

THE INFLUENCE OF EXTRACTION TREATMENT ON HOLDAWAY SOFT-TISSUE MEASUREMENTS IN HIMACHALI POPULATION

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KEYWORDS :

INTRODUCTION

Cephalometrics involves recording and interpretation of measurements of the skull made on standardized radiographs of the living head. Introduced by Broadbent and Hofrath in 1930s it is one of the most important tools for orthodontists in studying dental and skeletal malocclusion. Applications for cephalometric analysis include diagnosis, treatment planning, and prediction of growth and further evaluation of treatment results.¹

In modern times, soft tissue paradigm is the key factor that must be considered during the course of the orthodontic treatment. Soft tissue objectives that must be considered include whether to retract or maintain or protract upper or lower lips, mentalis strain, interlabial gap, lip competency and many other factors.²

The changes that occur in the soft tissue during the orthodontic treatment is remarkable and appreciable and plays a major role in determining the final aesthetic appearance of an individual.

Extraction of premolars during the orthodontic treatment is accompanied by changes in the soft tissue and may or may not be favorable to hard tissue retraction as per various studies.³

Lip structure depends heavily upon the underlying hard tissue, thin lips display a very significant correlation between incisor retraction and lip retraction, whereas patients with thick lips or low lip strain shows no such correlation.⁴

Although several studies have evaluated the relationship between incisor movement and soft tissue profile change but a little is known about the magnitude of soft tissue changes in pre molar extraction cases treatment and desirability of the changes.

In this study we determine the changes in soft tissue following extraction of first four premolars as determined by Holdaways analysis, possible sexual differences between pre and post treatment values and comparison of all values in between Himachali male and females and Anatolian Turkish Adults as determined by Holdaways soft tissue norms.

MATERIAL AND METHODS

The study was conducted in the Department of Orthodontics and Dentofacial Orthopaedics. 50 subjects were selected from patients visiting the department for seeking orthodontic treatment. The sample was divided into two groups based on gender (27 males & 23 females).

Lateral cephalograms were taken at the beginning of the treatment which was labeled as T1 and post treatment which was labeled as T2. Age group of the patient were in the range of 12 to 15 years and all the patients were classified as skeletal

Class I and the mean initial value for ANB was $2.25^\circ \pm 1.05$ and for the Sn-GoGn was $31.35^\circ \pm 3.60$.

The inclusion criteria for the study were as follows:-

No previous orthodontic treatment or maxillofacial surgery

No active periodontal disease and no periodontal treatment except scaling and polishing.

No craniofacial anomalies

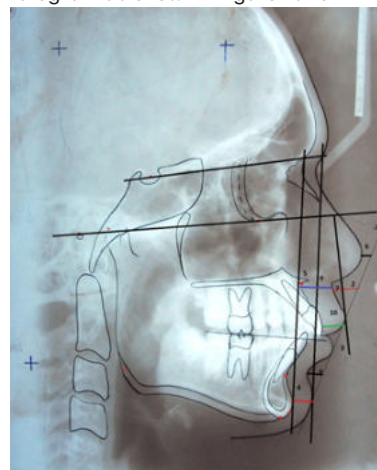
No severe malocclusion.

No canting of maxillary occlusion plane

Method Of Data Collection:

The lateral cephalogram of the subjects were taken at T1 and T2 stages, with the ear rods and the nasion pointer of the cephalostat in position in order to stabilize the patient's head and avoid excess motion.

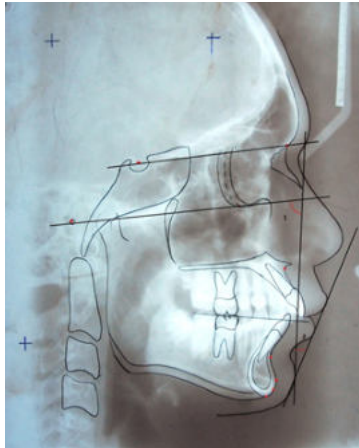
All the lateral cephalometric films were traced and all the reference points were identified, located and marked. The linear and angular measurements were then done on the lateral cephalogram as shown in figure 1 and 2



Cephalometric Linear Measurements Used (Figure 1)

1. **H line:** tangent drawn from the tip of the chin to the upper lip
2. **Measurement of soft tissue subnasale to H line:** measurement from subnasale to the H line;
3. **Lower lip to H line:** the measurement of the lower lip to the H line
4. **Soft-tissue chin thickness:** the distance between the hard and soft-tissue facial planes at the level of supra-pogonion
5. **Skeletal profile convexity:** the dimension between point A and facial line

6. **Nose prominence:** the dimension between the tip of the nose and a perpendicular line drawn to the Frankfort plane from the vermilion
7. **Upper lip sulcus depth:** the measurement between the upper lip sulcus and a perpendicular line drawn from the vermilion to the Frankfort plane
8. **Inferior sulcus to the H line (lower lip sulcus depth):** the measurement at the point of greatest convexity between the vermilion border of the lower lip and the H line
9. **Upper-lip thickness:** the dimension between the vermilion point and the labial surface of the upper incisor; and
10. **Upper-lip strain measurement:** the difference between the basic upper-lip thickness and the upper-lip thickness



