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ORIGINAL RESEARCH

Palatal Rugoscopy among Puducherry Population

Sathish Kumar, N Vezhavendhan, V Shanthi, N Balaji, MK Sumathi, Priya Vendhan

ABSTRACT

Background: Human identification is one of the most challenging subjects that man has been confronted with. The fingerprints and DNA comparison are the most commonly used techniques in human identification. Palatoscopy is one of the recently developing methods to identify a victim-based on the palatal rugae pattern.

Aims and objectives: The aim of the study was to analyze the different rugae pattern in Puducherry population and to find whether palatoscopy is a useful tool in human identification and sex determination.

Materials and methods: The studies consist of 100 male and female patients between the age group of 20 to 35 years. The rugae pattern was divided assessed based on Kotze classification. Chi-square test and one-way analysis was used to study the statistical significance.

Results: Wavy pattern appeared to be the most predominant pattern followed by curved, straight, branched and circular pattern in both male and female patients. The shape and number of rugae pattern is similar in male and females.

Conclusion: The present study concludes that wavy pattern appear to be most common rugae pattern among Puducherry population. No significant difference in rugae pattern was noted among the male and female group. Rugae pattern is unique to each individual and can be an effective tool in human identification.

Keywords: Forensic dentistry, Human identification, Palatoscopy, Palatal rugoscopy.

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INTRODUCTION

Palatal rugae are asymmetrical, irregular elevations of the mucosal fibrous connective tissue present in the anterior one-third of the palate. Their characteristic morphological pattern, individual uniqueness and stability overtime make palatal rugae a significant tool in human identification and race determination in forensic dentistry. The study of palatal rugae is called as palatal rugoscopy or palatoscopy. Human identification is one of the most challenging and complicated subject which is based on the scientific principles of involving dental records, fingerprints, lip print, palatoscopy and DNA analysis.[1] This palatal rugae, like fingerprints do not change during the life of the individual. They are protected from trauma and high temperatures because of their internal position in the oral cavity and are protected by lips, cheek, tongue and buccal pad of fat. Palatoscopy can be of special interest in those cases like burned bodies and decomposed bodies where the fingerprint is not available. The aim of the present study was to analyze the different rugae pattern in Puducherry population and to find whether palatoscopy is a useful tool in human identification and sex determination.

MATERIALS AND METHODS

The study group was chosen from the individuals who visited the department of oral medicine from January 2011 to December 2011 and constitute of 100 male and 100 female patients between the age group of 20 to 35 years. The patients were selected using stratified random sampling technique. Subjects with severe thumb sucking habits, congenital abnormalities, inflammation, premalignant and malignant lesion of the palate were excluded.

Alginate impressions of maxillary arch were made and the dental cast was made with dental stone for interpretation. The rugae patterns were delineated using a lead pencil. The rugae patterns of 200 cast models were examined by five trained examiners from the department of forensic medicine. The rugae pattern were analyzed using Kotze classification (1983). The rugaes were divided into 5 types based on their shape, such as Curved: The rugae have a crescent shape and curve gently, Wavy: Slight curve at the origin or termination of curved rugae. Straight: The rugae run directly

from their origin to termination. Circular: Rugae that form a definite continuous ring. Branched: Rugae with branching. The shape and total number of rugae pattern of each cast was noted, counted and documented. Different rugae pattern of the palate was compared with one-way ANOVA test using SPSS 15 software. Chi-square test was done to compare the statistical significance of the rugae patterns among male and female patients (Figs 1 to 3).

RESULTS

In the present study we have used the Kotze classification for rugae pattern analysis, in which wavy pattern appeared to be the most predominant pattern followed by curved, straight, branched and circular pattern in both male and female patients (Table 1). Comparing the different rugae patterns with one-way ANOVA analysis revealed that they are statistically significant with $p < 0.05$ (Table 2). Chi-square test showed that there is no statistical significance among different rugae patterns of male and female, suggesting that palatoscopy may not be a useful tool in sex determination. Throughout the whole study, no similar rugae pattern was appreciated in the evaluation of 200 cast model and every cast had a unique palatal rugae pattern, thereby confirming the uniqueness of the palatoscopy.

Fig. 1: Palatal rugae pattern in cast model

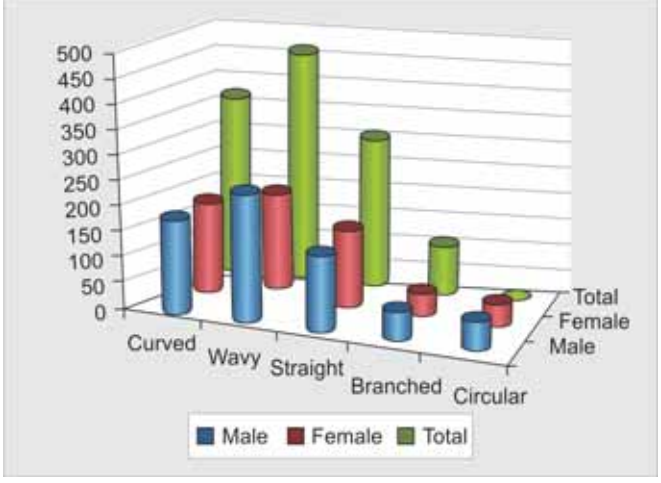

Fig. 2: Distribution of different rugae pattern in both male and female population

