

Lip Prominence Using Different Reference Planes

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ABSTRACT

Introduction: Facial beauty lies on lip prominence which in turn is the reflection of dental and skeletal relation of the jaws beside the lip morphology. Thus, orthodontist has control over lip prominence to enhance beauty by altering skeletal and dental relation. Hence analyzing lip prominence is essential for the success of orthodontic treatment. The aim of the present study is to determine lip prominence using different reference planes and secondly to assess sexual differences in lip prominence.

Materials & Method: lateral cephalograms of 43 (23 males and 20 females) Brahmins aged 18 - 27 years were collected. They were having dentally: Angle's Class I molar and canine relation with normal overjet and overbite and skeletally: normal jaw relationship, symmetric face with acceptable facial profile, without craniofacial abnormalities. Linear distance was measured in lateral cephalograms from most prominent point of the lip to reference planes of different analysis system. Comparative test was conducted within Brahmins to check gender diversity at significance level $p \leq 0.05$.

Result: Comparison of lip prominence of male and female Brahmins were found to have no statistically significant differences except for the upper lip to Burstone B line ($p \leq 0.05$) and lower lip to Holdaway H line ($p \leq 0.05$). When means of males and females were compared males were found to have more protrusive lips.

The Result of this study indicates protrusive lips of Brahmins compared to the established norms of Caucasians as analyzed with reference plane of different analysis system namely Ricketts, Steiners and Burstones. Sushners analysis showed retrusive lips indicating retrusive lips of Brahmins as compared with Black population.

Conclusion: During orthodontic treatment planning lip prominence should be emphasized based on gender and ethnicity.

Keywords: lip prominence, soft tissue analysis.

INTRODUCTION

Analysis of orthodontic treatment focuses on lip prominence along with hard tissue analysis.¹ A paradigm shift from hard tissues to soft tissues has been realized in the recent years due to the fact that the dental and skeletal corrections are eventually reflected upon the overlying soft tissue drape.² For the purpose many analysis has been put forward like Ricketts E line, Steiners S line, Burstones B line, Holdaways H line and Merrifields Z angle.³ Later as the analysis was performed in different ethnic groups, ethnic diversity has been proven as in Sushners Su line in Black population.⁴ Greater ethnic differences in soft tissue relationship than in skeletal and dental relationship has been reported.⁵ Knowing the Brahmins lip prominence with reference to different reference planes holds the clinical value for orthodontic treatment planning.

MATERIALS AND METHOD

Ethical approval was obtained from the Institutional Review Board (IRB - IOM). Radiographs taken were in natural head position with maximum intercuspation and lips in light contact.^{6,7}

Cephalometric Method

Using tools as 0.003 inches thick matte acetate tracing paper, 0.5 micro tipped pencils, intense light of view box, soft tissue landmarks was outlined manually. For better visualization of the soft tissues, cardboard is used to mask the radiopaque area.³ Their names were blinded to prevent researcher bias. Soft tissue landmarks was localised and the linear distance from the most prominent point in the outline of the lip to the reference lines of different analysis system namely Steiners, Ricketts, Burstone, Sushner, Holdaway and Merrifield Z angle was measured using the measuring scale and protractor nearest to 0.5 mm. Lip position ahead of the line was considered as positive and behind as negative. Landmarks were relocalised and average of differences was considered. Definition of landmarks and the reference planes are presented in table 1 and 2. Different reference lines of the study are presented in figure 1.

Statistical Analysis

Intraobserver variation in measurements performed in a week interval was statistically analyzed using



Figure 1: Reference Planes and Angle

Table 1. Cephalometric Landmarks⁸

No.	Landmarks	Description
1	Nasion Ns	The point of deepest concavity of the soft tissue contour of the root of the nose
2.	Pronasal Ps	The most prominent point of the nose
3.	Subnasal Sn	The point where the lower border of the nose meets the outer contour of the upper lip
4.	Labrale superius Ls	The median point in the upper margin of the upper membranous lip
5.	Labrale inferius Li	The median point in the upper margin of the lower membranous lip
6.	Soft tissue Pogonion Pog	The most prominent point on the soft tissue contour of chin
7.	Porion Po	The superior most point of external auditory meatus
8.	Orbitale Or	Inferior most point of inferior orbital rim

Table 2. Reference Planes and Z Angle^{2, 3, 9}

No.	Name	Description
1.	Steiners Line	Line from soft tissue pogonion to middle of S formed by lower border of nose
2.	Ricketts Line	Line from tip of the nose to pogonion
3.	Burstone Line	Line from subnasal to soft tissue pogonion
4.	Sushner Line	Line from soft tissue to nasion to soft tissue pogonion
5.	Holdaway Line	Line from upper lip to soft tissue pogonion
6.	Z Angle	Angle formed by soft tissue pogonion to most procumbent lip with FH plane

students “t” test. Descriptive statistics were drawn from the quantitative data for each variables using IBM-SPSS (Statistical Package for Social Science) version 20. Comparison of male and female within the group is performed with Mann-Whitney U Test at significance level 0.05. Coefficient of variation for different reference lines was performed to analyze which reference plane has lesser flexibility of data.⁶

RESULT

Intraobserver variation in measurements performed for 20 lateral cephalograms in a week interval was statistically

not significant. The established norms of different analysis system, descriptive statistics of male and female Brahmins and their statistical comparison is presented in table 3.

Linear distance, Labrale superius to Burstone B line of male Brahmins was significantly greater ($p \leq 0.05$) than the Female Brahmins. Linear distance from Labrale Inferius to Holdaway H line was significantly greater ($p \leq 0.05$) in females than males. Lip prominence with other reference planes though greater is not statistically significant.