Cephalometric Angular Measurements Used (figure 2)

1. **Soft tissue facial angle:** the downward and inner angle formed at a point where the sella-nasion line crosses the soft tissue and a line combining the suprapogonion with the Frankfort horizontal plane
2. **H angle:** the angle formed between the soft-tissue facial plane line and the H line

Method Error:

All measurements on the lateral cephalograms were made twice by the same examiner to minimize the error of measurements. Assessment of the intra-examiner reliability analysis was performed using Kappa statistics. The intra-examiner reliability was found to be Kappa= 0.80-1.00 (p < 0.001) which shows perfect agreement according to Landis and Koch (1997). All the measurements were obtained and statistically analysed.

RESULTS :-

The results obtained were analyzed using SPSS (Statistical Package for Social Sciences) software version 18. Independent t-tests were used to compare the measurements between male and female subjects. Spearman correlation coefficients were calculated to evaluate the associations between the variables and results were considered statically significant at p < 0.05.

Table 1: Showed The Pre And The Post Treatment Mean Values And Standard Deviations Of Holdaways Soft Tissue Measurement And Statistical Comparisons

Cephalometric variable	T1		T2		Difference (T2-T1)		P Value t-test
	Mean	SD	Mean	SD	Mean	SD	
Soft Tissue Facial Angle	86.98	2.43	87.21	2.79	0.23	2.21	p ≥ 0.05
H angle	17.67	4.31	16.66	4.10	-1.01	2.10	0.002**
Nose prominence	15.55	2.77	16.99	2.56	1.44	1.89	0.001**
subnasale – H line	5.21	1.99	5.01	1.76	0.20	1.23	0.01*

Inferior sulcus-Hline	4.60	2.10	5.10	1.87	0.50	1.10	0.013*
Lower lip –H	1.40	2.15	1.20	1.90	0.20	1.44	0.01*
Chin thickness	11.50	1.44	11.61	1.32	0.11	1.13	p ≥ 0.05
Upper lip thickness	11.10	2.12	11.99	2.01	0.80	1.66	0.001**
Skeletal profile convexity	3.11	2.32	2.89	2.11	0.22	1.89	p ≥ 0.05
Upper lip strain	2.11	1.10	1.40	1.23	0.71	1.90	0.03*
Upper lip sulcus depth	2.67	1.40	2.34	1.19	0.33	0.88	p ≥ 0.05

Table 2 & 3 Is Showing Comparison Of Mean And Standard Deviation Differences Of Cephalometric Variable Changes In Between Boys And Girls

Cephalometric variable	T1		T2		Difference (T2-T1)		P Value t-test
	Mean	SD	Mean	SD	Mean SD		
					Mean	SD	
Soft Tissue Facial Angle	84.87	2.99	84.99	3.11	0.29	0.12	p ≥ 0.05
H angle	17.23	4.22	16.99	4.10	0.24	2.45	0.044*
Nose prominence	15.87	2.89	16.78	2.46	0.93	1.89	0.020*
subnasale – H line	5.11	1.89	4.99	1.67	0.12	1.23	0.01*
Inferior sulcus-Hline	4.69	2.19	5.01	1.78	0.32	1.10	p ≥ 0.05
Lower lip –H	1.39	2.15	1.21	1.90	0.18	1.44	p ≥ 0.05
Chin thickness	11.39	1.34	11.59	1.33	0.20	1.11	p ≥ 0.05
Upper lip thickness	11.21	2.12	11.87	2.01	0.60	1.66	0.02*
Skeletal profile convexity	3.01	2.32	2.99	2.11	0.02	1.89	p ≥ 0.05
Upper lip strain	2.12	1.10	1.50	1.23	0.72	1.90	0.04*
Upper lip sulcus depth	2.59	1.45	2.39	1.16	0.20	0.88	p ≥ 0.05

Table 3

Cephalometric variable	T1		T2		Difference (T2-T1)		P Value t-test
	Mean	SD	Mean	SD	Mean SD		
					Mean	SD	
Soft Tissue Facial Angle	84.67	2.89	84.77	3.18	0.10	0.13	p ≥ 0.05
H angle	16.66	4.22	15.99	3.88	0.67	2.56	0.04*
Nose prominence	16.87	2.65	17.85	2.46	0.98	1.89	0.03*
subnasale – H line	4.88	1.65	4.32	1.34	0.56	1.11	p ≥ 0.05
Inferior sulcus-Hline	4.55	2.10	5.09	1.87	0.64	1.05	p ≥ 0.05
Lower lip –H	1.27	2.01	0.99	0.90	0.28	1.31	p ≥ 0.05
Chin thickness	10.77	1.23	11.24	1.43	0.47	1.05	p ≥ 0.05
Upper lip thickness	10.90	2.00	11.87	2.10	0.97	1.54	0.04*
Skeletal profile convexity	2.80	2.11	2.65	1.98	0.15	1.89	p ≥ 0.05
Upper lip strain	2.38	1.15	1.80	1.23	0.58	1.90	0.04*
Upper lip sulcus depth	2.30	1.45	1.90	1.16	0.40	0.87	p ≥ 0.05

