial esthetics[1]

The importance of facial esthetics to the practice of orthodontics has its origin at the beginning of our speciality. The recent shift to the soft tissue has made accurate assessment of the soft tissue structures of considerable importance and hence lead to the development of various soft tissue cephalometric analysis given by Holdaway and Legan.[2] The successful treatment of Orthognathic surgical patient is dependent on careful diagnosis. Cephalometric analysis can be an aid in the diagnosis of skeletal and dental problems and a tool for simulating surgery and orthodontics by the use of acetate overlays. The first step in the diagnosis of the orthognathic patient is to determine the nature of dental and skeletal defects. Patients who require orthognathic surgery usually have facial bones as well as tooth positions that must be modified by a combined orthodontics and surgical procedure. For this reason a specialised Cephalometric appraisal system called Cephalometric for Orthognathic Surgery (COGS) was developed at the University of Connecticut.

As there are no cephalometric norms for the Arnett's and Burstone soft tissue analysis for the population of the North Indian region at present , this study was aimed to determine the same in representative sample population of North India.

MATERIAL AND METHODS:

The study was conducted in Moradabad (U.P.). The purpose of this study was to establish cephalometric norms using Arnett's and Burstone Analysis for North Indian population (Moradabad). 200 individuals were selected on random basis from the Moradabad city. Sample selected for the study ranged in group of 18-25 years.

Inclusion criteria:

Subjects were in the age (range) group of 18-25years.

- All subjects had permanent dentition.
- There should be no missing or malformed teeth.
- Subjects should have well balanced face.
- Subjects should have a Class-I molar relation with normal overjet and overbite(2-4mm).
- None of the subjects had undergone any kind of removable, semi-fixed, or functional therapy.
- No previous history of orthognathic surgery.

Exclusion criteria:

- Subjects with congenital anomaly or craniofacial defect were excluded.
- The cephalometric tracing was carried out and Burstone-Legan and Arnett's soft tissue Analysis(fig.1) was done using Digimiser software.

A total of 43 parameters were measured for Arnett's STCA, of which 37 were linear and 6 angular. The soft tissue cephalometric parameters were divided into 5 groups- Dentoskeletal factors(fig.2), soft tissue structures(fig.1), facial lengths, projections to TVL and Harmony values(fig.4). The data so obtained was subjected to statistical analysis.

The Burstone's Soft Tissue Analysis. The findings are discussed under facial form and lip position. A constructed horizontal reference plane was used in the analysis because of the arbitrary nature of reference planes. This plane was constructed through the Nasion 7° up from the Sella–Nasion line. The Facial Form (including 2 angular measurements, 2 linear measurements and 2 ratios) and the Lip position (including 6 linear measurements, 1 angular measurement and 1 ratio)(fig.6)

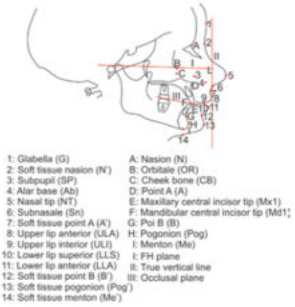

Fig:1- Hard and soft tissue landmarks

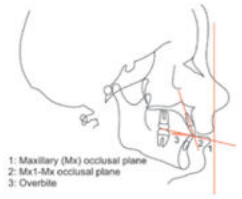

Fig:2- Dentoskeletal factors

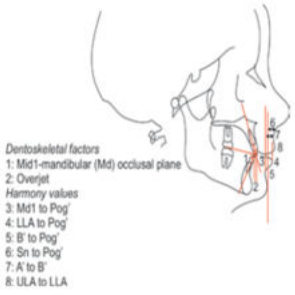

Fig:3- Dentoskeletal factors and harmony values

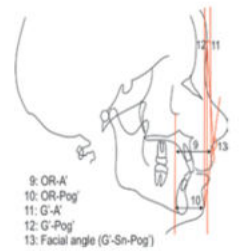

Fig:4- Harmony values

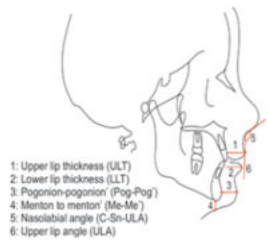

Fig:5- Soft tissue structures

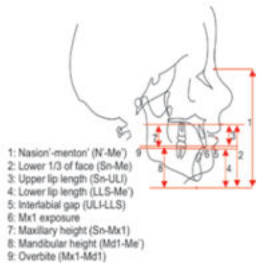

Fig:6- Facial lengths

STATISTICAL ANALYSIS:

Double Determination for assessment of inherent error in measurement to check the accuracy in the measurements. The obtained data was fed into the computer and statistical analysis was done for the same using the software "Statistical Package for Social Sciences" SPSS for windows (version 15.0) and analysed accordingly.

