Original Article

J Babol Univ Med Sci
22; 2020. P: 370-375

Comparison of Facial Soft Tissue Thickness in Males and Females and Class I Skeletal Pattern

Z. Ghaffari (DDS)[1], S. Sheikhzadeh (DDS,MS)*[2], E. Moudi (DDS,MS)[2], V. Arash (DDS,MS)[3], H. Gholinia (MSc)[4], M. Emamgholipour (DDS)[5]

1.Student Research Committee, Babol University of Medical Sciences, Babol, I.R.Iran

2.Oral Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran

3.Dental Materials Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran

4.Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran

5.Department of Endodontics, School of Dentistry, Shahed University, Tehran, I.R.Iran

J Babol Univ Med Sci; 22; 2020; PP: 370-375

Received: Mar 19th 2020, Revised: Aug 10th 2020, Accepted: Aug 31st 2020.

ABSTRACT

BACKGROUND AND OBJECTIVE: Proportional relationship between different facial structures, including soft tissue thickness and dental and skeletal components, is the key to beauty. Today facial soft tissue harmony is the primary goal of orthodontic treatment, unlike the past which focused only on hard tissue and dental occlusion. The aim of this study was to measure facial soft tissue thickness in the northern population of Iran with class I skeletal pattern in lateral cephalometry and compare these values between males and females to use the results in orthodontic treatment and craniofacial reconstructions.

METHODS: In this cross-sectional research, 180 lateral cephalometry of 77 male and 103 female, aged between 18-24 years who had referred to private orthodontic offices, were traced on acetate paper. Then, 10 anatomical variables were measured in Glabella, Nasion, Rhinion, Subnasal, Upper lip, Stomion, Lower lip, Labiomental region, Pogonion and Menton parallel to the Frankfurt plan.

FINDINGS: Facial soft tissue thickness in males was significantly higher than females in Nasion (male=5.65±1.55, female=4.38±1.47), Rhinion (male=3.07±0.64, female=2.5±0.57), Subnasal (male=16.39±2.55, female=14.05±1.44), Upper lip (male=15.51±2.29, female=13.57±1.64), Lower lip (male=16.48±1.85, female=14.64±1.39), Labiomental (male=11.02±1.46, female=10.49±1.67) and Pogonion (male=11.4±1.64, female=10.32±1.77) ($p<0.05$).

CONCLUSION: Based on the results of this study, there was a significant difference in facial soft tissue thickness between the two genders in the north Iranian population so that males had more facial soft tissue thickness than females in most of the areas.

KEY WORDS: *Facial Soft Tissue Thickness, Lateral Cephalometry, Ethnic Groups.*

Please cite this article as follows:

Ghaffari Z, Sheikhzadeh S, Moudi E, Arash V, Gholinia H, Emamgholipour M. Comparison of Facial Soft Tissue Thickness in Males and Females and Class I Skeletal Pattern. J Babol Univ Med Sci. 2020; 22: 370-5.

***Corresponding Author: S. Sheikhzadeh (DDS,MS)**
Address: Oral Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran
Tel: +98 11 32291408
E-mail: elfsh@yahoo.com

Introduction

The human face is the most important recognizable organ (1) and plays an important role in establishing social relationships (2, 3). Beauty may be interpreted as the proportional relationship between the various facial structures, including soft tissue thickness, dental and skeletal components (4-7).The process of orthodontic diagnosis and treatment planning has been frequently changed over time from emphasizing dental occlusion and hard tissue in the past to more emphasis on the soft tissue proportions. This development is called soft tissue paradigm, which considers the proportions and harmony of orofacial soft tissues as the primary goal in orthodontics, because facial beauty, mouth function, and tooth movement stability are primarily determined by the soft tissue of the face (8).

