

TO EVALUATE THE APPLICABILITY OF HOLDAWAY'S  
SOFT TISSUE NORMS AMONGST DIFFERENT  
MALOCCLUSIONS IN AMRITSAR POPULATION

## ABSTRACT:

Soft tissue paradigm determines the goals and limitations of modern orthodontic treatment. The study of soft tissue norms becomes imperative for achieving aesthetic goals. The racial variations play a key role for applicability of norms in different populations. Since Angle's Class II Division 2 and Division 1 are commonly reported in Amritsar population, present study focuses on studying soft tissue norms in Amritsar population among Class I and Class II (div1 and div2) malocclusions.

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## INTRODUCTION

In twentieth century, orthodontic treatment plan was primarily based on Angle's paradigm, in which primary goal was achieving ideal occlusion and the ideal jaw relationship was secondary. According to Angle's paradigm, achieving ideal hard tissues proportions would produce ideal soft tissues.<sup>1</sup>

However, in modern orthodontics, this concept has been replaced by soft tissue paradigm, which states that both the goals and limitation of modern orthodontics and orthognathic treatment are determined by the soft tissues of the face and not by the teeth or bones and ideal soft tissues proportions define ideal hard tissue.

Most people seek orthodontic treatment with aesthetics as

a prime consideration, which has led to a shift of focus to achieve balanced soft tissue relationship and adjust teeth and jaws accordingly.

For comprehensive diagnosis and treatment planning, cephalometric soft tissue analysis is essential.<sup>3</sup> Orthodontists may not reach all the desired soft tissue goals but the adaptation of facial tissues to underlying skeletal discrepancy holds significance among different races. The cephalometric values for soft tissue keep varying from one ethnic group to other. The racial groups must be treated according to their own characteristics. The goals and adaptation for soft tissue also varies as per the underlying skeletal pattern and on basis of based on gender..

Based on ethnic and racial variations, cephalometric soft

Table 1: Skeletal Cephalometric values

CEPH VALVE	CLASS 1		CLASS II DIV 1		CLASS II DIV 2	
	MEAN	SD	MEAN	SD	MEAN	SD
SNA	82	1.89	82.03	12.67	80.70	16.26
SNB	79.78	1.65	76.11	11.79	76.29	10.08
ANB	2.22	1.38	5.76	8.45	4.41	7.15

Table 2 : Holdaway soft tissue variables of Angle's Class I Malocclusion

CLASS 1	MAXIMUM	MINIMUM	MEAN	SD
SOFT TISSUE FACIAL ANGLE	97	77	90.4	45.9
NOSE PROMINENCE	19	9	12.08	37.6
SUPERIOR SULCUS DEPTH	6	1	2.84	33.2
SOFT TISSE SUB NASALE TO H LINE	8	1	4.76	30.4
SKELETAL PROFILE CONVEXITY	5	0	1.72	28.4
BASIC UPPER LIP THICKNESS	19	11	15.2	26.9
UPPER LIP STRAIN MEASUREMENT	15	1	4.32	25.6
H ANGLE	24	7	15.12	24.6
LOWER LIP TO H LINE	4	-5	0.16	23.8
INFERIOR SULCUS TO H LINE	10	0	5.56	23.04
SOFT TISSUE CHIN THICKNESS	15	8	12.32	22.38

tissue norms have been studied in different populations in many studies. However, ideal occlusion has been taken a standard criteria in most studies. A higher frequency of Angle's Class II Division 2 followed by Division 1 has been reported in the region as per a previous study, thus an evaluation for soft tissue norms in these malocclusions was essential<sup>2</sup>. In view of lack of many studies in different malocclusions in north Indian population, the present study

focuses on studying soft tissue norms in Amritsar population among Class I and Class II (div1 and div2) malocclusions. The proportions of soft tissue integument of the face and relationship of the dentition to the lips and face are the major determinants of ideal facial appearance, which is the prime orthodontic goal.<sup>3</sup>

