

Evaluation of soft tissue chin thickness in various skeletal malocclusions

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Abstract

Introduction: For appropriate diagnosis and treatment planning, cephalometric soft tissue analysis is essential. Such cephalometric variables are population specific and must be ascertained for any given geographical area. Hence this study aimed at soft tissue chin thickness in various skeletal malocclusions for Pakistani population,

Material and Methods: Lateral cephalograms were obtained from the data of 246 patients who were stratified on the basis of ANB into skeletal class I (120), II (82) and III (44). The soft tissue chin thickness was measured at 3 points namely soft tissue to hard tissue Pogonion (Pog-Pog'), soft tissue to hard tissue Gnathion (Gn-Gn') and soft tissue to hard tissue Menton (Me-Me'). Statistical analysis was applied after data compilation in SPSS 16.

Results: Sagittal class of the sample was significantly correlated to soft tissue thickness at Pogonion, Gnathion but not for Menton.

Conclusions: Soft tissue chin thickness differences among skeletal malocclusions were observed. The differences among different skeletal malocclusions may be taken into account in patients undergoing orthodontics or corrective jaw surgery, both during diagnosis and treatment planning.

Keywords: Facial profile, Skeletal malocclusions, Cephalometrics

Introduction

Soft tissue evaluation is integral for patients undergoing orthodontic treatment. Both hard and soft tissues must be considered for acquiring harmonious facial aesthetics and optimal occlusion.^{1,2} Soft tissue relationships are considered to be one of the limitations in orthodontic treatment and also

a major deciding factor producing questions in one's mind regarding success or failure of any given treatment.^{3,4} For appropriate diagnosis and treatment planning, cephalometric soft tissue analysis is essential.⁴ Cephalometric values particular to one ethnic group may not be applicable to others. It is important to develop individual standards for each population. Different racial groups must be treated according to their own characteristics. Soft tissues are one of the causative factors of Class II malocclusion, for example, Class II div 1 malocclusion may result from hypotonic upper lip or may be due to retroclined lower incisors, by hyperactive lower lip.^{3,4} Certain measures have been ascertained in Turkish population. Basciftci et al. conducted a study to determine Hold-away soft tissue in Anatolian Turkish adults and found significant differences between genders for soft tissue chin thickness and upper lip thickness.⁵ Most studies have

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analyzed facial soft tissue thickness in Japanese children with different skeletal classes.^{6,7} Soft tissue measures must be determined for Pakistani population and little research has been conducted so far in this area.^{8,9}

Hence the rationale of the present study was to evaluate and compare soft tissue chin thickness (STC thickness) in skeletal Class I, II and III malocclusion to better predict this integral soft tissue measure for the Orthodontic population of Pakistan.

Material and Methods

This was a cross-sectional study, conducted at Department of Orthodontics, Liaquat University of Medical and Health Sciences, Jamshoro. Data was collected from September 2015 to March 2016. The total sample comprised of 246 patients. These were selected with non-probability purposive sampling technique. An ethical approval was obtained from the ethical review committee (ERC) of the University and informed written consent was obtained from every patient. Patients included in the sample did not have a history of trauma, craniofacial anomaly, previous orthodontic, prosthodontic or orthognathic surgery treatments. Those having a history of trauma, cleft lip and palate, any previous orthodontic treatment, syndromes and uncooperative patients were excluded from the study.

Lateral cephalometric radiographs were taken using the same cephalostat in a standardized method and in a natural head position.¹⁰ Measurements were manually done. All assessments were performed by one investigator in a darkened room using a radiographic illuminator to ensure contrast enhancement of images. The sagittal relationship between the jaws was assessed by ANB angle. The STC thickness was measured at three different levels (Figure 1). (1) Pog-Pog' length between bony Pogonion (Pog) and its horizontal projection (Pog') over the vertical passing through soft tissue

