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VARIABILITY AND SPECIFICITY REGARDING THE FACIAL SOFT TISSUE THICKNESS FOR ROMANIAN ADULTS

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Abstract: Forensic identification is a subdomain of forensic medicine that is becoming more and more important every day. Cranio-facial reconstruction is one of the methods that can be used for a positive identification, especially when the other lines of evidence do not offer many certainties. In order to perform a cranio-facial reconstruction as reliable as possible, and for the reconstructed image to have the most consistent characteristics, it is necessary to create as many databases as possible regarding the thickness of the facial soft tissues, specific to the population. The aim of the present paper is to create a database of soft tissue thicknesses values for Romanian adult population. As material and method, the authors perform measurements of 11 craniometric landmarks on 100 computed tomography images of Romanian adults. Also, the authors perform a comparative analysis with other European population, including the Turkish population which is also a Balkan country. The results of the study show statistically significant differences between the values of the thickness of the facial soft tissues of the adult population of Romania and those of France, Czech Republic, Slovakia and Turkey respectively. We consider that the values of the facial soft tissues thickness obtained in this study can be considered as the starting point for a database, to be used in cranio-facial reconstruction process for Romanian adults in forensic cases as well as a beginning for other research studies.

Keywords: facial reconstruction, forensic identification, craniometric landmarks, database.

INTRODUCTION

Forensic identification is a subdomain of forensic medicine that is becoming more and more important every day. This resolution is motivated by the countless migration processes taking place between countries, by the multitude of people who hide their identities for various reasons, and by the political phenomena translated into conflicts generating multiple deaths. Thus, it is paramount for each country to have as many databases as possible to help the process of forensic identification, in order to succeed in establishing a correct identity of individuals with unknown identity.

Cranio-facial reconstruction is one of the methods that can be used for a positive identification, especially when the other lines of evidence do not offer many certainties. The cranio-facial reconstruction alone, of course, will not make a positive identification, but it is essential in the process of identification, since in corroboration with the other techniques, it is possible to limit the area of suspects, and then to reach the final goal, that of positive identification [1-3].

In order to perform a cranio-facial reconstruction as reliable as possible, and for the reconstructed image to have the most consistent characteristics, it is necessary to create as many databases as possible regarding the thickness of the facial soft tissues, specific to the population. The development of these databases is imperative to be carried out by as many countries as possible and on study groups as ample as possible. It is also important that said study groups are composed of modern, current populations.

Data on the thickness of facial soft tissues can be obtained using invasive and non-invasive

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methods. Invasive methods refer to the puncture of facial soft tissues by various techniques on cadaveric material. Non-invasive methods refer to the execution of measurements of certain craniometric points using imaging, for example computer-tomography, nuclear magnetic resonance or ultrasound [4].

The thickness of the facial soft tissues is influenced, above all, by the population group, so it is important that every country has these databases. The literature offers a multitude of studies for such databases, for many countries of the world, but Romania does not have such research [5-7].

In this respect, the paper presents references for the thickness of facial soft tissues for the modern population in the North-East region of Romania, based on measurements made on computer-tomographic images of living subjects.

Figure 1. Representation of the facial soft tissue thicknesses measurements.

MATERIAL AND METHODS

The study was conducted on 100 computer tomographic images of the cephalic extremity belonging to adults in Romania, aged between 20 and 84 years, of which 38 women and 62 men. The study group was divided into 3 age groups, between 18-39, 40-59 and over 60 years respectively. The tomographic computer images were taken from the archive of a Neurosurgery Hospital. Only the sex and age of the patients have been included as personal data in this research, other personal data related to identity not being retained.

The practical procedures were carried out with the approvement of the Ethical Committees of Grigore T.Popa Medicine and Pharmacy University.

Measurements

The computer-tomographic images were taken in a supine position and later were imported and viewed using Radiant Dicom software. Initially, all images were placed in the Frankfurt Horizontal Plane (FHP) position. Subsequently, measurements of the thickness of soft tissues were performed for 11 craniometric points, of which 8 on the midline, respectively 3 bilaterally (Table 1, Fig. 1). The craniometric points were selected according to the specialized literature and considering their feasibility on the computer-tomographic images available [8].

