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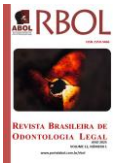

Forensic dentistry

APPLICABILITY OF PALATAL RUGOSCOPY CODIFICATION AS A TOOL IN HUMAN IDENTIFICATION

Uso de codificação das rugas palatinas como ferramenta de identificação humana

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ABSTRACT

Forensic dentistry is one of the areas of science that places the knowledge of dentistry in favor of civil society and justice. One of the great efficiencies of this specialization is the human identification, where rugoscopy is an efficient biological method. This technique involves the study of palatine wrinkles that are unique anatomical accidents and that are present in strategic locations in the anterior portion of the hard palate, being considered immutable throughout life and, consequently, being important in the study of human identification. The objective of this work was to study the rugoscopic characteristics of individuals from the city of Feira de Santana, in order to assess its applicability as a method of individual human identification. An observational, classificatory and cross-sectional study was performed. The study corresponded to the analysis of 100 plaster casts of the upper arch, where 51 corresponded to females and 49 to males. Regarding the analyses, it was decided to adopt the classifications of Silva (1936), analyzing the quantitative relation of wrinkles; Carrea (1937), relating the arrangement of wrinkles; and Bassauri (1961), analyzing the morphotypes of wrinkles. The results showed that, according to Silva's system, each individual has approximately 11 wrinkles. As for Carrea's analysis, type IV was the most predominant. While Bassauri showed no agreement on any pattern. Finally, it was found that there are no significant differences, proving that rugoscopy can be used as an effective means for human identification, in addition to being a feasible, low-cost and easy-to-perform method.

KEYWORDS

Forensic anthropology; Forensic dentistry; Hard palate.

INTRODUCTION

Human identification is fundamental for the progress of society. Everyone has the right to individual identification in civil society, and this process is closely linked to the practice of their rights and duties, bringing to light their individualization[1].

Human individuality is based on a complex of characteristics unique to each individual, such as fingerprints, DNA, and odontology. These characteristics are used to differentiate and identify a living individual or a corpse, and are considered primary methods of identification[2].

Forensic dentistry, in turn, is considered an efficient area and obtains good results for investigation, based on the assumption of the resistance of teeth and dental materials to the action of heat, traumas and chemical aggressions. Its practice consists of associating the information present in the dental documentation, consisting of the dental record, radiographs, plaster casts, examinations, photographs, among others, and the body examination, allowing to reach the human identity through comparison of records obtained ante-mortem (AM) and post-mortem (PM) [3].

Other dental methods can also be used in the identification process, especially when the use of primary methods becomes unfeasible, such as cheiloscopy and palatal rugoscopy. Due to its characteristics, the latter has the potential for biological identification, as it is unique and is present in the living individual, or even dead, in some cases, also in the skeletonization process[4-5].

This is because the palatine wrinkles are in a strategic location, protected from traumas and high temperatures. Espana et al. (2010)[6] showed that the relationship of dental prostheses, chemical substances or traumas does not change the morphology of these structures. In addition, according to Manganotti et al. (2021)[7], the profile of these wrinkles does not result in differences in age, skin color and use of previous orthodontics.

The study of palatal rugoscopy as a method of individual identification was first mentioned by Lopes de Léon in 1924, inspired by Vucetich. From this study, research on palatine wrinkles and on the fastest and safest ways to identify them was started, proposing then several classification systems, such as Carrea (1937)[8], Silva (1938)[9], Basauri (1961)[10], among others[11-12].

Accordingly, with the evolution of forensic sciences, the efficiency of palatine wrinkles as a method of human identification has been proven, showing its applicability even under unfavorable conditions[13].

Taking into account the relevance of the theme and its importance in society, this research was intended to study the rugoscopic characteristics of individuals in the city of Feira de Santana, in order to assess its applicability as a method of individual human identification.

METHODOLOGY

This study is characterized by being observational, classificatory and cross-sectional, with a quantitative approach in nature, involving the introduction of the classification methods of palatine wrinkles proposed by Carrea (1937)[8], Silva (1938)[9] and Bassauri (1961)[10], respectively.

Before data collection, a pilot calibration study was conducted with the researchers, in addition to testing the data collection methods, the indices were assessed by the Kappa method, and the agreement between the examiners reached 0.851, which is an excellent agreement.

