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RESEARCH ARTICLE

CHANGES IN FACIAL PROFILE ON TREATMENT WITH EXTRACTION OF FIRST PREMOLARS

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ABSTRACT

Purpose: This retrospective study aimed at determining the changes in facial profile of patients undergoing first four premolar extraction treatment through cephalometry as determined by Holdaway Analysis and compare the soft tissue norms with findings in Indian adults.
Study design: A retrospective cephalometric study
Material and Methods: Pre-and Post-extraction treatment lateral cephalograms of 30 patients selected from Department of Orthodontics, KVG Dental College, Sullia, were evaluated. All the patients included in the study underwent first four premolar extraction treatment. Various soft tissue measurements of pre and post extraction lateral cephalogram were compared to the Holdaway soft-tissue norms of Indian adults.
Results: On comparing the pretreatment values to that of post treatment, there was decrease in upper lip curvature, skeletal convexity at point A and upper sulcus depth, reduction in H lingle angle and upper lip strain whereas nose tip to H line, lower sulcus depth and soft tissue thickness increased. Our study showed there is an effect of first premolar extraction on facial profile.

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INTRODUCTION

One of the main goals of orthodontic treatment are aesthetic benefits, the awareness of which has increased over recent years (Conley) (Conley, 2006). The study of harmony in facial profile in orthodontics practice has been a priority (Basciftci *et al*., 2004). 2 A new era in orthodontics began with the introduction of cephalometer by Broadbent in 1931 (Broadbent, 1931). Cephalometric analyses can help the Orthodontist in determining the changes associated with growth and/or treatment and also in establishing in dentofacial relationships (Bishara, 1985). The changes in soft-tissue profile that occur during treatment play a significant role in diagnosis and future treatment planning process (Park, 1989). Investigations indicate that changes in soft tissue profile donot respond favourably to hard tissue retraction following premolar extractions (Case, 1964; Burstone, 1967; Garner, 1974; Hershey, 1972; Neger, 1959; Rudee, 1964).

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There is a general agreement that premolar extraction can influence the facial profile, but there is a still continued concern over desired magnitude of soft tissue response. Based on these points the study aims at determining the changes in facial profile of patients undergoing first four premolar extraction treatment through cephalometry as determined by Holdaway Analysis and compare the soft tissue norms with findings in Indian adults.

MATERIALS AND METHODS

In this retrospective study, lateral cephalograms of Pre-extraction treatment (T1) and Post-extraction treatment (T2) of 30 patients were selected from Department of Orthodontics, KVG Dental College, Sullia, were evaluated. The mean age group was 15 (ranging from 11 to 18 years of age). Mean treatment time was 36 months (ranging from 24 to 48 months). All sample included in the study underwent first four premolar extraction treatment. The orthodontic mechanics included fixed edgewise appliance with 0.022" x 0.022" slot brackets, initial arch with 0.014" nickel titanium followed by 0.019" x 0.025" steel arch was used. Residual spaces were closed using sliding mechanics.

Additional inclusion criteria

Pre- and post extraction lateral cephalogram were obtained in centric occlusion as per Broadbent's technique, with lips at rest. The cephalometric measurements were obtained by tracing of each radiograph manually. Following linear and angular measurements were demarcated as per Holdaway analysis.

- H line: tangent drawn from the tip of the chin to the upper lip;
- 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;
- Measurement of soft tissue subnasale to H line: measurement from subnasale to the H line;
- Lower lip to H line: the measurement of the lower lip to the H line;
- H angle: the angle formed between the soft-tissue facial plane line and the H line;
- Soft-tissue chin thickness: the distance between the hard and soft-tissue facial planes at the level of supra-pogonion;
- Skeletal profile convexity: the dimension between point A and facial line;
- Nose prominence: the dimension between the tip of the nose and a perpendicular line drawn to the Frankfort plane from the vermillion;
- Upper lip sulcus depth: the measurement between the upper lip sulcus and a perpendicular line drawn from the vermillion to the Frankfort plane;
- Inferior sulcus to the H line (lower lip sulcus depth): the measurement at the point of greatest convexity between the vermillion border of the lower lip and the H line;
- Basic upper-lip thickness: the dimension measured approximately three mm below point A and the drape of the upper lip;
- Upper-lip thickness: the dimension between the vermillion point and the labial surface of the upper incisor
- Upper-lip strain measurement: the difference between the basic upper-lip thickness and the upper-lip thickness.