Table 1. Description of the craniometric landmarks

Anatomical landmarks (craniometric point)	Description
Midline landmarks	
1.Supraglabella	The most anterior point of the forehead, above the glabella in the mid-sagittal plane
2.Glabella	The most prominent point between the supraorbital ridges in the mid-sagittal plane
3.Nasion	Midpoint of the frontonasal suture
4.Rhinion	The midpoint of the internasal suture on its most inferior and anterior portion
5.Mid-philtrum	The lowest point of the interior margin of the pyriform aperture at the base of the nasal spine projected onto the sagittal plane
6.Supramental	Centered in the fold of chin
7.Pogonion	The most prominent point in the midline of the mental protuberance
8.Gnation	Most inferior point of the mandible in the midsagittal plane
Bilateral landmarks	
9.Supraorbital (left and right)	Centre upper part of the margin of the orbit
10.Infraorbital (left and right)	Centre lower part of the margin of the orbit
11.mid-zygomatic (left and right)	Perpendicular point to the lateral orbit border, centered between the lower border of the orbit and the lower portion of the zygomatic process

Table 2. Comparison of the facial soft tissue thicknesses [mm] between Romanian males and females

	Males										Females										
Landmarks	N	Mean	SD	Median	Range	Min	Max	IQ range 25	IQ range 75	K-S test males	N	Mean	SD	Median	Range	Min	Max	IQ range 25	IQ range 75	K-S test fem	P value (Kolmogov Smirnov test)
supra-glabella	62	4.1	1.1	3.9	5.7	2.2	7.9	3.4	4.4	**<.001**	38	3.5	1.0	3.4	4.3	2.1	6.4	2.5	4.5	0.166	0.113
glabella	62	4.5	1.2	4.4	6.1	2.3	8.3	3.6	5.1	0.200	38	4.0	1.2	3.8	4.6	2.0	6.6	3.1	5.1	0.200	0.200
nasion	**62**	**5.9**	**1.6**	**5.6**	**6.3**	**3.6**	**9.9**	**4.7**	**6.8**	**0.034**	**38**	**4.5**	**1.1**	**4.2**	**4.3**	**3.0**	**7.3**	**3.7**	**5.1**	<.001	**0.014**
rhinion	**62**	**3.2**	**2.0**	**2.9**	**12.7**	**1.3**	**14.0**	**2.2**	**3.5**	<.001	**38**	**2.1**	**0.6**	**2.1**	**2.2**	**1.2**	**3.4**	**1.7**	**2.6**	**0.200**	**<.001**
mid-philtrum	**62**	**11.7**	**1.8**	**11.8**	**6.9**	**8.7**	**15.6**	**10.0**	**13.0**	**0.006**	**38**	**9.1**	**1.9**	**9.5**	**7.4**	**5.4**	**12.8**	**7.9**	**10.1**	**0.200**	**0.003**
supra-mental	62	8.7	1.3	8.7	5.3	5.8	11.1	7.6	9.7	0.200	38	8.3	1.9	7.7	7.4	4.9	12.3	6.6	9.7	**0.006**	0.088
pogonion	62	8.7	1.3	8.7	7.3	5.8	13.1	8.0	9.5	0.200	38	8.5	1.4	8.4	6.4	5.0	11.4	7.7	9.8	0.193	0.200
gnation	62	7.1	1.6	7.3	7.0	2.8	9.8	6.2	8.5	0.200	38	6.1	1.5	6.4	6.4	2.3	8.8	4.9	7.6	0.200	0.085
supraorbital left	62	6.2	1.6	6.0	7.6	2.5	10.1	5.0	7.3	0.200	38	5.6	1.2	5.7	5.5	3.2	8.7	4.9	6.4	0.200	0.127
infraorbital left	**62**	**4.7**	**1.4**	**4.3**	**6.4**	**2.5**	**8.9**	**3.7**	**5.3**	<.001	**38**	**4.2**	**1.3**	**3.9**	**4.3**	**2.1**	**6.3**	**3.3**	**5.5**	**0.127**	**0.031**
mid-zigomatic left	**62**	**9.2**	**2.0**	**9.2**	**10.3**	**3.8**	**14.1**	**8.1**	**10.0**	<.001	**38**	**9.5**	**1.2**	**9.8**	**6.1**	**7.1**	**13.2**	**8.7**	**10.0**	<.001	**<.001**
supra orbital right	62	6.8	1.5	6.7	8.2	3.9	12.1	5.6	7.7	0.200	38	6.1	1.5	6.1	6.5	3.5	10.0	5.0	6.9	0.147	0.200
infra orbital right	**61**	**4.7**	**1.5**	**4.6**	**7.1**	**2.3**	**9.4**	**3.6**	**5.5**	**0.200**	**38**	**4.1**	**1.3**	**3.7**	**4.4**	**2.1**	**6.5**	**3.2**	**5.3**	**0.009**	**<.001**
mid ygomatic right	**61**	**9.3**	**1.8**	**9.2**	**9.7**	**5.5**	**15.2**	**8.4**	**10.0**	<.001	**38**	**9.4**	**1.2**	**9.4**	**5.3**	**7.1**	**12.4**	**8.7**	**10.0**	**0.050**	**<.001**