Extensive studies have been performed on soft tissue thickness in different populations, and many researchers have concluded that soft tissue thickness varies in different races (9-13). In addition, measurements are influenced by age and gender (14, 15). Orthognathic and cosmetic surgeries also affect soft tissue. The rate of soft tissue changes in orthognathic surgery is 30 to 100% (16). There are several methods to measure soft tissue thickness. In the past, researchers used the Needle puncture method to measure soft tissue thickness (17). Other methods of measurement have evolved over time with the development of imaging technologies including ultrasonography, cephalometry, MRI, and CT (18-21).

Lateral cephalometry radiography is prescribed for almost all orthodontic patients, and has eliminated unnecessary exposure or additional payment. Moreover, the relationship between bone and soft tissue of the entire face is recorded in one image on this radiography. The disadvantages of other methods include the invasiveness of needle puncture technique, the imposition of an additional dose on the patient in CT radiography, and the need for extra payment in CT and MRI images.

Most of measurements and standards are derived from the European/American population, which cannot be used as norms in other populations because the present results indicate a significant difference between various populations and each must be treated according to their standards (9). Despite the great importance of soft tissue in the success of orthodontics found in the literatures, there are a few studies on facial soft tissue thickness in the Iranian population. Therefore, in this study, normal facial soft tissue thickness was obtained in a normal north Iranian population to use the results to help determining orthodontic treatment plan and craniofacial reconstructions. The aim of this study was to measure facial soft tissue thickness in the northern population of Iran with class I skeletal pattern in lateral cephalometry and compare these values between males and females.

Methods

The ethical license of this study was approved by the Research Ethics Committee of Babol University of Medical Sciences with the ethics code IR.MUBABOL.HRI.REC.1398.067. This cross-sectional research was conducted on lateral cephalometry radiography of 180 patients with an age range of 18 to 24 years old (including 103 females and 77 males) who had referred to private orthodontic offices.

All lateral cephalometry images were taken by Cranex D machine (Sordex, Finland, Helsinki). Inclusion criteria were having Class I skeletal pattern (ANB=1-4/Wits=0 and -1) without dental protrusion. Exclusion criteria included apparent facial anomalies in vertical, horizontal, and transverse dimensions, history of trauma, history of orthodontics treatment, and prosthesis or orthognathic surgery.

The studied variables, 10 anatomical distances are as follows:

–**Glabella (Gls-Gl):** Linear distance from the most prominent on the frontal bone to the soft tissue prominence on the forehead

–**Nasion (Ns-N):** Distance from bony Nasion to the soft tissue Nasion

–**Rhinion (Rh):** perpendicular distance from the intersection of nasal bone and cartilage to soft tissue

–**Subnasale (Sn-A):** distance between Subnasale and point A

–**Upper lip (Ls-Pr):** distance between the most prominent point of the upper lip and Prosthion

–**Stomion (St-U1):** distance between the most prominent point of the upper incisor and Stomion

–**Lower lip (Li-Id):** distance between the most prominent point of the lower lip and infradentale

–**Labiomental (B-Lm):** distance between point B and labiomental sulcus

–**Pogonion (Pogs-Pog):** distance between bony Pogonion and soft tissue Pogonion

Menton (Mes-me): distance between bony Menton and soft tissue Menton (Figure 1).

After drawing the Frankfurt plan, that comes from the connection of Orbitale (OR) which is the lowest point on the orbital margins and Porion (PO) is determined as the highest point of the external acoustic meatus, measurements were done by one person with a scale ruler (mm) parallel to the Frankfort plane. Within a period of 2 weeks, 20 radiographs were selected randomly and traced again by the same person. A paired t test was applied to both the first set and second set of measurements, and no significant difference was found between the two sets. Intra-class correlation coefficients were performed to assess the reliability of the measurements, and the coefficients of reliability for the measurement were above 0.942 (Table 1). Multivariate linear analysis of data was performed using Statistical Package for the Social Sciences software (SPSS; version 22). Means and standard deviations were calculated for each measurement and $p<0.05$ was considered as the significance level.