TABLES

Table 1 :Descriptive and gender comparison for Arnett's soft tissue parameters part I

Parameters	Gender	Mean	Std. Deviation	Std. Error Mean	t value*	p value
MxOP-TVL	MALE	93.16	2.40	0.24	0.00	1.00
	FEMALE	93.16	2.40	0.24		
Mx1-OP	MALE	55.52	2.83	0.28	0.00	1.00
	FEMALE	55.52	2.83	0.28		
Md1-OP	MALE	66.10	3.91	0.39	0.00	1.00
	FEMALE	66.10	3.91	0.39		
OJ	MALE	2.54	1.13	0.11	-0.14	0.89
	FEMALE	2.56	1.03	0.10		
OB	MALE	2.40	1.04	0.10	-0.24	0.81
	FEMALE	2.43	1.00	0.10		
ULT	MALE	11.75	1.86	0.19	-0.41	0.69
	FEMALE	11.85	1.63	0.16		
LLT	MALE	13.77	2.01	0.20	0.00	1.00
	FEMALE	13.77	2.01	0.20		
Pg-Pg□	MALE	11.71	1.44	0.14	0.00	1.00
	FEMALE	11.71	1.44	0.14		
Me-Me□	MALE	6.67	1.91	0.19	-1.06	0.29
	FEMALE	6.93	1.65	0.17		
NLA	MALE	100.89	7.91	0.79	0.00	1.00
	FEMALE	100.89	7.91	0.79		
ULA	MALE	11.82	3.71	0.37	-0.19	0.85
	FEMALE	11.92	3.59	0.36		
Na□-Me□	MALE	123.52	7.38	0.74	-0.48	0.63
	FEMALE	124.16	11.04	1.11		
ULL	MALE	22.20	2.04	0.20	0.00	1.00
	FEMALE	22.20	2.04	0.20		
ILG	MALE	2.10	0.57	0.06	0.00	1.00
	FEMALE	2.10	0.57	0.06		
LLL	MALE	42.01	5.24	0.52	-0.13	0.89
	FEMALE	42.11	5.11	0.51		
L1/3rd	MALE	67.65	5.45	0.55	-0.35	0.73
	FEMALE	67.90	4.81	0.48		
OB	MALE	2.36	0.73	0.07	0.00	1.00
	FEMALE	2.36	0.73	0.07		
Mx1Expsr	MALE	2.88	1.23	0.12	0.00	1.00
	FEMALE	2.88	1.23	0.12		

*independent t test

Table 1: Illustrates descriptive and gender comparison for Arnett's soft tissue parameters which showed difference among the gender for OJ, OB, ULT, Me-Me□, ULA, Na□-Me□, LLL, L1/3rd but it is found to be statistically non-significant (p>0.05) using independent t -test

Table 2: Descriptive and gender comparison for Arnett's soft tissue parameters part II

Parameters	Gender	Mean	Std. Deviation	Std. Error Mean	t value*	p value
Mxht	MALE	24.06	2.75	0.28	0.00	1.00
	FEMALE	24.06	2.75	0.28		
Mdht	MALE	47.00	4.56	0.46	0.03	0.98
	FEMALE	46.98	4.59	0.46		
G□-TVL	MALE	9.92	2.31	0.23	0.00	1.00
	FEMALE	9.92	2.31	0.23		
OR□-TVL	MALE	24.60	3.18	0.32	0.00	1.00
	FEMALE	24.60	3.18	0.32		
CB□-TVL	MALE	25.91	2.84	0.28	0.00	1.00
	FEMALE	25.91	2.84	0.28		
SP-TVL	MALE	18.41	2.60	0.26	0.00	1.00
	FEMALE	18.41	2.60	0.26		
AB□-TVL	MALE	13.98	2.61	0.26	0.00	1.00
	FEMALE	13.98	2.61	0.26		
NP□-TVL	MALE	13.07	1.61	0.16	0.00	1.00
	FEMALE	13.07	1.61	0.16		
SN-TVL	MALE	0.00	.000[a]	0.00	0.00	1.00
	FEMALE	0.00	.000[a]	0.00		
A□-TVL	MALE	1.00	0.45	0.05	-0.36	0.72
	FEMALE	1.03	0.52	0.05		
ULA-TVL	MALE	2.56	0.99	0.10	0.00	1.00
	FEMALE	2.56	0.99	0.10		