Data collection was performed by undergraduate Dentistry students at the Feira de Santana Higher Education Unit (UNEF, as per its Portuguese acronym). The analysis of the data obtained was performed by a pair of observers/researchers, who performed the classification of the palatine wrinkles of the surveyed participants, who formed a group of volunteers, where the individual plaster casts were obtained after authorization of the Free and Informed Consent Form (FICF).

The studied sample consists of 100 casts of people living in Feira de Santana and/or living in the surrounding cities. The group was composed of men and women over 18 years of age who authorized the survey.

The selection of sample participants was composed of patients from a dental clinic in the city, having as inclusion criteria individuals of both sexes and aged 18 years and over. Patients with any palate injury due to trauma, inflammation, malformation or other abnormalities or cases with inadequate obtaining of the upper arch molding were excluded from this study.

Data collection was performed using plaster casts already made and filed, following all the necessary proportions. Before the analysis of the wrinkles, the contour of their designs was performed with the aid of a black pencil, thus highlighting the wrinkles in relation to the plaster. After the delineation, the patterns were classified according to the systems proposed by Carrea (1937)[8], Silva (1938)[9] and Bassauri (1961)[10].

Following Carrea (1937)[8], a delineation of the palatine wrinkles with black pencil was performed in line with the wrinkle arrangements, dividing them into right and left, separating them by a vertical line up to the incisive papilla. Therefore, basing the wrinkles on four circumstances, where type I are the wrinkles that converge the palatine raphe in the posteroanterior direction; type II are located horizontally and perpendicularly to the palatine raphe; in turn, the wrinkles that are directed towards the anteroposterior direction and converge the palatine raphe, they are type III; and, finally, those that are in different directions are type IV (Figure 1).

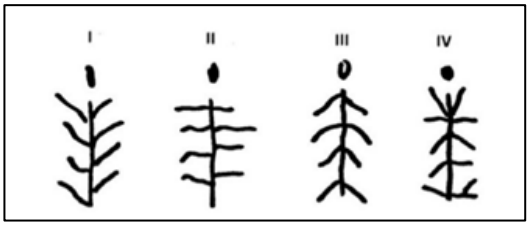

Figure 1. Classification proposed by Carrea (1937)[14].

After Carrea's assessment (1937), it was assessed following Silva's patterns, which adopts the following conformations: type 1: line; type 2: curve; type 3: angle; type 4: circle; type 5: sinuous, type 6: point and wrinkles formed in "Y", chalice, racket or branched, disregarding wrinkles smaller than two millimeters. This was ended up with the sum of the wrinkles,

according to the amount of each conformation (Figure 2).

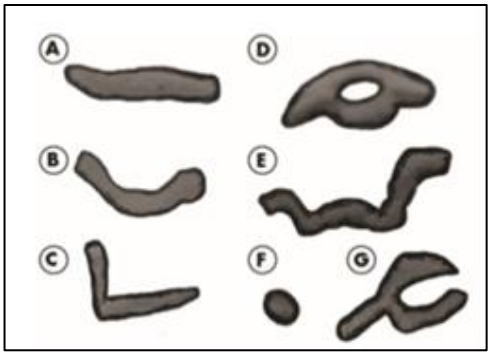

Figure 2. Classification proposed by Silva (1938)[15].

Finally, it was assessed according to Bassauri, who proposes that the major wrinkle, located more anteriorly will be classified with capital letters (A, B, C, D, E, F, X) and then the secondary wrinkles, through numbers (1, 2, 3, 4, 5, 6, 7), dividing the wrinkles into right and left. For this method, a code was made to allow identification later (Table 1).

Table 1. Classification System proposed by Bassauri[13]

Major Wrinkle	Secondary Wrinkle	Anatomy
A	1	Point
B	2	Line
C	3	Angle
D	4	Sinuous
E	5	Curve
F	6	Circle
X	7	Polymorphic

After the classification of all plaster casts of the participants, following the approaches mentioned above, an electronic table with information on palatine wrinkles was prepared in the Excel program (Office 2010, Microsoft Corporation®, Redmond, Washington, USA), where the quantitative values of palatine wrinkles. Finally, an individualized code was made among the three methods, as a way to show that individualization is one of the most striking characteristics of palatine wrinkles.

RESULTS

According to the collected data, the survey consists of 51% female casts and 49% male casts in a number of 100 casts, belonging to individuals aged between 18 and 62 years, equating to an average of 31 years old.

With regard to rugoscopic assessment, Table 2 shows the classification of palatine wrinkles applied to their arrangements, proposed by Carrea (1937), where a greater predominance of Type IV wrinkles was verified (41%), followed by Type II (28%) and Type III (27%), while Type I (4%) was the less observed in the total group in this research. It is noted that a statistically significant difference was found between the Carrea type wrinkles ($p<0,001$).

