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# Legan-burstone soft tissue profile values in a Circassian adult sample

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## Abstract:

**OBJECTIVE:** To determine the mean soft tissue facial profile for Circassian adults as determined by Legan–Burstone cephalometric analysis.

**MATERIALS AND METHODS:** 71 lateral cephalometric radiographs for nongrowing Circassian adults with normal occlusion were traced and accurately measured.

**RESULTS:** With regard to facial form analysis, Circassian adults showed higher facial convexity angle, retruded mandible, and obtuse lower face–throat angle. When compared with lip form norms, Circassians showed increased nasolabial angle, deeper mentolabial sulcus, and increased maxillary incisor exposure. Comparison between men and women showed that mentolabial sulcus depth was significantly increased in Circassian men compared with Circassian women.

**CONCLUSION:** The results of this study showed that soft tissue facial profiles for Circassians and Caucasians are different in certain values. Such differences should be taken into account when formulating a treatment plan for Circassian patients seeking orthodontic treatment and orthognathic surgery.

## Keywords:

Cephalometric, Circassian, Legan–Burstone, soft tissue

## Introduction

An esthetically pleasing and balanced face is one of the objectives of orthodontic treatment planning.<sup>[1]</sup> A beautiful face becomes the key to success as well, and therefore, clinical specialists working in the facial area encounter an increasing demand for treatments mainly based on esthetic requests. As a result, orthodontists and maxillofacial and plastic surgeons should have a deep understanding of those quantifiable objective facial characteristics that are considered by the public as “attractive.”<sup>[2]</sup>

The perception of an attractive face is largely subjective, with ethnicity, age, gender, culture, and personality influencing average facial traits.<sup>[3]</sup> Interestingly, facial features are usually studied in profile. Various

methods have been used to evaluate facial characteristics, such as anthropometry,<sup>[4]</sup> photogrammetry,<sup>[5]</sup> computer imaging,<sup>[6]</sup> and cephalometry.<sup>[7]</sup>

Angle<sup>[8]</sup> suggested that if teeth were placed in optimal occlusion, good facial harmony would result. In more recent years, a large number of researches<sup>[1–3]</sup> demonstrated that soft tissues, which vary considerably in thickness from one race to another, are a major factor in determining the final facial profile of the patient. Holdaway<sup>[9]</sup> and Legan and Burstone<sup>[10]</sup> developed soft tissue analyses that gained wide acceptance in clinical and research work in both orthodontics and orthognathic surgeries. However, these cephalometric norms were specific to European-Americans and might not apply to other ethnic groups such as Mexican Americans,<sup>[11]</sup> African Americans,<sup>[12]</sup> Chinese,<sup>[13,14]</sup> Japanese,<sup>[15,16]</sup> Koreans,<sup>[17]</sup> Iranians,<sup>[18]</sup> and Turkish.<sup>[19]</sup>

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Cephalometric soft tissue norms for different ethnic and racial groups had previously been established in many populations.<sup>[11-19]</sup> Most investigators had concluded that there were significant differences in the dento-facial relationship of various ethnic and racial groups. Therefore, it is important to develop standards for various populations. No report whatever is available dealing with Circassians' soft tissue profile norm. This study was carried out to (1) determine soft tissue profile norms among Circassians by means of angular, linear, and ratio measurements, (2) to compare Circassians' soft tissue values with Caucasian norms, and (3) to investigate the sexual differences between Circassian men and women. These would serve as a guide for esthetic treatment goals.

### Materials and Methods

Lateral cephalometric radiographs were taken for 71 nongrowing Circassian adults (37 male, mean age 24.49 years; 34 females, mean age 22.38 years).

Those meeting the following criteria were chosen:

- Circassian with Circassian grandparents
- Balanced facial profile with competent lip
- Class I occlusion with minimum or no crowding
- Normal overjet and overbite
- No previous history of trauma
- No previous orthodontic treatment, maxillofacial, or plastic surgery.