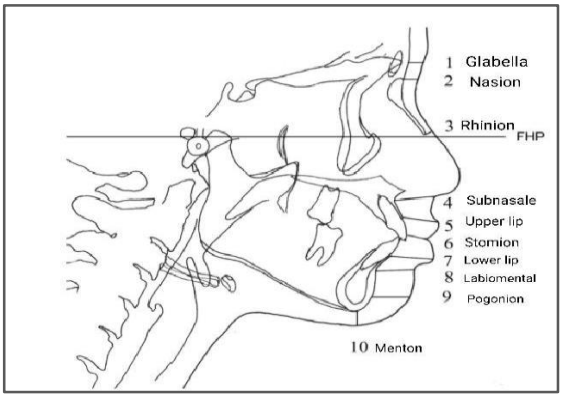

Figure 1. Anatomical distances to determine soft tissue thickness in profile view from H Utsuno et al. (19)

Table 1. Intraclass Correlation Coefficient

Index	Intraclass Correlation Coefficient	95% Confidence Interval	P-value
GLs-GL	0.985	0.961-0.994	<0.001
Ns-N	0.996	0.990-0.998	<0.001
RH	0.942	0.859-0.977	<0.001
SNA	0.997	0.992-0.999	<0.001
LS-PR	0.991	0.979-0.997	<0.001
ST-U1	0.993	0.983-0.997	<0.001
LI-ID	0.998	0.996-0.999	<0.001
B-LM	0.997	0.993-0.999	<0.001
POG-POGs	0.992	0.980-0.997	<0.001
ME-MEs	0.996	0.990-0.998	<0.001

Results

In this study, 77 males (42.8%) and 103 females (57.2%) with a mean age of 19.4±2.23 years who had a class I skeletal pattern participated in this study. According to linear multivariate analysi, facial soft tissue thickness in males was significantly higher than females in Nasion (male=5.65±1.55, female=4.38±1.47), Rhinion (male=3.07±0.64, female=2.5±0.57), Subnasal (male=16.39±2.55, female=14.05±1.44), Upper lip (male=15.51±2.29, female=13.57±1.64), Lower lip (male=16.48±1.85, female=14.64±1.39), Labiomental (male=11.02±1.46, female=10.49±1.67) and Pogonion (male=11.4±1.64, female=10.32±1.77) ($p<0.05$) (Table 2), and no significant difference was observed in the Glabella, Stomion, and Menton ($p>0.05$).

Table 2. Comparison of soft tissue thickness variables by gender

Gender / Variable	Female Mean±SD	Male Mean±SD	Total Mean±SD	P-value
GLs-GL	5.48±0.99	5.36±0.95	5.43±0.97	0.42
NS-N	4.38±1.47	5.65±1.55	4.93±1.63	<0.001
RH	2.5±0.57	3.07±0.64	2.75±0.66	<0.001
SN-A	14.05±1.44	16.39±2.55	15.05±2.30	<0.001
LS-PR	13.57±1.64	15.51±2.29	14.4±2.17	< 0.001
ST-U1	5.06±1.19	5.33±1.22	5.18±1.21	0.15
LI-ID	14.64±1.39	16.48 1.85	15.42±1.84	<0.001
B-LM	10.49±1.67	11.02±1.46	10.72±1.6	0.02
POGs-POG	10.32±1.77	11.4±1.64	10.78±1.8	<0.001
MEs-ME	7.8±1.37	8.06±1.32	7.91±1.35	0.2

Discussion

According to linear multivariate analysis in this cross-sectional study, facial soft tissue thickness in males and females were significantly different expect for in Glabella, Stomion, and Menton. Since it has been found that genetic effects influence skeleton and overlying soft tissue, various researchers have investigated the thickness of facial soft tissue in different populations (15, 22-26).

Comparison of results with other populations showed that Brazilian and Sudanese males have thicker soft tissue in all measured areas compared to the Iranians (3, 13). In a comparison with Pakistani population, the males of this population have a greater soft tissue thickness than the Iranian population in all areas except for Menton (10). Moreover, the males of the Turkish population have thicker soft tissue in Glabella, Subnasal, Upper lip, Stomion, Lower lip, Labiomental, and Menton compared to the males in the Iranian population (4).