Mx1-TVL	MALE	10.67	1.89	0.19	0.12	0.90
	FEMALE	10.64	1.93	0.19		
Md1-TVL	MALE	13.41	2.49	0.25	0.00	1.00
	FEMALE	13.41	2.49	0.25		
LLA-TVL	MALE	1.55	0.68	0.07	0.00	1.00
	FEMALE	1.55	0.68	0.07		
B□-TVL	MALE	7.62	2.48	0.25	-0.39	0.70
	FEMALE	7.75	2.30	0.23		
Pg□-TVL	MALE	3.24	1.72	0.17	-0.10	0.92
	FEMALE	3.26	1.80	0.18		

*independent t test

Table 2 illustrates descriptive and gender comparison for Arnett's soft tissue parameters which showed difference among the gender for Md ht, A□-TVL, Mx1-TVL, B□-TVL and Pg□-TVL but it is found to be statistically non-significant (p>0.05) using independent t -test.

Table 3: Descriptive and gender comparison for Burstone's soft tissue parameters

Parameters	Gender	Mean	Std. Deviation	Std. Error Mean	t value*	p value
FCA	MALE	13.21	3.81	0.38	0.00	1.00
	FEMALE	13.21	3.81	0.38		
Mx.Progn	MALE	6.27	2.31	0.23	0.00	1.00
	FEMALE	6.27	2.31	0.23		
Md.Progn	MALE	2.28	1.60	0.16	0.32	0.75
	FEMALE	2.35	1.76	0.18		
VH Ratio	MALE	0.89	0.25	0.03	0.00	1.00
	FEMALE	0.89	0.25	0.03		
LFTA	MALE	100.58	3.70	0.37	0.00	1.00
	FEMALE	100.58	3.70	0.37		
LVHD Rto	MALE	1.07	0.20	0.02	0.00	1.00
	FEMALE	1.07	0.20	0.02		
NLA	MALE	98.11	8.10	0.81	1.77	0.08
	FEMALE	96.04	8.42	0.84		
ULP	MALE	1.96	1.17	0.12	0.00	1.00
	FEMALE	1.96	1.17	0.12		
LLP	MALE	1.82	1.43	0.14	0.00	1.00
	FEMALE	1.82	1.43	0.14		
MS	MALE	3.70	1.73	0.17	0.00	1.00
	FEMALE	3.70	1.73	0.17		
VLC Ratio	MALE	0.50	0.18	0.02	0.00	1.00
	FEMALE	0.50	0.18	0.02		
MI Expsr	MALE	2.30	1.01	0.10	0.00	1.00
	FEMALE	2.30	1.01	0.10		
ILG	MALE	1.93	0.62	0.06	0.00	1.00
	FEMALE	1.93	0.62	0.06		

*independent t test

Table 3 illustrates descriptive and gender comparison for Burstone's soft tissue parameters showed difference among the gender for Md. Progn and NLA but it is found to be statistically non-significant (p>0.05) using independent t -test.

Table4: Descriptive and gender comparison for Arnett's harmony soft tissue parameters

Parameters	Gender	Mean	Std. Deviation	Std. Error Mean	t value*	p value
Md1-Pg□	MALE	9.21	2.31	0.23	0.00	1.00
	FEMALE	9.21	2.31	0.23		
LLA-Pg□	MALE	4.41	2.03	0.20	0.00	1.00
	FEMALE	4.41	2.03	0.20		
B□-Pg□	MALE	3.02	1.03	0.10	0.32	0.75
	FEMALE	3.02	1.03	0.10		
TNP-Pg□	MALE	60.03	4.75	0.48	0.00	1.00
	FEMALE	60.03	4.75	0.48		
SN-Pg□	MALE	3.70	1.41	0.14	0.00	1.00
	FEMALE	3.70	1.41	0.14		
A□-B□	MALE	5.87	1.57	0.16	0.00	1.00
	FEMALE	5.87	1.57	0.16		
ULLA-LLA	MALE	3.07	1.38	0.14	-0.06	0.95
	FEMALE	3.08	1.49	0.15		
OR□-A□	MALE	2.20	0.70	0.07	-0.18	0.86
	FEMALE	2.22	0.70	0.07		
OR□-Pg□	MALE	18.74	2.52	0.25	0.00	1.00
	FEMALE	18.74	2.52	0.25		
FA	MALE	168.18	4.20	0.42	0.00	1.00
	FEMALE	168.18	4.20	0.42		
G□-A□	MALE	7.92	1.56	0.16	0.00	1.00
	FEMALE	7.92	1.56	0.16		
G□-Pg□	MALE	4.19	1.14	0.11	0.00	1.00
	FEMALE	4.19	1.14	0.11		