All cephalometric lateral skull radiographs were taken in a natural head position, with the teeth in maximum intercuspation and lips in light contact. Tracings of the cephalometric radiographs were made by hand on 0.003 matte acetate sheets. All radiographs were traced by hand by a single author to avoid interobserver variability and were reviewed by another author for accurate landmark identification.

In this study, three angular, seven linear, and three ratio measurements were made on each radiograph. The landmarks were located according to the definitions of Legan–Burstone.<sup>[10]</sup>

The following soft tissue and hard tissue points were identified from lateral cephalometric X-rays:

1. Cm: columella point
2. Sn: subnasale point
3. Ls: labrale superius
4. Pog': soft tissue pogonion
5. Li: labrale inferius
6. Si: soft tissue "B" point
7. Stms: upper lip stomion
8. Ui: upper incisal
9. Stmi: lower lip stomion

10. Me: soft tissue mention
11. N: nasion
12. S: sella
13. G: soft tissue gnathion
14. C: cervical point.

After locating the points, horizontal reference plane (HP) have been drawn, which was constructed by drawing a line through Nasion (N) 7° up from the Sella (S)-N line. Angular, linear, and ratio measurements of Legan–Burstone analyses are shown in Figures 1 and 2.

1. Legan–Burstone soft tissue analysis of facial form [Figure 1]:
  1. Facial convexity angle (G-Sn-Pog')
  2. Maxillary prognathism (G-Sn)
  3. Mandibular prognathism (GPog')
  4. Lower face–throat angle (Sn-Gn'-C)
  5. Vertical height ratio (G-Sn/Sn-Me')
  6. Lower vertical height–depth ratio (Sn-Gn'/c-Gn').
2. Legan–Burstone soft-tissue analysis of lip form [Figure 2]:
  1. Nasolabial angle (Cm-Sn-Ls)
  2. Upper lip protrusion (Ls to Sn-Pog')
  3. Lower-lip protrusion (Li to Sn-Pog')
  4. Mentolabial sulcus depth (Si to Li-Pog')
  5. Maxillary incisor exposure (Stms-Ui)
  6. Interlabial gap (Stms-Stmi)
  7. Vertical lip–chin ratio (Sn-Stms/Stmi-Me').

Descriptive statistics (mean and standard deviation) were calculated using SPSS program version 17.0. The results were tabulated and compared with Legan–Burstone norms. To compare this ethnic of group with other

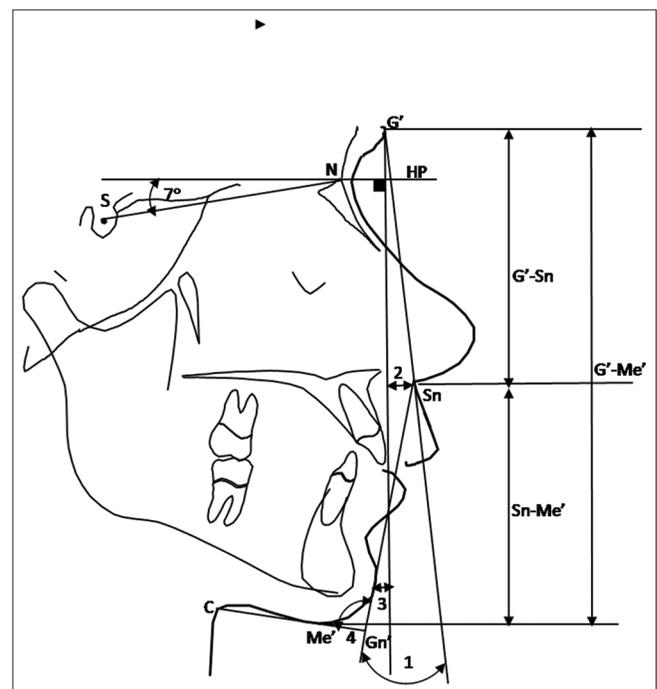


Figure 1: Legan–Burstone soft tissue analysis of facial form

ethnics, compare men and female of this specific group, an independent *t* test was used at 5% level ( $P < 0.05$ ).