Pogonion; (2) Gn-Gn' distance between bony Gnathion (Gn) and soft tissue Gnathion (Gn') and (3) Me-Me' distance between bony Menton (Me) and its vertical projection (Me') on the horizontal passing through soft tissue Menton. The three distances were measured manually. To determine the intra-observer reliability, a single investigator repeated all angular and linear cephalometric

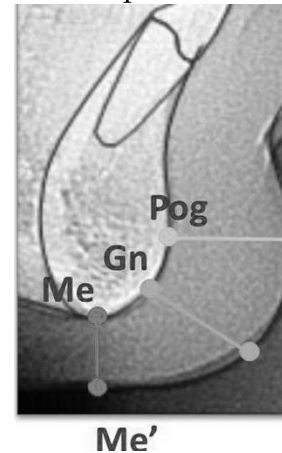


Figure 1: Top: Soft tissue chin thickness at Pogonion

Middle = Soft tissue chin thickness at Gnathion, Bottom = Soft tissue chin thickness at Menton

measurements on randomly selected cephalographs (10% of the sample). Data was analyzed by SPSS version-16. The descriptive statistics of variables like gender, skeletal classification were presented as frequency and percentages, where as the descriptive statistics for variables like age, soft tissue thickness at Pogonion, Gnathion and Menton are presented as mean and standard deviation. One way ANOVA was applied between skeletal classification and soft tissue thickness at Pogonion, Gnathion and Menton to ascertain the statistical inference. The level of significant was set ≤ 0.05 with 95% confidence interval.

Results

Males and females were 59% and 41% respectively (Figure 2). Mean age of the

patients was 20.33 ± 5.264 with minimum and maximum age 11 and 32 respectively. The sample comprised of a total 246 patients amongst which skeletal Class I were 120, Class II were 82 and Class III were 44 (Figure 3). Descriptive statistics of soft tissue thickness is shown in Table I. The one way ANOVA shows the relationship of skeletal classifications with soft tissue chin thickness at Pogonion, Gnathion and Menton which are statistically significant for the first two anatomical areas but not for the third (Table II, III and IV).

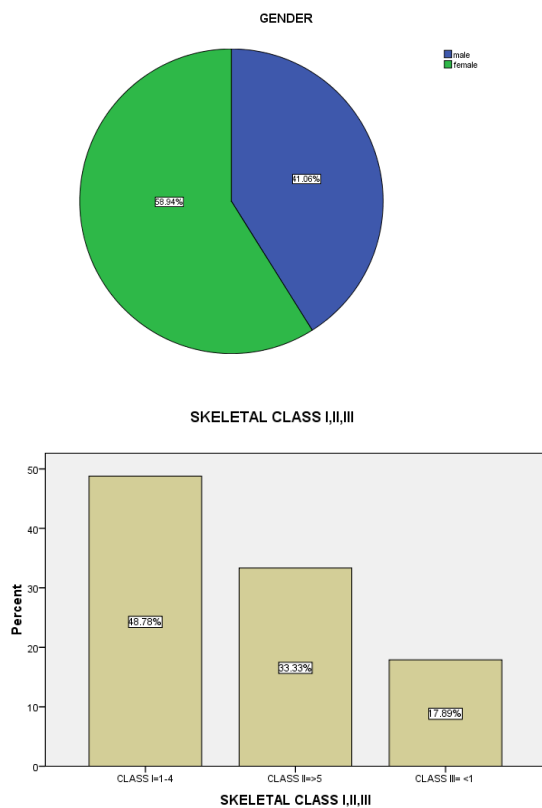


Figure 2: Descriptive statistics of skeletal classification

Table I: Description of soft tissue thickness

| | Soft tissue chin thickness at Pogonion | Soft tissue chin thickness at Gnathion | Soft tissue chin thickness at Menton |
|----------------|--|--|--------------------------------------|
| Mean | 10.41 | 8.50 | 7.87 |
| Std. Deviation | 3.438 | 3.088 | 6.433 |

| Range | 14 | 12 | 93 |
|---------|----|----|----|
| Minimum | 4 | 3 | 2 |
| Maximum | 18 | 15 | 95 |

