

**PALATAL RUGOSCOPY AS A METHOD OF GENDER DETERMINATION IN
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ABSTRACT

Context: Palatal rugae are used for various purposes and are of most importance in forensic cases, because they are highly individualistic. **Aims:** Rugae are also characteristic to a particular population, which could help in mass disaster. This paper studies about the pattern of rugae in Marathwada population of Maharashtra State. **Settings and Design:** A total of 60 subjects, 30 Males and 30 Females were considered for the study. The study subjects were in the age range of 19-26 years from Marathwada region and were randomly selected from OPD in the Department of Oral Medicine and Radiology at Maharashtra Institute of Dental Sciences, Latur. **Methods and Material:** After taking verbal consent from patient, alginate impressions were made in perforated impression trays and stone casts were made. The rugae were marked with a sharp graphite pencil and then lengths were measured using flexible wire. The study was based on the classification system given by Thomas and Kotze and Kapali et al. **Statistical analysis used:** Chi square and mann-whitney tests were used for mean and relationship between the attributes. Confidence interval and p-value were set at 95% and ≤ 0.05 respectively. **Results:** The number of rugae is more when compared to females, both on right and left side of palate and wavy pattern is found to be more compared to other patterns in this population. **Conclusions:** The features of rugae being stable, unique, easily recorded and highly reliable make them a good mode for forensic identification.

KEYWORDS: Palatal Rugae, Forensic Odontology, Marathwada Populations.**INTRODUCTION**

Forensic odontological identification by their nature is multidisciplinary team efforts relying on positive identification as well as presumptive or exclusionary methodologies. In forensic odontology dentists play a pivotal role in supporting legal and criminal issues. Personal identification forms an integral part of forensic science, especially when they are dealing with crimes or with mutilated bodies that have undergone damage beyond recognition. Palatal rugae pattern is a forensic identification parameter.^[1] In 1889 Allen applied palatal rugae in the identification for the first time.^[2] Palatine rugae are unique to each individual and are reasonably stable during the person's growth. Once formed, it only changes in its length, due to normal growth, staying in the same position throughout the life of a person. Under the protection of lips, cheeks, tongue, teeth, bones and dentures, palatal rugae can protect against trauma, high temperature and decomposition and is less susceptible to trauma and injuries, so it plays an important role on forensic identification.^[1]

This present study is an attempt to determine the number and different pattern of rugae and to see if there is any gender difference in rugae pattern in Marathwada population thereby highlighting the importance of palatal rugae in establishing person's identity.

SUBJECTS AND METHODS

A total of 60 subjects, 30 Males and 30 Females, with healthy oral condition without inflammation, trauma, braces or dentures were considered for the study. The study subjects were in the age range of 19-26 years from Marathwada region and were randomly selected from OPD in the Department of Oral Medicine and Radiology at Maharashtra Institute of Dental Sciences, Latur.

Impression making

After taking verbal consent from patient, alginate impressions were made in perforated impression trays and stone casts were made. The rugae were marked with a sharp graphite pencil and then lengths were measured using flexible wire.

Classification of palatal rugae

The study was based on the classification system given by Thomas and Kotze and Kapali *et al.*^[3]

Length of Rugae. The length of rugae is as follows: primary (>5 mm), secondary (3–5 mm), fragmentary (<3 mm).

Shape of Rugae

The shapes of individual rugae were classified into 4 major types. **Curvy:** the curved type had a simple crescent shape with a gentle curve. **Wavy:** the wavy rugae were serpentine (snake-like) in shape. **Straight:** the straight types ran directly from their origin to insertion. **Circular:** they are classified as rugae that showed definite continuous ring formation.

Unification. This occurs when two rugae are joined at their origin or termination. Unification is classified into two categories.

Diverging: rugae were considered to be diverging if two rugae had the same origin but immediately branched.

Converging rugae: were considered to be converging if two rugae with different origins join on their lateral portions.

Statistical Analysis: Chi square and mann-whitney tests were used for mean and relationship between the attributes. Confidence interval and p-value were set at 95% and ≤ 0.05 respectively.

RESULTS

Table 1 shows that males had more number of rugae when compared to females, both on right and left side of palate with a mean of 5.83 in males and 5.73 in females on right side and 5.87 in males and 5.6 in females on left side. There was no statistical significance in number on right and left side and gender.

Table 2 shows that the primary, secondary and fragmentary rugae were more in males when compared to Females.

Table 3 and 4 shows wavy pattern were more when compared to straight and curvy patterns followed by diverging and converging patterns.

Table 1: Frequency distribution based on the number, according to gender and sides.

Gender	Number	
	Right	Left
	Mean (SD)	Mean (SD)
Males	5.83 (2.13)	5.87 (1.43)
Females	5.73 (1.2)	5.6 (1.28)
P Value	0.97	0.51

Table 2: Frequency distribution based on length, according to gender.