## Results

Table 1 shows the descriptive statistics of the pooled means for both genders representing Circassian soft tissue values compared with Caucasian norms as determined by Legan–Burstone analysis.

The result showed that Circassian values have statistically significant differences in three facial form and three lip form measurements compared with Legan–Burstone norms. Circassian adults had higher facial convexity angle ( $P = 0.043$ ), retruded pogonion ( $P = 0.002$ ), lower face–throat angle ( $P = 0.001$ ), more obtuse nasolabial angle ( $P = 0.042$ ), deeper mentolabial sulcus ( $P = 0.000$ ), and increased maxillary incisor exposure ( $P = 0.002$ ).

An independent samples *t*-test was used to compare Circassian men with women. Table 2 shows that 1 out of

13 measurements showed significant differences between men and women. Circassian men showed deeper mentolabial sulcus depth compared with Circassia women ( $P = 0.012$ ).

## Discussion

Nowadays, large numbers of Circassian adults are seeking orthodontic treatment including orthognathic surgery all over the world, hence it is important to determine soft tissue cephalometric norms for this particular ethnic group and to base our treatment plans accordingly.

Legan–Burstone analysis was used in this study because it presents the soft tissue in more detail with simplicity and directness in mind, and it is widely used.

### Facial form

Facial convexity angle was found to be greater in our study group, which implies a more convex profile in Circassians than in Caucasians. This measurement was approximately  $2.5^\circ$  higher in Circassian sample for both genders. Mandibular retrusion was the reason for increased soft tissue convexity for Circassian sample, as smaller values were recorded for mandibular prognathism measurement in Circassian subjects compared with Caucasian samples. This finding was in agreement with Uysal *et al.*<sup>[19]</sup> and Garg and Alexander,<sup>[20]</sup> whereas less convex profile was reported in Japanese<sup>[15]</sup> and Black Americans.<sup>[12]</sup>

Lower face–throat angle was more obtuse compared with Caucasians. Legan and Burstone stated that an obtuse lower face–throat angle should warn the clinician not to use procedures that reduce the prominence of the chin.<sup>[10]</sup>