*independent t test

Table 4 illustrates descriptive and gender comparison for Arnett's harmony soft tissue parameters which showed difference among the gender for B□-Pg□, OR□-A□ and ULLA_LLA but it is found to be statistically non-significant (p>0.05) using independent t –test.

DISCUSSION:

"The Burstone's Soft Tissue Analysis"

The findings are discussed under facial form and lip position. A constructed horizontal reference plane was used in the analysis because of the arbitrary nature of reference planes. This plane was constructed through the Nasion 7° up from the Sella–Nasion line. The Facial Form (including 2 angular measurements, 2 linear measurements and 2 ratios) and the Lip position (including 6 linear measurements, 1 angular measurement and 1 ratio).

"Arnett's Soft Tissue Analysis"

OJ in this study it is 2.54±1.13mm in males and 2.56±1.03mm in females (Table-1) with slight difference between males and females but is statistically non-significant. This is in contrast to study conducted by Cheng et al[7] with the linear findings smaller in females than males. Similar results were found in the study conducted by Uysal et al[6]

OB in this study it is 2.40±1.04mm and 2.43±1.00mm in males and females (Table-1) with slight difference but is statistically non-significant. This is in contrast to study conducted by Cheng et al[7] with the linear findings smaller in females than males. Similarly the study conducted by Flynn et al[17]

ULT in this study it is 11.75±1.86mm in males and 11.85 ±1.63mm in females (Table-1) with slight difference between the two but is statistically insignificant. This is contrary to the study conducted by Uysal et al[6]. And also from the study conducted by Cooke et al[9]

Me-Me□ in this study it is 6.67±1.91mm in males and 6.93 ±1.65mm in females (Table-1) with slight difference between the two which is statistically insignificant. Similar results were seen in the study conducted by Kalha et al[10] and Sinojiya et al[11] with statistically insignificant difference between the two groups. This is in contrast to the study conducted by Uysal et al[6]

ULA in this study it is 11.82±3.59° in males and 11.92±3.59° in females (Table-1) with slight difference seen between the two groups but is statistically insignificant, which is in contrast to the study conducted by Uysal et al[6]. Studies conducted by Sinojiya et al[11] and Kalha et al[10] are accordance to our study.

L1/3rd in this study it is 67.65±5.45mm in males and

67.90±4.81mm in females (Table-1) with slight difference between the two which is statistically non-significant. This is in contrast to the study conducted by Sinojiya et al[11]. Similar results were seen in the study conducted by Kalha et al[10], Upadhyay et al[12], Hideki et al[13] and Wu JYC et al.[14]

Md1-TVL in this study it is -13.41±2.49mm in males and -13.41±2.49mm in females (Table-2) with no statistically significant difference between the two. This is in accordance to the study by Kalha et al[10], Sinojiya et al[11] and Uysal et al.[6]

Pg□-TVL in this study it is 3.24±1.72mm in males and 3.26±1.80mm in females (Table-2). No statistically significant difference is seen. This is in accordance to the study by Kalha et al[10], Sinojiya et al[11] and Uysal et al.[6]

NLA in this study it is 98.11±8.10° in males and 96.04±8.42° in females (Table-4). Slight difference is seen in the two groups but is statistically non-significant. It is lesser in the North Indian population. Also in accordance to the study conducted by Lew et al[15] with less obtuse angle in Chinese population. Also in contrast to the study conducted by Hashim et al[16]

CONCLUSION:

- Cephalometric norms using Arnett's and Burstone analysis were established for North Indian population.
- Intergroup comparison depicted slight difference in NLA, OR'-Pg', Pg'-TVL, Na'-Me', OJ and OB which are not statistically significant.
- Mild retrusion of incisors with upper and lower lip fullness is an acceptable treatment outcome.

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