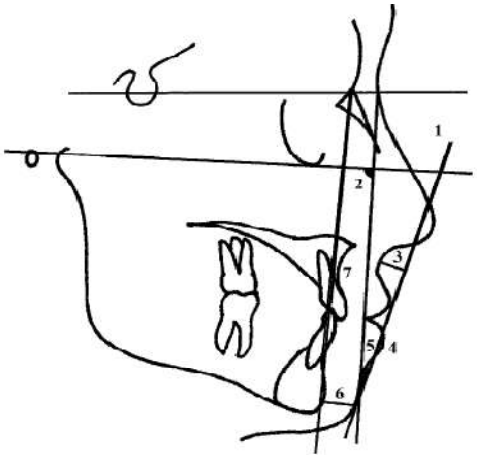

Figure 1. Cephalometric measurements: 1, H line; 2, Soft tissue facial angle; 3, Measurement of soft tissue subnasale to H line; 4, Lower lip to H line; 5, H angle; 6, Soft-tissue chin thickness; 7, Skeletal profile convexity

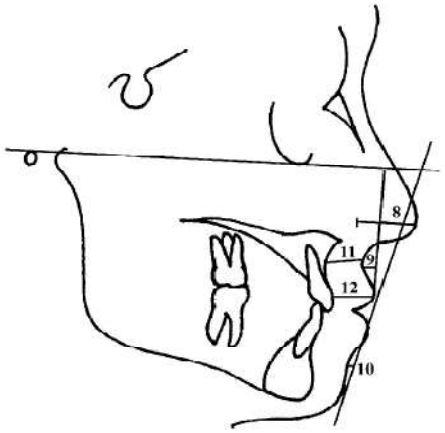

Figure 2. Cephalometric measurements: 8, Nose prominence; 9, Upper lip sulcus depth; 10, Inferior sulcus to the H line (lower lip sulcus depth); 11, Basic upper lip thickness; 12, Upper lip thickness

All statistical analyses were performed using SPSS software package (Version 10.0, SPSS Inc, Chicago, Ill, USA). Arithmetic mean and standard deviation were calculated for each measurement.

RESULTS

The mean differences between pre- and post treatment measurements facial angle ($P > 0.05$), upper lip curvature ($P < 0.001$), skeletal convexity at point A ($P > 0.05$), upper sulcus depth ($P < 0.05$), upper lip thickness ($P < 0.05$), upper lip strain ($P < 0.001$), lower lip H line ($P > 0.05$) decreased. The mean differences of pre and post treatment measurements of Nose tip to H line ($P > 0.05$), lower Sulcus depth ($P > 0.05$), Soft tissue thickness ($P < 0.05$) increased (Table 1). The values observed in upper lip curvature, upper sulcus depth, upper lip thickness, upper lip strain and soft tissue thickness were statistically significant. Whereas values of facial angle, skeletal convexity at point A, lower lip H line, Nose tip to H line, lower sulcus depth were not statistically significant.

DISCUSSION

There are few studies in literature that directly compared the pre and post treatment Holdaway soft tissue measurements. Most of these studies on profile change during orthodontic tooth movement are concerned with the relationship between incisor retraction and lip position (Rudee, 1964; Hershey, 1972). Some studies showed that there was no statistical significance existed for the soft tissue position in pre and post orthodontic treatment between two sexes Basciftci (2004). While other studies showed that females develop at earlier age and achieve a mature adult face earlier than males (Oliver, 1982). The H angle measures the prominence of the upper lip in relation to the overall soft-tissue profile (Baum, 1961). H line angle was reduced after the treatment. Similar result was seen in the study done by Basciftci (2004). The retraction of the maxillary incisors, however, may or may not be the most important factor influencing the retraction of the upper lip (Holdaway, 1983). Factors other than the maxillary incisor retraction may have a greater influence on the upper-lip response. Such factors may include the complex anatomy of the upper lip and difficulty involved in assessing the tension in the lips when the cephalometric radiographs are taken.