Bold means significant at P<=0.05 for each landmark.
IQ range = 25%-75% sample range.

Statistical analysis

Data resulted from CT's measurements were analyzed using Microsoft 365 Excel software for storing and plotting results and SPSS 29.0.0.0 software for the statistical analysis.

We calculated the basic descriptive statistics, such as the mean, standard deviation, median, min, max and IQ range for the whole sample of 100 CT living people, separately for men and females and for ages (young, adult and old).

We tested the normality of distribution between men and females using the Kolmogorov-Smirnov test to find if the samples are normal distributed against the cumulative distribution function (Table 1). We calculated the age differences with the Kruskal-Walli's test for the median values (Table 2).

We performed a MANOVA test to evaluate the influence of the independent variables, respectively age and sex on the 14 dependent variables (all the landmarks studied by CT's). Other possible influences could come from the body mass index, weight or height, but we don't have such data. MANOVA is a multivariate analysis of variance that provides regression analysis and analysis of variance for multiple dependent variables by one or more factor variables or covariates, in our cases the age, sex and their combined impact.

We too performed comparison examinations. We may gather that each country FSTT is unmistakable despite a few minor commonalities within the FSTT points of interest. Still, the rhinion point of interest shows up to be one that presents common means over all examined populations.

The statistical significance for most statistical tests is set at P-value = 0.05 (meaning 5%). Values lower than the significant threshold demonstrate that we deny the null hypothesis of the normal distribution, meaning that the distribution is not normal to the hypothesis.

RESULTS

Sexual dimorphism

The results regarding the sexual dimorphism in FSTT are shown especially in Table 2 and also in Table 3.

Age differences

The results of the analysis of the age medians on each landmark, for males and females, are detected in Table 3.

Variability

Table 4 provides the results of the MANOVA regression and variance test for all the 14 landmarks. We applied the Benferroni adjustment for all the tests. The significance of the threshold is 0.05 (Table 3). The MANOVA calculates the influence of independence over the means of the dependent variables.

The results show that the influence of age is not important, except from mid-philtrum, which means that the influence of the group ages on face soft tissues depths has impact only the exception above.

The gender variable seems to influence more the face soft tissues characteristics – for landmarks as nasion, rhinion, mid-philtrum, gnathion, infraorbital left and supra orbital right, as the age variable. No interaction effect is detected, meaning that the influence of age and sex are independent on the face tissue depths. We don't have information about other possible independent variables, as mentioned above.

Specificity

We did comparative studies between the Romanian landmarks FSTT and CT samples for living people- nationals such as: Czech, Slovak, French and the Turkish people, from studies mentioned in our references [9-12].

The analysis is done with the Medcalc software (https://www.medcalc.org/) for the comparisons of means and standard deviation values.

The calculated difference between the observed means and standard deviation values in the two samples is determined by the analysis. The difference is presented together with a significant value (P-value).

The P-value is the likelihood that the observed difference between the samples would occur if the null hypothesis were true. The notion that the difference is zero is the null hypothesis.

Similarities between the studies are P-values higher than 0.05.

The main result is that there is a common trend for the rhinion landmark, males and females, as the comparative means and standard values have lower values than the threshold (Table 5).

The comparison regardless the gender variable points out the same similarity for the rhinion FSTT's samples (Table 6).