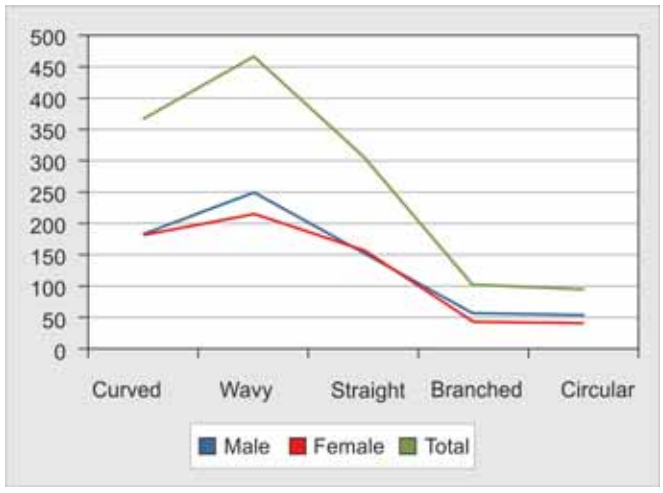

Fig. 3: Graph depicting the different shape of rugae pattern based on Kotze classification

Table 1: Total number of rugae pattern in male and female patients

	Curved	*Wavy*	*Straight*	*Branched*	*Circular*
Males	186	249	147	57	54
Females	183	216	156	45	42
Total	369	465	303	102	96

Table 2: One-way ANOVA analysis for different of rugae pattern

	Sum of squares	*Mean square*	*F-test*	*Sig.*
Curved	45.00	45	67.50	0.00
Wavy	5445.00	5445.00	8167.50	0.00
Straight	405.00	405.00	607.50	0.00
Branched	708.05	708.05	855.36	0.00
Circular	720.00	720.00	925.71	0.00

DISCUSSION

Palatal rugae are anatomical folds of irregular fibrous connective tissue located on the anterior third of the palate and are called as 'plica palatine'. They are formed in the 3rd month of intrauterine life and their orientation is formed by about 12th to 14th week of prenatal life. They are lined by stratified squamous parakeratinized epithelium with a connective tissue base. Physiologically, the palatal rugae are involved in the oral swallowing and improve the relationship between food and the taste receptors; it also participates in speech and in the suction process in children.

Palatal rugoscopy was first proposed in 1932, by a Spanish investigator Troban Hermaso. Since then, various classifications have been given by Kotze, Lysell and Thomas. In literature, the consensus opinion is that the rugae remain fairly stable in number and do not undergo any change due to normal growth, extraction, ageing and disease. Morphological changes may occur due to trauma, persistent pressure, extreme finger sucking, proliferative benign and malignant lesions.[2,3] Limsons and Julian compared the rugae patterns using computer software and reported that the percentage of correct matches ranged from 92 to 97%.[4] Ohtani and Gondivkar examined the accuracy rate of identification of rugae pattern in edentulous cases and achieved more than 90% correct matches.[5,6] In our present study, on comparing the different rugae pattern of the 200 cast models, no similar palatal-rugae patterns were observed by the examiners. The present study confirms that palatoscopy is unique and can be a useful tool in human identification or it can be an adjunct to other investigation like fingerprint and DNA analysis. Thomas and Kotze (1983) studied the rugae patterns of six South African populations to analyze the interracial difference. They found that rugae were unique to each ethnic group and that it can be used successfully in race determination in forensic dentistry.

The present study revealed that the wavy pattern appears to be the most predominant pattern in males and females followed by the curved, straight, branched and circular pattern among Puducherry population. The result of the study was consistent with the finding of Nayak P et al and Kotrashetti et al who concluded that wavy and curved pattern were the most common pattern among Indian population.[7,8] Shetty et al[9] revealed that the Indian males had more curved pattern than Tibetan males and the Tibetan females had wavier pattern than Indian females.[10] Preethi et al (2007) after studying on the Western and South Indian population concluded that the straight pattern was predominant and circular group was completely absent. Bharath et al[11] stated that there is no statistical significance in the total number of rugae pattern noticed in the Indian male and female population which is similar to the finding of our present study, but Saraf et al using logistic regression analysis concluded that palatoscopy is a useful tool which can be used in sex determination.

CONCLUSION

The uniqueness of rugae pattern in each individual is promising; hence palatoscopy can be used as an investigatory tool in human identification. On comparing the different palate rugae pattern—wavy pattern appeared to be the most predominant pattern among Puducherry population followed by curved, straight, branched and circular pattern in both males and females. No statistically significant difference was noticed in palatal rugae pattern of males and females; which suggests the fact that palatoscopy may not be used as an efficient tool for sex determination.

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