Silva's rugoscopic classification (1938) is made through numerical morphotypes that define the palatine wrinkles (type 1: line; type 2: curve; type 3: angle; type 4: circle; type 5: sinuous; type 6: point; and type 7: composed). Then, the sum of wrinkles from simple ones to composed ones was performed. The values of the sums found in the plaster casts were divided by the sampling *n* of the addressed study (n=100), in order to find the relative frequency of palatine wrinkles, obtaining an average of 11.43 (table 3).

Table 2. Assessment of palatine wrinkles according to Carrea's method (1937).

	Frequency	Percentage
Type I	4	4.0%
Type II	28	28.0%
Type III	27	27.0%
Type IV	41	41.0%
TOTAL	100	100.00%

Table 3. Assessment of palatine wrinkles according to Silva's method (1938).

	VALUES
AVERAGE	11.4321
MINIMUM	5.0
MAXIMUM	20.0

When analyzing the palatine wrinkles by means of Bassauri's method (1961), shown in Table 4, it was noticed that, on the right side, the main wrinkle (wrinkle 1) that most appeared was the polymorphic type 28 (28%); however, it was the sinuous-type wrinkle that maintained the greatest constancy in the wrinkles on the right side, 3 (31%), 4 (26%), 5 (24%), 6 (12%), 9 (4%), 11 (2%) and 12 (1%). Wrinkle 2 showed a greater amount in the curved shape (28%) and wrinkles 7 (8%) and 8 (5%) had a greater amount of line-type wrinkle, only wrinkle 10 (2%) had an amount similar between point-type wrinkles and line-type wrinkles.

On the left side, the curve-type palatine wrinkle (34%) was the most observed in wrinkle 1, and the most predominant wrinkle on the left side was the sinuous type in wrinkles 2 (30%), 4 (34%), 5 (24%), 6 (12%), 7 (8%) and 8 (4%). Wrinkles 3 and 9 had a higher predominant pattern of line-type wrinkles (31%) and (12%), respectively. Wrinkle 10 had an equality between curve (1%) and polymorphic (1%) wrinkles, followed by wrinkle 12, which was tied in line (1%) and sinuous (1%). Wrinkle 12 was not present in any individual on the left side.

By dividing the wrinkles according to the system proposed by Bassauri (1961), a total of 1,101 wrinkles were found, being 551 wrinkles in men and 550 in women. It is noted that a greater number of sinuous-type wrinkles (27.52%) were found, followed by curve-type wrinkles (22.25%) and line-type wrinkles (21.25%). Circle (1.18%) and angle (4.26%) were the least present types in the research.

In order to rid the study of potential errors, Bassauri's (1961) method was followed, where the wrinkles were classified according to their morphotypes, where the formation of an individual code was verified, the results were significant enough to find that there was no repeated pattern. Furthermore, although the wrinkles maintained a pattern, a differentiation took place, which is the measure of the tendency for the uniqueness of the wrinkles.

DISCUSSION

In this study, palatal rugoscopy methods were used based on respecting a set of biological and technical characteristics that make it representative in forensic investigations, such as stability, perpetuity, uniqueness, practicability and classificability. Since, according to Caldas et al. (2007)[16], wrinkles remain stable throughout life, only suffering changes in length and position due to the individual's natural development.

Table 4. Assessment of palatine wrinkles according to Bassauri's method (1961), among 100 individuals.