The same design of closeness for the values of the means and the implies of std. deviations are found within the comparison with the Slovak consider for the rhinion point of interest, particularly females (Table 7).

The Rhinion sample shows similarities between Romanian and French people in the Guyomark's study,

Table 3. Comparison of the facial soft tissue thickness (mm) between age groups (Kruskal-Wally's test)

Landmarks	Sex	Age 18-39				Age 40-59				Age >=60				Kruskal Wallis test (P-values)
		N	Median	Percentiles 25	75	N	Median	Percentiles 25	75	N	Median	Percentiles 25	75	
supra-glabella	F	10	2.7	2.5	3.4	18	3.7	2.8	4.7	10	3.6	2.5	4.8	0.115
	M	32	3.9	3.3	4.3	18	3.9	3.6	4.5	12	4.3	2.9	5.7	0.628
glabella	F	10	3.7	3.0	4.1	18	4.0	3.0	5.2	10	3.7	3.1	5.2	0.564
	M	32	4.2	3.6	4.8	18	4.4	3.6	5.6	12	4.9	3.2	5.3	0.736
nasion	F	10	4.2	3.6	4.8	18	4.2	4.0	5.2	10	4.5	3.6	5.4	0.830
	M	32	5.5	5.0	6.3	18	6.3	4.3	8.3	12	5.6	4.1	7.2	0.797
rhinion	F	10	1.8	1.6	2.5	18	2.0	1.4	2.7	10	2.1	2.1	2.6	0.484
	M	32	2.7	2.0	3.3	18	2.7	2.2	3.6	12	3.0	2.9	4.1	0.212
mid-philtrum	**F**	**10**	**9.7**	**8.7**	**10.6**	**18**	**10.0**	**8.5**	**11.0**	**10**	**8.0**	**6.3**	**9.1**	**0.034**
	M	**32**	**12.7**	**10.6**	**13.6**	**18**	**11.5**	**10.3**	**12.5**	**12**	**9.9**	**9.1**	**10.3**	**<.001**
supra-mental	F	10	7.0	6.6	8.0	18	8.9	7.4	9.7	10	7.2	6.3	10.5	0.197
	M	32	8.6	7.7	9.3	18	8.9	7.6	9.6	12	8.4	7.6	10.4	0.864
pogonion	F	10	8.2	7.6	8.8	18	8.9	7.8	10.0	10	7.7	6.9	9.6	0.264
	M	32	8.7	8.3	9.6	18	8.8	7.6	9.6	12	8.6	7.6	9.2	0.785
gnation	F	10	5.7	4.0	7.3	18	6.5	5.6	7.7	10	6.1	4.8	7.6	0.520
	M	32	7.6	5.7	8.5	18	7.2	6.5	8.5	12	6.9	5.6	8.2	0.680
supraorbital left	F	10	5.0	4.6	5.6	18	6.1	5.2	6.9	10	5.7	4.7	5.9	0.077
	M	32	6.0	5.2	7.3	18	5.8	4.4	7.5	12	6.1	4.8	7.4	0.744
infraorbital left	F	10	3.3	2.8	4.4	18	5.2	3.6	5.8	10	3.8	3.3	4.9	0.057
	M	32	4.2	3.7	4.6	18	4.4	3.8	5.5	12	6.0	3.5	7.3	0.125
mid-zigomatic left	F	10	**9.6**	8.3	10.0	18	**9.8**	8.7	10.0	10	**9.6**	9.0	10.0	0.980
	M	32	**9.2**	8.4	10.0	18	**9.3**	7.0	10.5	12	**8.7**	7.5	9.9	0.689
supra orbital right	**F**	**10**	**4.8**	**4.3**	**5.6**	**18**	**6.6**	**5.6**	**8.0**	**10**	**6.0**	**5.7**	**6.5**	**0.002**
	M	32	6.8	5.9	7.8	18	6.4	5.4	7.5	12	7.0	5.0	8.0	0.662
infra orbital right	F	10	3.3	3.0	3.9	18	4.4	3.2	6.0	10	3.5	3.1	5.0	0.105
	M	32	4.5	3.5	5.5	18	5.0	3.7	5.5	11	4.6	3.4	7.0	0.729
mid ygomatic right	F	10	**9.1**	8.0	10.3	18	**9.3**	8.8	10.3	10	**9.8**	8.6	10.0	0.776
	M	32	**9.3**	8.4	9.9	18	**9.3**	8.1	10.0	11	**8.8**	8.4	10.0	0.925