The comparison of the results of this research with other populations showed that Brazilian females have thicker soft tissue in all measured areas compared to the females of the Iranian population (13). Sudanese females also have thicker facial soft tissue than the females of Iranian population in all areas except for Stomion (3). In a comparison of Iranian population with Japanese population, the females of this population have a greater soft tissue thickness than the females of Iranian population in the Glabella, Nasion, Lower lip, Labiomental, and Pogonion (12).

The females of the Turkish population have thicker facial soft tissue in Subnasal, Labiomental, and Menton compared to the females in the Iranian population (4). Pakistani females also have thicker facial soft tissue than Iranian females in all areas except for Glabella and Menton (10). The presented research also indicates that the facial soft tissue thickness of the males was significantly higher than females in Nasion, Rhinion, Subnasal, Upper lip, Lower lip, Labiomental, and Pogonion. The comparison of populations showed that the facial soft tissue thickness of the males of the Turkish population is more than females in Glabella, Nasion, Subnasal, Upper lip, Stomion, Lower lip, Labiomental, and Pogonion (6). Moreover, males have thicker soft tissue than females in Rhinion, Subnasal, and Upper lip in the Brazilian population (13). The reason for the differences between the findings of the studies mentioned above and our study is probably the difference in race and age of the subjects.

Contrary to the present research, the results of El-Mehallawi who measured the facial soft tissue thickness in 204 Egyptian adults using Ultrasonic Prob showed that soft tissue thickness in females was higher than males in most measured areas (25). The difference between the findings of this study and our study may be due to the different measurement techniques.

These results indicate that regardless of the studied race, men have on average thicker soft tissue than women in some points of face like Nasion, Rhinion, Subnasal, Upper lip, Lower lip, Labiomental, and Pogonion, and this issue should be considered in the orthodontic treatment plan. Furthermore, the Iranian population has a unique facial soft tissue thickness. Therefore, it is recommended to measure the facial soft tissue thickness at different age ranges in future studies to achieve more comprehensive results for the Iranian population. A significant difference was observed between the two genders, and males had higher facial soft tissue thickness than females except for Glabella, Stomion, and Menton.

Acknowledgment

We are grateful for the support of the Oral Health Research Center and the cooperation of the School of Dentistry of Babol University of Medical Sciences in this research.

References

1.Perovic T, Blazej Z. Male and Female Characteristics of Facial Soft Tissue Thickness in Different Orthodontic Malocclusions Evaluated by Cephalometric Radiography. Med Sci Monit. 2018;24:3415-24.

2.Alavi S, Mohammad Okhravi S, Mamavi T. Evaluation of Facial Soft Tissue Profile in 6-15 Years Old Children with Normal Occlusion in Isfahan. Res J Med Sci. 2013;7(3):80-5.

3.Hamid S, Abuaffan AH. Facial soft tissue thickness in a sample of Sudanese adults with different occlusions. Forensic Sci Int. 2016;266:209-14.

4.Kurkcuoglu A, Pelin C, Ozener B, Zagyapan R, Sahinoglu Z, Yazici AC. Facial soft tissue thickness in individuals with different occlusion patterns in adult Turkish subjects. HOMO. 2011;62(4):288-97.

5.Taki AA, Oguz F, Abuhijleh E. Facial soft tissue values in Persian adults with normal occlusion and well-balanced faces. Angle Orthod. 2009;79(3):491-4.

6.Kamak H, Celikoglu M. Facial soft tissue thickness among skeletal malocclusions: is there a difference?. Korean J Orthod. 2012;42(1):23-31.

7.Aghili H, Tabatabaei SM, Moghadam MG, Jafarzadeh M, Samei R. Soft tissue cephalometric norms in Iranian normal subjects. Int J Med Res Health Sci. 2016;5(4):149-55.