Table II: Skeletal classifications with soft tissue chin thickness at Pogonion

| | N | Mean | Std. Deviation | P value |
|----------------|-----|-------|----------------|---------|
| Class I = 1-4 | 120 | 9.75 | 3.663 | 0.008 |
| Class II = >5 | 82 | 10.84 | 3.473 | |
| Class III = <1 | 44 | 11.41 | 2.213 | |
| Total | 246 | 10.41 | 3.438 | |

Table III: Skeletal classifications with soft tissue chin thickness at Gnathion

| | N | Mean | Std. Deviation | P value |
|----------------|-----|-------|----------------|---------|
| Class I = 1-4 | 120 | 7.78 | 3.210 | 0.001 |
| Class II = >5 | 82 | 8.68 | 2.789 | |
| Class III = <1 | 44 | 10.11 | 2.643 | |
| Total | 246 | 8.50 | 3.088 | |

Table IV: Skeletal classifications with soft tissue chin thickness at Menton

| | N | Mean | Std. Deviation | P value |
|----------------|-----|------|----------------|---------|
| Class I = 1-4 | 120 | 7.69 | 8.586 | 0.951 |
| Class II = >5 | 82 | 7.65 | 3.397 | |
| Class III = <1 | 44 | 8.77 | 3.011 | |
| Total | 246 | 7.87 | 6.433 | |

Discussion

The soft tissue thickness of every patient is an important factor to consider during Orthodontic assessment. Many a times, severe skeletal discrepancy is masked by favourable soft tissue. Nature has a tendency of compensation, be it hard tissues for the soft tissues or vice versa. The patient must always be positioned in a relaxed position when viewing the soft tissue profile as suggested by Arnett and Gunson.¹¹ They suggested that the patient should be positioned in a relaxed lip position while evaluating the soft tissue profile since this position demonstrates the relationship of soft tissues to hard tissues without muscular compensation for dento-skeletal abnormalities.

In the present study statistically significant gender differences were not determined for each skeletal class. Contrary to this statistically significant gender differences were determined for the thickness of the labrale superius, labrale inferius, pogonion, and menton measurements in a study by Uysal et al.¹² Additionally, several studies^{13,14} evaluating the soft tissue cephalometric norms for different populations with different mean ages showed that these parameters were more statistically significant in men than in women. Few studies^{6,7} have investigated the soft tissue thickness of patients with different skeletal malocclusions. The published data was for Japanese girls (aged 6 - 16 years) and women (aged 17 - 33 years) who had different skeletal malocclusions. The thickness at labrale superius and stomion points among each skeletal type was significantly the greatest in Class III for both males and females. Contrary to this significant differences were found at both Pogonion and Gnathion positively related to skeletal classes in the present study.

It is difficult to make a valuable comparison between our findings and the findings of other clinicians since a limited number of studies have been published on this subject. The disagreement between our findings and

these author's findings might be due to the racial differences. A review of the literature confirms differences in the soft tissue profile among various ethnic and racial groups.

Another study compared soft tissue thickness at various points on the face and compared with skeletal relationship on the basis of CBCT. Lateral cephalometric films were shown to have severe limitations, including distortion, low reproducibility, differences in magnification, and the superimposition of bilateral craniofacial structures compared with the CBCT. In addition, CBCT technology made it feasible to achieve true (1:1 size) images without magnification and showed high intra-observer and inter-observer reproducibility. This is a major limitation of the present study. The integumental comparisons of subjects from the Bolton growth study failed to depict morphologic differences between Class I and Class III malocclusions, supporting the tenet that the soft tissue envelope can mask (or accentuate) a sagittal skeletal discrepancy.

Conclusions

The differences among different skeletal malocclusions may be taken into account in patients undergoing orthodontics or corrective jaw surgery, both during diagnosis and treatment planning. Significant differences in soft tissue thickness among skeletal malocclusions were observed for various chin points. Additional studies must be conducted to ascertain soft tissue thickness differences between males and females.

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