Table 4. Multivariate MANOVA results

Dependent Variable	N	Min	Max	Mean	Std. Deviation	P-values Age	Sex	Age*Sex
supra-glabella	99	2.1	7.9	3.9	1.1	0.137	0.012	0.631
glabella	99	2.0	8.3	4.3	1.2	0.327	0.050	0.796
nasion	99	3.0	9.9	5.4	1.6	0.545	**<0.000**	0.502
rhinion	99	1.2	14.0	2.8	1.7	0.129	**<0.000**	0.371
mid-philtrum	**99**	**5.4**	**15.6**	**10.7**	**2.2**	**<0.000**	**<0.000**	**0.854**
supra-mental	99	4.9	12.3	8.5	1.6	0.185	0.060	0.252
pogonion	99	5.0	13.1	8.6	1.3	0.613	0.225	0.503
gnation	99	2.3	9.8	6.7	1.6	0.321	**0.001**	0.671
supraorbital left	99	2.5	10.1	6.0	1.5	0.690	0.059	0.244
infraorbital left	**99**	**2.1**	**8.9**	**4.5**	**1.3**	**0.016**	**0.008**	**0.065**
mid-zigomatic left	99	3.8	14.1	9.3	1.8	0.999	0.540	0.871
supra orbital right	**99**	**3.5**	**12.1**	**6.5**	**1.5**	**0.045**	**0.019**	**0.017**
infra orbital right	99	2.1	9.4	4.5	1.4	0.090	**0.006**	0.190
mid-zigomatic right	99	5.5	15.2	9.3	1.6	0.966	0.778	0.832

where there is no distinction for the gender.

The rhinion landmark seems to be the same landmark that shows similarities with the Turkish study, for males and females, separately, but also for the whole sample.

Unlike some presumptions, there are some similarities with the Turkish landmarks, for the supra-glabella (males) and rhinion (males).

The rhinion sample shows similarities between Romanian and Turkish people, where there is no distinction for the gender (Table 10).

Table 5. Comparison of results with the Czech study (males *vs*. females)

Landmarks	Sex	Present study			Drgacova (Czech) study			P-value
		N	Mean	Std. Deviation	N	Mean	Std. Deviation	
glabella	M	62	4.456	1.201	56	6.298	1.165	<.0001
	F	38	3.964	1.152	46	6.019	1.315	<.0001
nasion	M	62	5.935	1.568	56	9.416	1.905	<.0001
	F	38	4.506	1.087	46	8.255	1.868	<.0001
rhinion	**M**	**62**	**3.165**	**2.027**	**56**	**3.115**	**0.633**	**0.08599**
	F	**38**	**2.140**	**0.581**	**46**	**2.618**	**0.627**	**0.0006**
pogonion	M	62	8.714	1.297	56	13.542	2.641	<.0001
	F	38	8.480	1.421	46	11.767	2.197	<.0001
gnation	M	62	7.112	1.554	52	9.148	1.876	<.0001
	F	38	6.145	1.512	41	7.978	2.155	<.0001
supraorbital left	M	62	6.156	1.608	56	9.996	1.716	<.0001
	F	38	5.639	1.161	46	8.911	1.776	<.0001
supra orbital right	M	62	6.798	1.524	56	10.221	1.693	<.0001
	F	38	4.216	0.208	46	8.935	1.587	<.0001

Table 6. Comparison of results with the Czech study (all samples)

Landmarks	Present study			Drgacova study (Czech article)			P-value
	N	Mean	Std. Deviation	N	Mean	Std. Deviation	
glabella	100	4.269	1.201	102	6.2	1.2	<.0001
nasion	100	5.392	1.563	102	8.9	1.9	<.0001
rhinion	**100**	**2.775**	**1.705**	**101**	**2.9**	**0.7**	**0.4966**
pogonion	100	8.625	1.343	102	12.7	2.6	<.0001
gnation	100	6.744	1.601	93	8.6	2.1	<.0001

Table 7. Comparison of results with the Slovak (Panenkova) study (males *vs*. females)