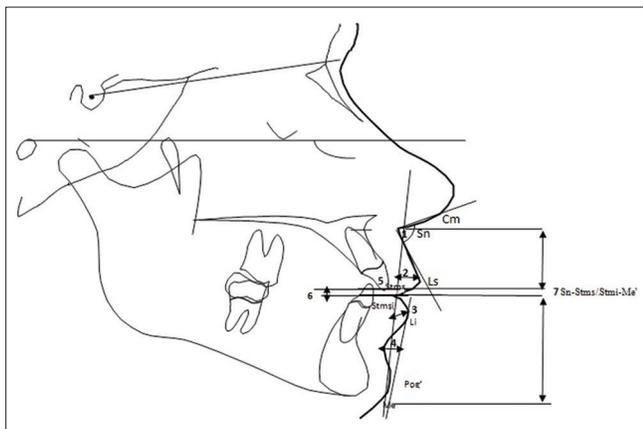


Figure 2: Legan–Burstone soft tissue analysis of lip form

**Table 1: Comparison between Circassians values and Caucasian norms using Legan–Burstone analysis**

Variables	Circassians (n=71)		Norms		P
	Mean	SD	Mean	SD	
<b>Facial form</b>					
Facial convexity angle (G-Sn-Pog')	14.48	5.78	12	4	0.043
Maxillary prognathism (G-Sn)	6.22	4.33	6	3	0.809
Mandibular prognathism (GPog')	-4.64	7.33	0	4	0.002
Lower face-throat angle (Sn-Gn'-C)	108.54	12.34	100	7	0.001
Vertical height ratio (G-Sn/Sn-Me')	0.96	0.13	1	-	-
Lower vertical height-depth ratio (Sn-Gn'/c-Gn')	1.8	0.69	1.2	-	-
<b>Lip form</b>					
Nasolabial angle (Cm-Sn-Ls)	106.65	10.59	102	8	0.042
Upper-lip protrusion (Ls to Sn-Pog')	2.57	2.65	3	1	0.415
Lower-lip protrusion (Li to Sn-Pog')	1.56	3.08	2	1	0.470
Mentolabial sulcus depth (Si to Li-Pog')	-6.21	2.23	4	2	0.000
Maxillary incisor exposure (Stms-Ui)	3.32	1.78	2	2	0.002
Interlabial gap (Stms-Stmi)	2.29	0.5	2	2	0.257
Vertical lip-chin ratio (Sn-Stms/Stmi-Me')	0.47	0.06	0.5	-	-

SD – Standard deviation

**Table 2: Comparison between Circassian men and women values using Legan-Burstone analysis**

Variables	Female		Male		P
	Mean	SD	Mean	SD	
Facial form					
Facial convexity angle (G-Sn-Pog')	14.79	6.33	14.21	5.31	0.676
Maxillary prognathism (G-Sn)	6.08	3.96	6.35	4.69	0.794
Mandibular prognathism (GPog')	-5.18	7.16	-4.05	7.53	0.520
Lower face-throat angle (Sn-Gn'-C)	105.75	11.09	111.11	13.008	0.067
Vertical height ratio (G-Sn/Sn-Me')	0.94	0.14	0.97	0.11	0.421
Lower vertical height-depth ratio (Sn-Gn'/c-Gn')	1.66	0.52	1.93	0.8	0.107
Lip form					
Nasolabial angle (Cm-Sn-Ls)	105.15	13.45	108.04	11.76	0.337
Upper lip protrusion (Ls to Sn-Pog')	2.87	2.51	2.30	2.78	0.370
Lower lip protrusion (Li to Sn-Pog')	1.83	2.81	1.31	3.33	0.481
Mentolabial sulcus depth (Si to Li-Pog')	-5.53	2.64	-6.84	1.55	0.012
Maxillary incisor exposure (Stms-Ui)	3.72	1.78	2.95	1.73	0.069
Interlabial gap (Stms-Stmi)	2.37	0.49	2.22	0.5	0.207
Vertical lip-chin ratio (Sn-Stms/Stmi-Me')	0.48	0.06	0.47	0.06	0.485

SD – Standard deviation

Comparisons between both sexes showed no significant differences, although mandibular prognathism value was smaller in females than males which indicate that females have relatively more convex facial profiles than males.

### Lip form

Greater nasolabial angle by 4° was recorded in Circassian subjects compared with Caucasian sample. Legan and Burstone<sup>[10]</sup> indicated that in surgical procedures, this angle should be in the range of 102° ± 8°. Circassian adult values were near the upper border of the range. Similar findings were reported in Japanese,<sup>[15]</sup> Koreans,<sup>[17]</sup> and Turkish.<sup>[19]</sup>

The mentolabial sulcus relative to lower lip pogonion line measurement showed that mentolabial sulcus depth was increased in Circassian adult sample which might be attributed to mandibular retrusion. Similar findings were obtained by uysal *et al.*<sup>[19]</sup> and Celebi *et al.*<sup>[21]</sup> Comparisons between both sexes showed that mentolabial sulcus depth was larger in Circassian males than in females. This could be attributed to the fact that males have more prominent chin compared with females.

Statistically significant difference was also found in the maxillary incisor exposure between our study group and the Caucasians. The comparison revealed more incisor exposure in Circassian adults compared with Caucasians.

### Conclusion

In conclusion, we compared the soft tissue profiles of Circassian adults with those of Caucasians and found out the Circassian adults have

- More convex soft tissue facial profiles

- More retruded chins
- More obtuse lower face–throat angle
- Increased nasolabial angle
- Deeper mentolabial sulcus
- More maxillary incisor exposure.

These differences should be taken into account when treating Circassian patients according to Caucasian norms.

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### Conflicts of interest

There are no conflicts of interest

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