Comparison of Palatal Rugae Pattern among Indian and Malaysian Population

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Abstract

Background: Tools for establishing identity is invaluable part of forensic sciences form the beginning of the profession. Odontology is one of such branches which in early days started in its crude form with identification of different species and races within the species, currently is an individual subject with specialist societies, journals and courses. Palatal rugae, was identified to be a potential tool for establishing identity few centuries back itself but is not validated even today to be part of standard protocols. This is a pilot study comparing two racial groups i.e., Indian and Malaysian with established parameters for palate rugae aiming at testing the feasibility of the parameters to be used in identification of individuals and racial groups and also to provide preliminary data to make way to larger studies.

Aims and Objectives: The aim of this pilot study is to explore the feasibility of palate prints as tool for identification by, studying palate print in Indian and Malaysians and Comparison of plate Rugosity between Indians and Malaysians students for identification.

Methodology: Study population was male Indian and Malaysian Medical and Dental students, age between 18-25 years studying at Mangalore, India. Sample size 80 (40 in each group); were selected for studying of Palatal Rugae. The palate impressions were collected using maxillary alginate cast. The parameters assessed were: Total number of rugae, number of primary rugae (length- 5 to 10 mm), secondary rugae (3-5mm), fragmentary rugae (less than 3 mm). Comparison for two populations was done using non-parametric Mann-Whitney Test.

Results: There were no statistically significant differences among the Indians and Malaysians in total number and number secondary rugae in both sides more in Indians than Malaysians.

There was statistically significant difference in number of the primary rugae and the fragmentary rugae, which in both sides were more in Indians than Malaysians.

Conclusion: In conclusion, palatal rugae pattern are unique to an individual and their use in forensic identification has been advocated and applied. Our study demonstrated significant difference in the number of primary rugae on each side. It was more in Indians than Malaysians. This study demonstrated the uniqueness of rugae pattern in different individuals. Thus, it appears to be an effective & reliable source of identification.

***Key words**: Palate rugae, Odontology, Primary rugae, Secondary rugae, Fragmentary rugae.*

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Background

Establishing identity is crucial in Forensic Medicine. Forensic Odontology is a specialty or a branch of dental science which occupies the total spectrum

of methods applied to medico-legal identification. Forensic Odontology can be defined as it's a branch of dental science which deals with application of dental knowledge to civil or criminal laws that are enforced by police in a criminal judicial system.[1]

Dental, finger print, lip print, ear print, foot print and DNA are the most common techniques used in this context allowing fast and secure identification. Palatal rugae have been equated with fingerprint and are unique to an individual. It can be special interest in edentulous cases and also in certain conditions where there are no fingers to be studied, such as burned bodies or bodies that underwent severe decomposition. Rugae pattern may be specific to racial group facilitating population identification.

Palatal rugae otherwise called Plicae Palatinae Transverse and Rugae palatine, usually situated in the anterior third of the upper palate, Rugae are the asymmetrical and irregular elevation of the mucosa and each side of the side of the median raphe and behind the incisive papillae. In several branches of dentistry like Orthodontics, Prosthodontics, Anthropology, Genetics,Forensic Odontology and Comparative Anatomy, rugae pattern have been studied for various purpose.[2]

Palatal Rugae appear usually in the third month of intrauterine life and once rugae is formed, they experience changes in their size and but not in shape due to growth of palate. The Shape will be maintained throughout life. Because of the uniqueness and the overall stability of the rugae has been considered relevant for identification in forensic medicine.[3] The palate Rugae are protected from trauma and high temperature because of the internal position of rugae in oral cavity, surrounded by lips, tongue, cheeks and bone. During the growth also the palatine rugae are unique and stable to each individual. When the body is fully decomposed or burned or both upper and lower limbs are missing, in those cases the palatoscopy can be helpful for personal identification of body. In aeronautical accidents it is a valuable technique in order to ensure identification of pilots making use of antemortem data.[4] The palatalrugae is unique and permanent in each person's life. But some evens can contribute to changes in rugae pattern including persistent pressure of the Prosthodontics treatment and orthodontics treatment, extreme finger sucking in infancy, severe face trauma and cleft palate repair. The changes are more common in treated cases.[5] Hence the objective of this pilot study is to explore the feasibility of palate prints as tool for identification. Comparison of palate rugosity between Indian and Malaysian students for identification is done with palate print in Indian and Malaysians.

Materials and Methods

The present study was conducted at Yenepoya Medical College Hospital from November 2011 to September 2013. The ethical committee approved the study (Ethical clearance). Informed consent was taken from all the participants.

Inclusion Criteria for the study: Medical and Dental students in the age of 18-25 were included in the study.

Exclusion criteria for the study: 1. Subjects with the history of cleft palate and repaired cleft palate. 2. Subjects with the history of defect in maxillary palate. 3. Subjects below the age of 18 years 4.Those who had undergone surgery in anterior palate region 5.Individual undergoing orthodontic treatment, 6. those who had undergone extraction of upper permanent teeth and individual with palate lesions. 7. Subjects with trauma and facial accidents.

Participants were recruited by simple random sampling. The total sample size was 80.Permission was taken for inclusion of data for dissemination for research purposes.

The materials used for collection of palatal Prints were Alginate powder, perforated metal maxillary impression tray, Mixing bowl, Spatula, Dental Stone and Water. The participants were explained about the procedure and discomfort it may cause. After informed consent, Maxillary impressions were taken using Alginate and a dental cast was poured using type 2 dental stone to form an exact replica of mouth. The palatal rugae impressions were collected from the dental stone cast poured. The rugae seen as elevated impressions were marked on these casts using a black permanent marker pen (Fig 1 and 2).Prints that were collected was coded. Comparison of prints were made to see the similarity and palatal prints were classified.