Type of palatine wrinkle	Gender				Total Group		Gender				Total Group	
	Male		Female				Male		Female			
	N	%	N	%	N	%	N	%	N	%	N	%
TOTAL	49	49	51	51	100	100	49	49	51	51	100	100
● Wrinkle 1												
Point	2	4.08	3	5.88	5	5.0	2	4.08	1	1.96	3	3.0
Line	8	16.32	16	31.37	24	24.0	7	14.28	12	23.52	19	19.0
Angle	2	4.08	0	0	2	2.0	2	4.08	2	3.92	4	4.0
Sinuous	4	8.16	8	15.68	12	12.0	7	14.28	5	9.80	12	12.0
Curve	10	20.40	16	31.37	26	26.0	16	32.65	18	35.29	34	34.0
Circle	3	6.12	0	0	3	3.0	3	6.12	3	5.88	6	6.0
Polymorphic	20	40.80	8	15.68	28	28.0	12	24.48	10	19.60	22	22.0
● Wrinkle 2												
Point	6	12.24	6	11.76	12	12.0	3	6.12	5	9.80	8	8.0
Line	3	6.12	8	15.68	11	11.0	7	14.28	11	21.56	18	18.0
Angle	1	2.04	2	3.92	3	3.0	2	4.08	3	5.88	5	5.0
Sinuous	15	30.61	10	19.60	25	25.0	18	36.73	12	23.52	30	30.0
Curve	15	30.61	13	25.49	28	28.0	9	18.36	14	27.45	23	23.0
Circle	1	2.04	0	0	1	1.0	1	2.04	0	0	1	1.0
Polymorphic	8	16.32	12	23.52	20	20.0	9	18.36	6	11.76	15	15.0
● Wrinkle 3												
Point	4	8.16	6	11.76	10	10.0	3	6.12	1	1.96	8	8.0
Line	6	12.24	10	19.60	16	16.0	16	32.65	15	29.41	31	31.0
Angle	3	6.12	2	3.92	5	5.0	2	4.08	4	7.84	6	6.0
Sinuous	17	34.69	14	27.45	31	31.0	13	26.53	17	33.33	30	30.0
Curve	15	30.61	14	27.45	29	29.0	11	22.44	8	15.68	19	19.0
Polymorphic	2	4.08	2	3.92	4	4.0	4	8.16	6	11.76	10	10.0
● Wrinkle 4												
Point	7	14.28	9	17.64	16	16.0	7	14.28	3	5.88	10	10.0
Line	6	12.24	15	29.41	21	21.0	9	18.36	9	17.64	18	18.0

Angle	0	0	1	1.96	1	1.0	2	4.08	1	1.96	3	3.0
Sinuous	16	32.65	10	19.60	26	26.0	15	30.61	19	37.25	34	34.0
Curve	9	18.36	7	13.72	16	16.0	10	20.40	4	7.84	14	14.0
Circle	1	2.04	0	0	1	1.0	0	0	0	0	0	0
Polymorphic	3	6.12	4	7.84	7	7.0	2	4.08	4	7.84	6	6.0
● Wrinkle 5												
Point	7	14.28	4	7.84	11	11.0	4	8.16	7	13.72	11	11.0
Line	9	18.36	8	15.68	17	17.0	5	10.20	7	13.72	12	12.0
Angle	2	4.08	3	5.88	5	5.0	3	6.12	0	0	3	3.0
Sinuous	13	26.53	11	21.56	24	24.0	11	22.44	13	25.49	24	24.0
Curve	3	6.12	9	17.64	12	12.0	8	16.32	4	7.84	12	12.0
Polymorphic	4	8.16	2	3.92	6	6.0	4	8.16	4	7.84	8	8.0
● Wrinkle 6												
Point	1	2.04	2	3.92	3	3.0	3	6.12	5	9.80	8	8.0
Line	7	14.28	4	7.84	11	11.0	4	8.16	3	5.88	7	7.0
Angle	1	2.04	1	1.96	2	2.0	2	4.08	3	5.88	5	5.0
Sinuous	5	10.20	7	13.72	12	12.0	10	20.40	2	3.92	12	12.0
Curve	4	8.16	7	13.72	11	11.0	3	6.12	2	3.92	5	5.0
Polymorphic	1	2.04	1	1.96	2	2.0	3	6.12	3	5.88	6	6.0
● Wrinkle 7												
Point	1	2.04	3	5.88	4	4.0	2	4.08	3	5.88	5	5.0
Line	5	10.20	3	5.88	8	8.0	4	8.16	2	3.92	6	6.0
Sinuous	3	6.12	4	7.84	7	7.0	6	12.24	2	3.92	8	8.0
Curve	2	4.08	1	1.96	3	3.0	1	2.04	2	3.92	3	3.0
Circle	0	0	0	0	0	0	1	2.04	0	0	1	1.0
Polymorphic	0	0	1	1.96	1	1.0	0	0	1	1.96	1	1.0
● Wrinkle 8												
Point	0	0	0	0	0	0	2	4.08	1	1.96	3	3.0
Line	3	6.12	2	3.92	5	5.0	2	4.08	0	0	2	2.0
Angle	0	0	0	0	0	0	1	2.04	1	1.96	2	2.0