Table 1. Mean, Standard deviation, and P value of Pretreatment and Post treatment Soft tissue measurements

	Mean	Mean Difference	Std. Deviation	Std. Error Mean	P value
Pre Facial angle	88.2	-0.01	3.755	0.685	>0.05
Post Facial angle	88.1		3.126	0.571	
Pre Upper Lip Curvature	4.7	-1.00	1.047	0.191	<0.001
Post Upper Lip Curvature	3.7		1.142	0.208	
Pre Skeletal convexity at point A	2.8	-0.73	3.513	0.641	>0.05
Post Skeletal convexity at point A	2.07		3.473	0.634	
Pre H Line Angle	18.9	-2.00	4.361	0.796	<0.05
Post H Line Angle	16.9		4.265	0.779	
Pre Nose tip to H-Line	2.27	0.93	3.388	0.619	>0.05
Post Nose tip to H-Line	3.2		3.704	0.676	
Pre Upper Sulcus Depth	8.67	-0.93	1.98	0.361	<0.05
Post Upper Sulcus Depth	7.73		2.477	0.452	
Pre Upper Lip thickness	14.3	-0.53	2.18	0.398	<0.05
Post Upper Lip thickness	13.7		2.273	0.415	
Pre Upper Lip strain	3.13	-1.30	1.238	0.226	<0.001
Upper Lip strain	1.83		1.458	0.266	
Pre Lower Lip H-Line	2.33	-0.73	2.279	0.416	>0.05
Post Lower Lip H-Line	1.6		1.163	0.212	
Pre Lower Sulcus Depth	4.73	0.57	2.303	0.421	>0.05
Post Lower Sulcus Depth	5.3		2.211	0.404	
Pre Soft tissue thickness	11.6	0.37	1.731	0.316	<0.05
Post Soft tissue thickness	11.9		1.874	0.342	

In this study we found significant difference in upper lip strain, and upper lip strain decreased posttreatment. Oliver (Hershey, 1972) observed significant changes for basic upper-lip thickness during extraction treatment only in the males. James determined that the average posttreatment lip profile position of the non-extraction group was slightly more retrusive than that of the extraction group. In this study we found that upper lip curvature and upper sulcus depth decreased posttreatment this difference was significant. Holdaway proposed that the ideal position of the lower lip is zero to 0.5 mm anterior to the H line, but individual variations from one mm behind to two mm anterior to the H line are considered to be in a good range. In addition, Basciftci *et al*. found that the ideal position of the lower lip to the H line was 0.03 ± 1.91 for Anatolian Turkish adults. In our study lower lip to H line reduced in posttreatment but was not significant. Singh's (Talass *et al*., 1987) study showed that in a group of 31 male and 29 female patients, the soft-tissue chin thickness increases after orthodontic treatment. Our study showed soft-tissue thickness reduction posttreatment which was statistically significant. Holdaway (Oliver, 1982) stated that skeletal profile convexity is not really a soft-tissue measurement. However, facial convexity is directly interrelated to harmonious lip positions and has a bearing on the dental relationships. In this study, the difference in skeletal profile convexity during the treatment period was not significant. Whereas lower sulcus depth slightly and, nose to H line increased post treatment.

Conclusion

On comparing the pretreatment values to that of post treatment, there was decrease in upper lip curvature, skeletal convexity at point A and upper sulcus depth, reduction in H lingle angle and upper lip strain whereas nose tip to H line, lower sulcus depth and soft tissue thickness increased. Our study showed there is an effect of first premolar extraction on facial profile.

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