Among different reference lines Coefficient of variation is found to be least with Sushners reference plane (32.49

Table 3. Descriptive Statistics of Male and Female Brahmins and their Statistical Comparison

Measurements	Norms Male (23)		Male (23)				Female (20)				Test		
			Mean	SD	Min	Max	Mean	SD	Min	Max	Diff	p Value	Sig
Steiner													
S Line													
UL	0	mm	0.130	1.180	-3	2	-0.650	1.565	-3	2	-0.780	0.116	NS
LL	0	mm	0.870	1.546	-2	4	0.700	2.250	-3	5	-0.170	0.457	NS
Ricketts													
E Line													
UL	-4	mm	-2.910	3.554	-10	6	-4.600	2.563	-9	0	-1.687	0.138	NS
LL	-2	mm	-1.150	2.703	-7	4	-1.850	2.739	-6	3	-0.698	0.405	NS
Burstone													
B Line													
UL	3.500	mm	4.040	1.397	1	6	3.100	1.210	1	5	-0.943	0.021	S *
LL	2.200	mm	3.570	2.019	0	7	3.100	2.150	-1	7	-0.465	0.474	NS
Holdaway													
H Line													
LL	0	mm	0.090	1.125	-1	3	0.950	1.395	-1	4	0.863	0.030	S *
Sushner													
Su Line													
UL	9.050	mm	9.610	2.856	5	15	8.350	2.943	4	13	-1.259	0.214	NS
LL	7.250	mm	6.910	2.448	3	10	6.250	2.863	1	11	-0.663	0.415	NS
Merrifield													
Z Angle	80	Deg	73.700	7.112	60	84	76.600	7.556	63	90	2.904	0.311	NS

UL – Upper Lip, LL – Lower Lip, S – Significant, NS – Not Significant, p – Probability * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

% upper lip / 39.94% lower lip) indicating least amount of flexibility of data with this reference plane.

DISCUSSION

Lip prominence is the reflection of skeletal and dental relation beside the influence of the soft tissue drape of the lip.² Lateral cephalograms collected for this study were of individuals having skeletally and dentally normal relation with acceptable facial profile.⁵ Hence the sample of this study were of individuals having normal anteroposterior and vertical dimension. Lateral cephalograms were taken in maximum intercuspation with lips in light contact which allows less muscular stress and is also most commonly presented lip posture in public.⁶

The age of our sample lies between 18-27 years so values obtained in this analysis are applicable for adults. Lips are most prominent during adolescent due to increase in its thickness and decreases with age. Due to thinning of the lips with age, fuller lips should be preferred during treatment planning.¹⁰⁻¹²

Ricketts E line (-2.91 male / -4.60 female upper lip) (-1.15 male / -1.85 female lower lip), Steiners S line (0.13 male /

-0.65 female upper lip) (0.87 male / 0.70 female lower lip), Burstones B line (4.04 male / 3.10 female upper lip, $p \leq 0.05$) (3.57 male / 3.1 female lower lip) Sushners Su line (9.61 male / 8.35 female upper lip) (6.91 male / 6.25 female lower lip) indicated prominent upper and lower lips in males compared to females. In Holdaway H line where lower lip is compared in reference to upper lip females were found to have more protrusive lower lip than males (0.09 male / 0.95 female lower lip $p \leq 0.05$). In Merrifields Z angle where the reference line lies in the most prominent lip indicated prominent lip in males than females (73.7 male / 76.6 female). Here the reference line passes through the prominent upper lip in case of males and prominent lower lip in case of females. This indicates that though the lower lip is more prominent in females compared to upper lip, it is less prominent than that of male lips.

Greater thickness of lips in males could be the contributing factor for the prominent lips in male Brahmins.¹³ Pogonion to nasion perpendicular which signifies the chin position indicates posteriorly positioned chin in male Brahmins than female Brahmins, could be the contributing factor for females to have prominent lower lips than males.¹⁴ The five

reference planes of this analysis has one of their location in the chin. Preference of lip prominence in reference to chin position has been observed in earlier studies.¹⁵

Brahmins lip prominence was found to be greater compared to established norms given by Ricketts, Burstone and Holdaway, which could be due to dentoalveolar protrusion in Brahmins compared to Caucasians.¹⁴ These findings are supported by Merrifield's Z angle (80 Caucasians and 75 in an average for Brahmins). Lip prominence in Brahmins were found to be lesser compared to Blacks as shown by Sushner's analysis (9.61 male / 8.35 female upper lip) (6.91 male / 6.25 female lower lip). Here again lip thickness, nasal inclination and chin prominence may play a role in lip prominence bringing ethnic diversity.⁴

One of the most important measurements while deciding extractions is the lip prominence in comparison with the standardized peer group. Hence the values obtained in this study has clinical application.¹⁶

Least coefficient of variation meaning lesser flexibility of data in Sushner's Su line (upper lip 32.49%, lower lip 39.94%) could be because this line among others lies closest to

the skeletal structures. Beside this line is not influenced by individual variation of nose inclination and chin prominence.⁶

Caucasians prefer fuller lips and African American prefer flatter lips than the norms of that race indicating attractive face may not necessarily follow norms of the race. The study samples are of individuals with acceptable facial profile. Preference of facial profile may or may not match the norms achieved in this group. Further study regarding preference of lip prominence can be performed so as to find out whether the attractive group falls under the established norms from this study.¹⁷

CONCLUSION

Brahmin males with prominent lips than Brahmin females presented sexual dimorphism. Upper and lower lip prominence was found to be different than the established norms in reference to different reference planes. Hence there is a need for standardized comparison with the peer group for orthodontic diagnosis and treatment planning.



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