8.Proffit WR, Fields HW, Larson B, Sarver DM. Contemporary Orthodontics, 6th ed. Elsevier; 2019.

9.Amini F, Razavian ZS, Rakhshan V. Soft tissue cephalometric norms of Iranian class I adults with good occlusions and balanced faces. Int Orthod. 2016;14(1):108-22.

10.Jeelani W, Fida M, Shaikh A. Facial Soft Tissue Thickness Among Three Skeletal Classes in Adult Pakistani Subjects. J Forensic Sci. 2015;60(6):1420-5.

11.Wang J, Zhao X, Mi C, Raza I. The study on facial soft tissue thickness using Han population in Xinjiang. Forensic Sci Int. 2016 Sep;266:585.e1-585.e5.

12.Utsuno H, Kageyama T, Uchida K, Yoshino M, Oohigashi S, Miyazawa H, et al. Pilot study of facial soft tissue thickness differences among three skeletal classes in Japanese females. Forensic Sci Int. 2010;195(1-3):165.e1-5.

13.Pithon MM, Rodrigues Ribeiro DL ,Lacerda dos Santos R, Leite de Santana C, Pedrosa Cruz JP. Soft tissue thickness in young north eastern Brazilian individuals with different skeletal classes. J Forensic Leg Med. 2014;22:115-20.

14.Ayoub F, Saadeh M, Rouhana G, Haddad R. Midsagittal facial soft tissue thickness norms in an adult Mediterranean population. Forensic Sci Int. 2019;294:217.e1-217.e7.

15.Sharma P, Arora A, Valiathan A. Age changes of jaws and soft tissue profile. Scientific World Journal. 2014;2014:301501.

16.Soncul M, Bamber MA. Evaluation of facial soft tissue changes with optical surface scan after surgical correction of Class III deformities. J Oral Maxillofac Surg. 2004;62(11):1331-40.

17.Stephan CN, Preisler R. In vivo facial soft tissue thicknesses of adult Australians. Forensic Sci Int. 2018;282:220.e1-e12.

18.Thiemann N, Keil V, Roy U. In vivo facial soft tissue depths of a modern adult population from Germany. Int J Legal Med. 2017;131(5):1455-88.

19.Utsuno H, Kageyama T, Uchida K, Kibayashi K. Facial soft tissue thickness differences among three skeletal classes in Japanese population. Forensic Sci Int. 2014;236:175-80.

20.Utsuno H, Kageyama T, Uchida K, Yoshino M, Miyazawa H, Inoue K. Facial soft tissue thickness in Japanese children. Forensic Sci Int. 2010;199(1-3):109.e1-6.

21.Utsuno H, Kageyama T, Deguchi T, Umemura Y, Yoshino M, Nakamura H, et al. Facial soft tissue thickness in skeletal type I Japanese children. Forensic Sci Int. 2007;172(2-3):137-43.

22.Lee Y-J, Park J-T, Cha J-Y. Perioral soft tissue evaluation of skeletal Class II Division 1: A lateral cephalometric study. Am J Orthod Dentofacial Orthop. 2015;148(3):405-13.

23.Sadeghian S, Ghodousi A, Ghafari R, Afsari E, Raei P. Evaluation of soft tissue thicknesses of facial midline landmarks before and after puberty. J Isfahan Dent School. 2012;7(4):418-24. [In Persian]

24.Arash Vo, Rahmati Kamel M, Ostad Rahimi A, Ghorbanipour R. Evaluation of soft tissue norms on lateral cephalograms in babol. Caspian J Dent Res. 2017;6(2):30-4. [In Persian]
25.El-Mehallawi IH, Soliman EM. Ultrasonic assessment of facial soft tissue thicknesses in adult Egyptians. Forensic Sci Int. 2001;117(1-2):99-107.
26.Stephan CN, Norris RM, Henneberg M. Does sexual dimorphism in facial soft tissue depths justify sex distinction in craniofacial identification?. J Forensic Sci. 2005;50(3):513-8.