Landmarks	Sex	Present study			Slovak study			P-value
		N	Mean	Std. Deviation	N	Mean	Std. Deviation	
supra-glabella	M	62	4.071	1.123	76	5.1	1.2	<.0001
	F	38	3.527	1.035	79	4.6	0.9	<.0001
glabella	M	62	4.456	1.201	80	5.9	1.3	<.0001
	F	38	3.964	1.152	80	5.5	1	<.0001
nasion	M	62	5.935	1.568	80	8	1.5	<.0001
	F	38	4.506	1.087	80	6.9	1.2	<.0001
rhinion	M	62	3.165	2.027	80	2.5	0.7	0.0071
	F	**38**	**2.140**	**0.581**	**80**	**2.1**	**0.6**	**0.7331**
mid-philtrum	M	62	11.725	1.812	69	15.2	2.6	<.0001
	F	38	9.149	1.854	72	12.4	2	<.0001

Table 8. Comparison of results with the French (Guyomark'h) study (all samples)

Landmarks	Present study			Guyomark'h study			P-value
	N	Mean	Std. Deviation	N	Mean	Std. Deviation	
glabella	100	4.3	1.2	366	6.5	1.2	<.0001
nasion	100	5.4	1.6	469	8.2	1.6	<.0001
rhinion	**100**	**2.8**	**1.7**	**321**	**3.0**	**1.3**	**0.2145**
pogonion	100	8.6	1.3	254	11.8	2.1	<.0001
gnation	100	6.7	1.6	211	9.5	3.3	<.0001

DISCUSSION

In recent years, there has been an increase in research on facial soft tissue thickness in more and more countries. In order to perform a cranio-facial reconstruction or superimpositions as precise as possible, it is particularly important to know the thickness of the facial soft tissues at certain craniometric points. These data can be collected by invasive or non-invasive methods. Non-invasive methods refer to the possibility of using computer-tomographic images, or other imaging techniques, in order to take the necessary measurements. The advantages of using computer-tomographic images are multiple, among which is the fact that it allows measurements for living people, is a non-contact technique and, also, permits keeping records and logging them in a database [4,13-16].

In the present study, we used computer-tomographic images, taking measurements of the facial soft tissue thickness of 11 craniometric points in an adult population in the North-East region of Romania. The study was conducted without information on the weight or height of the patients, so in our analysis only the sex and age of the patients were taken into account, these being divided into three age groups, between 18-39 years old, 40- 60 years old and over 60 years old.

Regarding sexual dysmorphism, significant FSTT's were found for landmarks like nasion, rhinion, mid-philtrum, infraorbital-left, mid-zygomatic left, infra orbital right and mid zygomatic right, with P-values lower than 0.05. The same significant FSTT's P-values were found in the Slovak study (for nasion, nasion, mid-philtrum or supraorbital left) or in the Czech study (nasion, phinion, gnation).

All significant soft tissues thicknesses are higher for males, except from mid-zygomatic left (where the means are higher for females, 9.5 *vs.* 9.2) and mid-zygomatic right (where the means are higher for females, 9.4 *vs.* 9.3). The same results are confirmed by the median values, meaning the value the middle value from the lowest value to the highest one.

According to the performed analysis, it was proved that there are differences between the genders only for the craniometric points of the nose and orbit. This is to be expected, as the nose and the orbit are

Table 9. Comparison of results with the Turkish study (males *vs.* females)

Landmarks	Sex	Present study N	Mean	Std. Deviation	Turkish study N	Mean	Std. Deviation	P-value
supra-glabella	**M**	**62**	**4.07**	**1.12**	**25**	**4.34**	**0.81**	**0.2771**
	F	38	3.53	1.03	25	4.31	1.01	0.0043
glabella	M	62	4.46	1.20	25	6.71	1.04	<.0001
	F	38	3.96	1.15	25	6.87	0.94	<.0001
nasion	M	62	5.93	1.57	25	7.92	0.86	<.0001
	F	38	4.51	1.09	25	7.57	1.03	<.0001
rhinion (end of	**M**	**62**	**3.16**	**2.03**	**25**	**3.26**	**0.51**	**0.8090**
nasals)	F	38	2.14	0.58	25	2.78	0.72	0.0002
mid-philtrum	M	62	11.73	1.81	25	12.61	1.21	0.0281
	F	38	9.15	1.85	25	11.50	1.47	<.0001
pogonion (mental	M	62	8.71	1.30	25	12.27	1.50	<.0001
eminence)	F	38	8.48	1.42	25	12.50	1.72	<.0001
supraorbital left	M	62	6.16	1.61	25	7.14	0.83	0.0049
	F	38	5.64	1.16	25	7.54	1.33	<.0001
infraorbital left	M	62	4.66	1.61	25	5.57	1.64	0.0199
	F	38	4.22	1.28	25	6.76	1.43	<.0001