Sinuous	2	4.08	1	1.96	3	3.0	2	4.08	2	3.92	4	4.0
Curve	1	2.04	2	3.92	3	3.0	0	0	2	3.92	2	2.0
Polymorphic	1	2.04	1	1.96	2	2.0	1	2.04	0	0	1	1.0
● Wrinkle 9												
Point	0	0	1	1.96	1	1.0	0	0	2	3.92	2	2.0
Line	2	4.08	1	1.96	3	3.0	0	0	2	3.92	12	12.0
Sinuous	3	6.12	1	1.96	4	4.0	2	4.08	0	0	2	2.0
Curve	1	2.04	2	3.92	3	3.0	0	0	0	0	0	0
● Wrinkle 10												
Point	0	0	2	3.92	2	2.0	0	0	0	0	0	0
Line	2	4.08	0	0	2	2.0	0	0	0	0	0	0
Angle	0	0	1	1.96	1	1.0	0	0	0	0	0	0
Sinuous	1	2.04	0	0	1	1.0	0	0	0	0	0	0
Curve	0	0	1	1.96	1	1.0	0	0	1	1.96	1	1.0
Polymorphic	0	0	0	0	0	0	1	2.04	0	0	1	1.0
● Wrinkle 11												
Point	0	0	1	1.96	1	1.0	0	0	0	0	0	0
Line	0	0	0	0	0	0	1	2.04	0	0	1	1.0
Sinuous	1	2.04	1	1.96	2	2.0	0	0	1	1.96	1	1.0
● Wrinkle 12												
Sinuous	1	2.04	0	0	1	1.0	0	0	0	0	0	0

As for the functionality of palatine wrinkles, there is a counterpoint regarding the validation and standardization of their use, due to the fact that this identification method does not have a unique system, but rather several classifications, such as: Silva (1938)[9], Carrea (1937)[8], Bassauri (1961)[10]. In turn, this diversity makes the use subjective to different interpretations among observers.

Therefore, in this study, the two observers agreed to define criteria that would not lead to different classifications. Thus, it was necessary to use a qualified examiner to conduct the calibration process between the examiners so that there are no statistically significant differences in the results and there is interobserver agreement.

During the calibration phase of this study, it was decided to choose the printing methods of wrinkles using plaster casts, as this can provide a better analysis of these elements. In literature, some studies are found in which alginate was used as a molding material and, subsequently, plaster casts are made, such as those performed by Castellanos et al. (2007)[17] and Saraf et al. (2011)[18].

It was decided to choose the method even if the filing occupied a larger space for its storage, entailed a higher the cost for its preparation and required a longer collection time in obtaining the records. This is because, some authors such as Castro-Silva et al. (2014)[15] and Modesto (2014)[1], observed that this method generates greater reliability in the analysis of wrinkles, since it has the wrinkles in hand, managing to handle them at different angles as they are fixed on a stable support.

The history of palatal rugoscopy is quite debatable among authors. According to Ohtani et al. (2008)[19], Harrison Allen in 1889 was the first person to dedicate himself to the studies of palatine wrinkles, publishing a work with the title “The Palata Ruge in Man”. Nevertheless, on the other hand, Tornavoi et al. (2010)[13] and Caldas et al. (2007)[16] argue that rugoscopy was proposed by Trobo-Hermosa (1932), even though there was a divergence between the dates, one suggesting 1930 and the other 1932, respectively. Patil et al. (2008)[20] report that the classification system was proposed by Goria in 1911, i.e., it was the first. However, the surveys were only actually carried out by Lopes de Léon in 1924, when, inspired by Vucetich’s methodology, he proposed a classification system similar to the dactyloscopic system.

Due to the variety of classification alternatives mentioned above, which are useful in the discrimination of palatine wrinkles, which makes the classification controversial in relation to its reliability. A review of the classifications and their authors was then conducted, choosing three methods among all the classifications, that of Carrea (1937)[8], Silva (1938)[9] and Bassauri (1961)[10], which are considered practical and comprehensive, in addition to complementing each other.

Espana et al. (2010)[6] performed a study with a team of 20 university firefighters to outline the individual characteristics of the palatine wrinkles in this audience. As for the number of wrinkles, he observed that an average of 13 wrinkles was achieved for each individual. This fact, however, is different from what was found in this study regarding the amount of wrinkles, which was equivalent to an average of 11 wrinkles per individual.

Castro-Silva et al., in 2014[15], performed a study in the city of Niterói-RJ, with plaster casts from students who counted 184 pieces. They observed that, according to the method recommended by Carrea, those individuals had a higher prevalence of type IV. In the study by Wichnieski et al. (2012)[21] with 94 individuals at the Pontifical Catholic University of Paraná, it was shown that type IV of Carrea was predominant. These data were similar to the research in question, where there was a greater presence of type IV of Carrea.