Table 4: Showing The Comparison Of Pre And Post Treatment Values Of Himachali Population With The Holdaways Soft Tissue Norms Of Anatolian Turkish Adults

Cephalometric Variables	Turkish Norms (N)		Pre treatment (T1)		Post Treatment (T2)		P Value t-test	
	Mean	SD	Mean	SD	Mean	SD	N-T1	N-T2
Soft Tissue Facial Angle	87.31	8.84	87.41	3.88	87.84	3.99	p≥0.05	p≥0.05
H Angle	13.75	3.10	15.79	4.56	14.88	4.10	0.02**	0.040*
Nose prominence	18.74	3.59	17.30	2.66	19.10	2.65	NS	NS
Soft Tissue subnasale to h line	5.12	3.33	5.90	2.10	5.40	1.70	NS	NS
Inferior sulcus to H line	6.2	2.3	4.80	2.10	5.24	1.91	0.003**	NS
Lower lip to H line	0.03	1.90	1.46	1.90	1.10	1.20	0.001**	0.003*
Chin thickness	12.95	2.10	11.56	1.63	11.85	1.62	0.004**	0.006*
Upper lip thickness	13.96	2.7	12.22	2.25	12.90	2.31	0.001**	NS
Skeletal Profile convexity	-0.21	2.30	3.12	2.54	2.81	2.45	0.001**	0.002*
Upper lip strain	2.68	2.39	2.49	1.56	1.34	1.99	NS	0.01*
Upper lip sulcus depth	2.97	1.50	2.76	1.10	2.60	1.22	NS	NS

DISCUSSION:-

In research studies have been conducted that shows correlation in between lip retraction and extraction and several other studies combine data on extraction versus non extraction treatment protocol.

In this study we have evaluated the influence of extraction treatment on soft tissue profile of the patient according to the Holdaways Soft Tissue Measurements and comparison in between the two sexes.

Our study showed that the soft tissue facial angle showed a slight increase in between the two phases of the treatment indicating that during the treatment this angle changed favorably because of the growth and treatment effect which was in accordance with the study done by **Basciftci and Uysal T⁴**.

H line angle usually measures the prominence of the upper and lower lip with respect to H line as per Holdaways method, in our study the value decreases with p value <0.001 (Table I) . This indicates the protrusion or the prominence of the upper and lower lip decreases after extraction which is in accordance with the study conducted by **Jim Bokas** and **Kocadereli⁵** stating that change in value is because of change in position of maxillary mandibular denture bases followed by soft tissue⁵

Nose prominence in Holdaways is measured by extending the H line and measuring the tissue beyond the line, according to Holdaways the 12mm nose prominence is the measured value and in our study the prominence of nose increases with p <0.001 after extracting the premolars as lip follows the hard tissue support hence increasing the prominence of nose which is in accordance with the study conducted by **Jim Bokas** .

In our study the upper lip thickness increased followed by extraction, **Anderson et al⁶** also reported the same finding which is also in accordance with the study conducted by **Holdaways** stating that retraction of upper incisors leads to an increase in lip thickness and which further leads to

decrease in lip strain. The soft tissue chin thickness was increased after the orthodontic treatment this is because it is closely related to the degree of prognathism of the chin symphysis and in all the cases the distribution of soft tissue of the chin over the symphysis changed as the teeth were moved this was in accordance with the study conducted by **Ruchi Nanda.⁷**

Table ii and iii showed the comparison of values in between males and females and Similar to our study, some researchers have highlighted the importance of sex on soft tissue thickness (**Chaconas & Bartroff, 1975; Kurkcuglu et al.** In addition, the thickness of the upper lip was greater in men than women in our study and in previously reported studies performed on different a ethnic group which was in accordance to the study conducted by **Zekiye Karaca et al.⁸**

Further It was found that the overall soft tissue chin thickness increased after orthodontic treatment. The females had less increase at all levels than the males which were in accordance with the study conducted by **Nanda et al.⁷**

Table IV showed us the comparison of pre and post treatment values of Himachali population with the Holdaways Soft Tissue Norms of Anatolian Turkish Adults and according to which chin thickness, nose prominence and upper lip thickness was greater in Turkish adults as compared to Himachali population.

CONCLUSION :

Based on the present study, it was concluded that statistically significant differences were found between the participants of Himachali ethnic population and Anatolian Turkish Adults populations. Differences were also found between the Himachali males and females.

- The H line angle decreases after extraction hence indicating the protrusion or the prominence of the upper and lower lip decreases
- Nose prominence increases after extraction as lip follows the hard tissue support.
- soft tissue chin thickness was increased after the orthodontic treatment
- In addition, the thickness of the upper lip was greater in men than women in our study and the overall soft tissue chin thickness increased after orthodontic treatment and The females had less increase at all levels than the males which were in accordance with the study

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