Table 10. Comparison of results with the Turkish study (all samples)

Landmarks	Present study N	Mean	Std. Deviation	Turkish study N	Mean	Std. Deviation	P-value
supra-glabella	100	3.86	1.12	50	4.33	0.91	0.0111
glabella	100	4.27	1.20	50	6.79	0.98	<0.0001
nasion	100	5.39	1.56	50	7.74	0.96	< 0.0001
rhinion	**100**	**2.78**	**1.71**	**50**	**3.02**	**0.67**	**0.3411**
mid-philtrum	100	10.75	2.21	50	12.05	1.45	0.0002
pogonion	100	8.63	1.34	50	12.39	1.60	<0.0001
supraorbital left	100	5.96	1.47	50	7.34	1.12	< 0.0001
infraorbital left	100	4.49	1.35	50	6.16	1.64	< 0.0001

two anatomical areas of the facial massif important in anthropological analysis for predicting gender.

The landmarks that did not differ significantly between the males and females are mostly the same with those that did not differ within the group sample, such as glabella, pogonion, gnation, supraorbital left or supraorbital right: they have close standard deviation values (not the means).

Regarding the age differences, the results of the comparison of the groups of age are splitted among young people (lower than 40 years), adults (between 40 and 59 years) and old people (more than 60 years). For most of the landmarks the distribution of the median values falls according to the rule: lowest values for young people which increase for adults and then decrease again for the old people (more than 60 years), but not so much as reaching the young values.

Except from the rule are the following landmarks: supra glabella and glabella (m), nasion (m), rhinion (m&f), mid-philtrum (m), gnation (m), supraorbital left (m), infraorbital left (m), supraorbital right (m) and mid zygomatic right (f), which makes the rule not being so obvious in time. The evolution of ages for the median values of the landmarks are important for clinical or anthropological interpretations.

Accordingly, the males' medians are higher than the females', except from the mid-zygomatic left.

Regarding the comparative analysis with the population of Slovakia, the Czech Republic, France and Turkey respectively, we note that as a conclusion, from the comparison investigations, that each country FSTT is distinct despite some minor commonalities in the FSTT landmarks. Still, the rhinion landmark appears to be one that exhibits common means across all studied populations. It is also pointed out that the values obtained as a result of our research are lower than those of the French, Slovaks, Czechs, respectively of the Turks, but, studying the comparative analysis between the population of Romania and that of Turkey, and taking into account the differences between the population of Romania and the other three populations with which the comparative analysis was carried out, it is observed, however, that the differences are relatively smaller between the population of Romania and Turkey. This last aspect shows the influence of the Balkan area of which Romania and Turkey are also part.

The results of our study are important for the practice of forensic anthropology, respectively forensic identification, especially due to the fact that Romania is at the beginning of the road in such research. At the same time, such research is necessary and shows the interpopulation variations of the values of facial soft tissues thickness.

In conclusion, the study emphasizes the measurements taken regarding the thickness of the facial soft tissues for the adult population of Romania on computer-tomographic images, i.e. being performed on living people. The measurements were made correspondingly to 11 craniometric points, considering gender and age, of which 7 showed statistically significant differences between the sexes.

The results of the study show statistically significant differences between the values of the thickness of the facial soft tissues of the adult population of Romania and those of France, Czech Republic, Slovakia and Turkey respectively. We consider that the values of the facial soft tissues thickness obtained in this study can be considered as the starting point for a database, to be used in cranio-facial reconstruction process for Romanian adults in forensic cases as well as a beginning for other research studies.

Conflict of interest

The authors declare that they have no conflict of interest.

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