The parameters assessed were: 1) Total number of rugae, 2) Number of primary rugae.

The rugae were classified based on their length as[6]:

1) Primary->5mm,

2) Secondary- 3 to 5mm

3) Fragmentary-<3mm

Results

A total of 80 maxillary dental casts obtained from 40 Indians and 40 Malaysians students' population were examined for the palatal rugae patterns by applying the classification proposed by Thomas & Kotze.[6]

Total Number of Rugae: Racial wise, there were no significant differences in the total number of rugae on the right side or left side of the palate among the Indians and Malaysians.

Number of primary rugae: The primary rugae in each side is more in Indians than Malaysians and statistically significant.

Number of secondary rugae: The Secondary rugae both does not show any statistically significant between Indians and Malaysians.

Number of fragmentary rugae: The fragmentary rugae in both sides more in Indians than Malaysians and statistically significant.

All the details from each dental cast were observed as mentioned and documented in the Performa. The data was tabulated and Comparison of each value between the two races were tested by Mann Whitney U Test. The tools used were Microsoft excel and SPSS software Version (18.0)

Fig:1Palatal rugae pattern

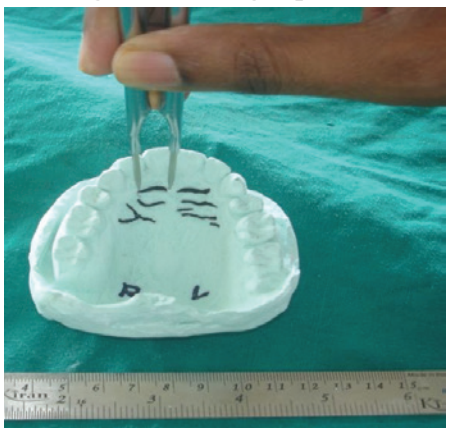

Figure 2: Length of the rugae measured using divider and measuring scale

Table 1: Comparison of each value between the two races: Mann Whitney u test

		N	25th Percentile	MEDIAN	75th	IQR	Mann-Whitney U	Z	P VALUE
LEFT SIDE LENGTH Primary	INDIAN	40	3	4	4	1	584	-2.221	0.026
	MALAYSIAN	40	3	3	4	1			
LEFT SIDE LENGTH Secondary	INDIAN	40	0	0	1	1	649.5	-1.753	0.08
	MALAYSIAN	40	0	0	0	0			
LEFT SIDE LENGTH Fragmentary	INDIAN	40	0	1	2	2	374.5	-5.142	<0.001
	MALAYSIAN	40	0	0	0	0			
RIGHT SIDE LENGTH Primary	INDIAN	40	4	4	5	1	474	-3.36	0.001
	MALAYSIAN	40	3	3	4	1			
RIGHT SIDE LENGTH Secondary	INDIAN	40	0	0	1	1	713	-1.154	0.249
	MALAYSIAN	40	0	0	0	0			
RIGHT SIDE LENGTH Fragmentary	INDIAN	40	0	0	2	2	491	-3.851	<0.001

Discussion

Establishing a person's identity can be very difficult process in Forensic Medicine. DNA analysis, lip prints and finger prints are the most scientifically reliable methods of identification. In Forensic Odontology field, still the palatal Rugoscopy in its infancy.[6]This study described the rugae pattern, shape and unification, quantitatively and qualitatively. Uniqueness to individuals has been clearly as providing the rugae are the reliable source of identification.[7,8,9,10,11]The present study was an attempt to determine the number, shape and unification, also to assess the predominant pattern of rugae in students in Yenepoya Medical College, Mangalore. An attempt was also made to determine the differences in rugae pattern among two races in the selected groups. Several studies done in the past have revealed and have statistically proved that the rugae patterns are highly individualistic and there are differences between races and gender.[12,13] In our study the number of primary, secondary or fragmentary rugae did not show any statistically significant differences among the Indian and Malaysians.

This observation was in contrast to that of Shwetha.et al,[12] who reported that Mysorean males and Tibetan females had more primary rugae than their respective counterparts.[13]Kashima in her study among Indian and Japanese children reported that Japanese children had more primary rugae than Indians.[14] Kapali in her study reported that Australian Aborigines had more primary rugae than the Caucasoids.[7]

This study clearly demonstrates that, palatal rugae are unique to each individual and rugae pattern with its different parameters can be used successfully as a tool of identification. In conclusion, palatal rugae pattern is considered to be unique to an individual and their use in forensic identification has been advocated and applied.[12]Although the study demonstrates the significant difference in unification of the palate rugae, the diverging patterns is more in Malaysians than Indians and diverging pattern more common in Malaysians than Indians. Although this study fails to demonstrate any significant racial difference in length and shape or rugae. This study also clearly demonstrated the uniqueness of rugae pattern in different individuals. Thus, it is an effective & reliable source of identification. However, this study was done in an institutional setting and had a limited sample size of 80 subjects. it will be beneficial to conduct studies with larger sample size and compare between various ethnic groups to validate the findings of this study and generalize the findings of this study. Another drawback of this method of identification is that it can be used only when an ante mortem record of palatal rugae is available.

Conclusion

In conclusion, palatal rugae pattern are unique to an individual and their use in forensic identification has been advocated and applied. Our study demonstrated significant difference in the number of primary rugae on each side. It was more in Indians than Malaysians. This study demonstrated the uniqueness of rugae pattern in different individuals. Thus, it appears to be an effective & reliable source of identification.

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Conflict of Interest: All the authors involved in the study confirm that they have no conflict of interest in this study.

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