**Table 3 : Holdaway soft tissue variables of Angle's Class II Division 1 Malocclusion**

CLASS II DIV 1	MAXIMUM	MINIMUM	MEAN	SD
SOFT TISSUE FACIAL ANGLE	94	83	88.88	44.8
NOSE PROMINENCE	16	1	9.19	38.8
SUPERIOR SULCUS DEPTH	8	0	3.57	34.7
SOFT TISSE SUB NASALE TO H LINE	11	1	5.69	31.8
SKELETAL PROFILE CONVEXITY	8	0	4.19	29.7
BASIC UPPER LIP THICKNESS	20	12	15.73	27.9
UPPER LIP STRAIN MEASUREMENT	5	-10	-4.96	20.6
H ANGLE	32	17	23.84	25.7
LOWER LIP TO H LINE	4	-5	-0.34	22.7
INFERIOR SULCUS TO H LINE	10	4	6.76	23.9
SOFT TISSUE CHIN THICKNESS	14	8	10.65	23.1

#### MATERIAL AND METHOD

The study was carried out in the department of Orthodontics and Dentofacial Orthopaedics, Sri Guru Ram Das Institute of Dental Sciences and Research, Sri Amritsar. A sample consisting of 75 cephalometric radiographs from both genders and age group 15 to 30 years with pleasing profile from records. These included 25 with Angle's Class I, 25 with was taken Angle's Class II Division 1 and 25 with Angle's Class II Division 2 malocclusion. During sample selection, the radiographs of Class III, cleft lip/cleft palate and syndrome were excluded from the study.

The selection criteria for Class I included pleasing soft tissue profile, bilateral Angle's Class I molar relationship, normal overjet and overbite, well aligned maxillary and mandibular arches with <2mm crowding or spacing, no congenitally missing teeth, congenital anomalies or facial asymmetry, no missing teeth (except 3<sup>rd</sup> molar).

The selection criteria for Class II Division 1 included bilateral Class II molar relationship with proclined maxillary incisor teeth (atleast two incisors), ANB>4°, no congenitally missing teeth, congenital anomalies or facial asymmetry, no missing teeth(except third molars).

The selection criteria for Class II Division 2 included bilateral Class II molar relationship with retroclined maxillary incisor teeth (atleast two incisors), ANB>4°, no congenitally missing teeth, congenital anomalies or facial asymmetry, no missing teeth(except third molars).

Analysis: Each cephalogram was traced and soft tissue values were recorded.

#### RESULTS

The various measurements made on the sample are compiled in Table 1, 2, 3 and 4.

**Table 4: Holdaway soft tissue variables of Angle's Class II Division 2 Malocclusion**

CLASS II DIV 2	MAXIMUM	MINIMUM	MEAN	SD
SOFT TISSUE FACIAL ANGLE	93	85	89.08	41.6
NOSE PROMINENCE	19	6	12.58	36.05
SUPERIOR SULCUS DEPTH	6	0	2.875	32.2
SOFT TISSE SUB NASALE TO H LINE	9	2	5.33	29.5
SKELETAL PROFILE CONVEXITY	6	0	3.04	27.5
BASIC UPPER LIP THICKNESS	18	11	15.12	25.9
UPPER LIP STRAIN MEASUREMENT	16	-4	0.54	24.6
H ANGLE	28	10	19.29	23.6
LOWER LIP TO H LINE	6	-4	1.79	22.7
INFERIOR SULCUS TO H LINE	11	4	7.33	21.9
SOFT TISSUE CHIN THICKNESS	15	9	11.58	21.2

## DISCUSSION

The first impact of any face is the soft tissue, which is the primary consideration in present day diagnosis and treatment planning. The facial skeleton and its overlying soft tissues determine facial harmony and balance.

For the assessment of patient, only cephalometric dento-skeletal analysis is not sufficient and often leads to aesthetic problems. Therefore, profile analysis for soft tissue structures and their proportions becomes imperative as a part of routine diagnosis. There have been studies done on soft tissue for different populations but the consideration of ethnic variations is important for the applicability of standard measurements in any population.<sup>4-8</sup> Due to higher frequency of Angle's Class II in the region as reported in previous study, the study for soft tissue norms in various malocclusions in Amritsar population was essential.<sup>2</sup> Thus, the present study was carried out on 75 patients with equal distribution of skeletal class I and skeletal class II div 1, div 2 to assess the soft tissue proportion in Amritsar region.

The mean values for SNA, SNB and ANB of class I patients were 82, 79.78, 2.22 degrees respectively, for class II division 1 malocclusion SNA SNB and ANB were 82.03, 76.11 and 5.76 degrees respectively and for Angle's Class II division 2 angles were 80.7, 76.29 and 4.41 degrees respectively.