Regarding the classification by Bassauri's method (1961)[10], which shows characteristics related to the determination of its shape, providing greater specificity in the individuality of the palatine wrinkles. The current study revealed that the sinuous-type wrinkles were mostly on the right side. Nevertheless, the pattern followed by Santos and Caldas (2012)[22] in a study held at the Faculty of Dental Medicine of the University of Porto, with a sample (n=50), was divergent, showing that the line-type wrinkle was mostly on the right side. In opposition to the two previous results, Basman et al. (2020)[23] reported that the curve-type wrinkle is the most dominant on the right side.

Another assessed consideration is the left side, where, in this study, the sinuous-type wrinkle was the most prevalent; however, for Santos and Caldas (2012)[22], it was the line-type wrinkle that reached the major proportion. These results are also opposed to those achieved by Basman et al. (2020)[23], where he obtains a predominance of curve-type wrinkles. In the same study, he shows that point-type wrinkles and circle-type wrinkles were the least present, both on the left and on the right sides. Opposing in parts to the current study, where circle-type wrinkles and angle-type wrinkles were present in smaller amounts.

The quantitative parameters established for this study showed differences between the selected groups, thus suggesting an individual variation to a specific population. Nevertheless, the particularity of the structures was recognized and the findings affirm the identifying and individualizing potential of the rugoscopic method. Even though fingerprints are the most studied method, the importance of human identification by other methods should be discussed.

Despite everything, it is known that the method in question requires a correct dental record with a complete odontogram, complementary exams and the inclusion of means that support the identification through the oral cavity, including a reliable, simple and inexpensive technique. Furthermore, the fact of not having a unique system of nomenclatures makes it difficult to make comparisons, disfavoring the use of palatine wrinkles in everyday life.

CONCLUSION

Palatal rugoscopy proves to be a useful biological tool, being able to provide relevant individual data that reach the criteria of uniqueness, immutability, perpetuity, practicability and classificability.

From the results found in this work, it can be concluded that, according to the amount of palatine wrinkles according to Silva's classification, it is approximately 11 wrinkles per individual.

Regarding the methodology proposed by Carrea (1937), where he assesses the arrangement of palatine wrinkles, there was a prevalence of type IV, where the wrinkles are directed in different ways on the palate.

When analyzing the wrinkles by Bassauri's method (1961), which is classified by the shape of these wrinkles, a variation between the groups can be perceived, showing that each individual has

a different formation, affirming the unique power of the wrinkles.

Finally, it is considered that the study has structural relevance, establishing the need for a unique and universal classification to systematize the process and make it efficient in forensic investigations of human identification.

RESUMO

A odontologia legal é uma das áreas da ciência que coloca os conhecimentos da odontologia a favor da sociedade civil e da justiça. Uma das competências desse campo de atuação é a identificação humana, que tem a rugoscopia como um dos métodos de identificação biométrica. Esta técnica envolve o estudo das rugas palatinas que são acidentes anatômicos únicos, localizados na região anterior do palato duro e consideradas imutáveis durante toda a vida. O objetivo do trabalho foi estudar as características rugoscópicas de indivíduos da cidade de Feira de Santana, a fim de avaliar sua aplicabilidade como método de identificação humana individual. Procedeu-se a um estudo observacional, classificatório e transversal. O estudo correspondeu à análise de 100 modelos de gesso do arco superior, onde 51 correspondiam a indivíduos do sexo feminino e 49 do sexo masculino. Para a análise foram adotadas as classificações de Silva (1936), analisando a relação quantitativa das rugas, Carrea (1937) relacionando a disposição das rugas e Bassauri (1961), analisando os morfotipos de rugas. A associação dos três métodos por indivíduo deu origem a um código, sendo este único para cada participante da pesquisa. Os resultados mostraram que de acordo com o sistema de Silva, cada indivíduo possui aproximadamente 11 rugas. Quanto à análise de Carrea, o tipo IV foi o mais predominante. Enquanto Bassauri demonstrou não haver concordância em nenhum padrão. O código criado permitiu a identificação individual de cada participante da pesquisa. Por fim, ficou constatado que não existem diferenças significativas, provando que a rugoscopia pode ser utilizada como um meio eficaz para identificação humana, além de ser um método viável, de baixo custo e fácil execução.

PALAVRAS-CHAVE

Antropologia Forense; Odontologia legal; Palato duro.

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