A decrease of facial angle is suggestive of Class II dental and skeletal pattern. For angular measurements, the mean facial angle was found to be 90.4°, 88.8° and 89.08° respectively for Angles Class 1, Class II Division 1 and Angle's Class II Division 2 respectively. This was comparable to the values reported by Holdaway analysis, which was originally carried out for Caucasian population and in previous study on Indian population.<sup>3,4</sup>

For linear measurements, nose prominence is measured from the most prominent nasal point to the H-Line and this came out to be average 12.08mm in Class I, 9.19mm in Class II division 1 and 12.58 in Class II division 2. Upper lip thickness was found to be 15.2mm for Class I, 15.73 mm for Class II Division 1 and 15.12mm for Class II division 2. Inferior sulcus depth was found to be came out to be 5.56mm in Class I,

6.76mm in Class II division1 and 7.33mm in Class II division2. Basic upper lip thickness was reported as 15.2mm in Class I, 15.73mm in Class II division1 and 15.12mm in Class division 2. The values were in normal ranges of Holdaway (14-24 mm for nasal prominence, 15mm for upper lip thickness and  $5\pm 2$ mm for inferior sulcus depth respectively) suggesting that lip and nasal soft tissue prominence and their esthetic acceptance is similar in the population studied when compared with the results obtained in previous studies in different population groups.<sup>3,4,5</sup>

Superior sulcus depth was found to be 2.84mm in Class I, 3.57mm in Class II division1 and 2.8mm in Class II division2, which was lesser than the normal values reported in Holdaway's analysis ( $5\pm 2$ mm). The values of Lip Strain was reported as 4.32mm in Class I, -4.96mm in Class II division 1 and 0.54mm in Class II division 2. This value was reportedly higher for the Class I malocclusion group than the average values reported by Holdaway's. These are suggestive relative prominence of hard tissue with reduced sulcular depth and increased lip strain in presently studied population. The Angle's Class II Division 1 population group reported the maximum strain conferring to the integral proclination of maxillary anterior teeth.

Skeletal Profile convexity is suggestive of the skeletal relationships of the jaws. In the present study, the value for convexity was found to be 1.72 in Class I, 4.19 in Class II division1 and 3.04 in Class division 2. These are suggestive of comparative profile in the present population in comparison to the standards laid for Caucasian population (-2 to 2mm by Holdaway's analysis). Profile convexity reported was comparative lesser in Angle's Class II Division 2 in comparison to Division 1 suggestive of compensation by retroclination of anterior teeth and treatment plan must take this into account.

When recording the relation of upper lip to chin, H angle was recorded as  $15.12^\circ$  in Class I,  $23.84^\circ$  in Class II division1 and  $19.29^\circ$  in Class division 2 suggestive of a relative prominence of lip to chin in the present population. The value of lower lip to H-Line was 0.16mm in Class I, -0.34mm in Class II Division 1 and 1.79mm of Class II Division 2 malocclusion and soft tissue subnasale to H-Line value of 4.76mm for Class I, 5.69 mm for Class II Division 1 and 5.33 for Class II division 2 were in average soft tissue ranges reported for Caucasian population. (Average H-Angle  $7-15^\circ$ ,  $5\pm 2$ mm for subnasale to H-line and -1 to 2mm for lower lip to H-Line)

The soft tissue in relation to chin was recorded as chin thickness, which was found as a mean value of 12.32 mm in Class I, 10.65mm in Class II Division 1 and 11.58mm in Class II Division 2. This value was slightly higher than those reported in other studies. The least value of soft tissue chin thickness was in Angle's Class II Division 1 malocclusion suggestive of

response to the skeletal malrelation.

Thus, the present norms should be followed when diagnosing or planning treatment for any case belonging to the population studied. The study implies that ethnic and geographic population values emphasise the need for individual studies for different populations.

As the study was limited to a smaller sample, further studies are required on larger population sample to validate the norms obtained. In view of lack of adequate number of Class III patient records, further studies must include Class III population group for any variation in the malocclusion group.

#### CONCLUSION

The soft tissue norms vary for Amritsar population when compared with standards laid down for Caucasian population.

Further studies with greater sample size are required to validate the same.

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