Gender	Length		
	Primary	Secondary	Fragmentary
	Mean (SD)	Mean (SD)	Mean (SD)
Males	8.80 (2.27)	3.0 (2.3)	0.10 (0.31)
Females	8.63 (1.96)	2.6 (1.8)	0.03 (0.18)
P Value	0.9	0.59	0.65

Table 3: Frequency distribution based on shape, according to gender: On Right side.

Gender	Shape (Right side)				
	Straight	Wavy	Curvy	Converging	Diverging
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Males	1.3 (1.3)	3.5 (1.63)	1.2 (0.81)	0.0 (0.0)	0.2 (0.41)
Females	0.9 (0.9)	3.47 (1.17)	0.97 (0.81)	0.07 (0.25)	0.2 (0.41)
P Value	0.45	0.93	0.3	0.65	1.0

Table 4: Frequency distribution based on shape, according to gender: On Left side.

Gender	Shape (Left side)				
	Straight	Wavy	Curvy	Converging	Diverging
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Males	0.8 (0.9)	3.5 (1.5)	1.23 (0.9)	0.03 (0.18)	0.17 (0.38)
Females	0.7 (1.6)	3.3 (1.06)	1.23 (1.10)	0.2 (0.41)	0.210(0.31)
P Value	0.83	0.76	0.9	0.26	0.6

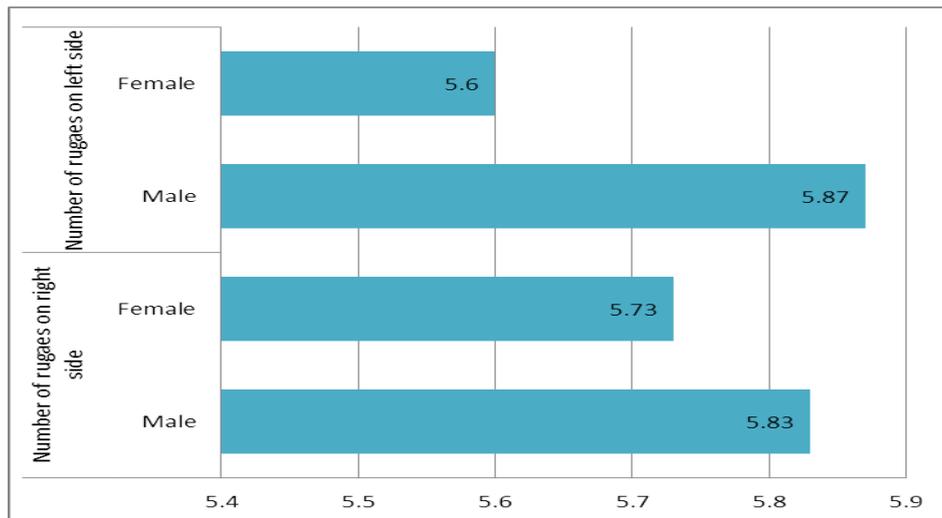


Diagram 1: Mean Number of Rugaes on right and left side in comparison with gender.

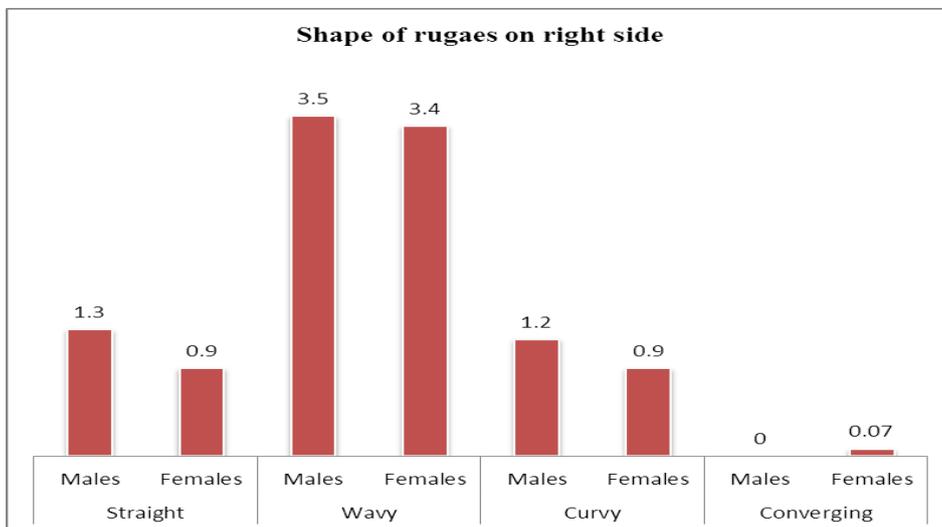


Diagram 2: Mean Number of different type of Rugaes on right side in comparison with gender.

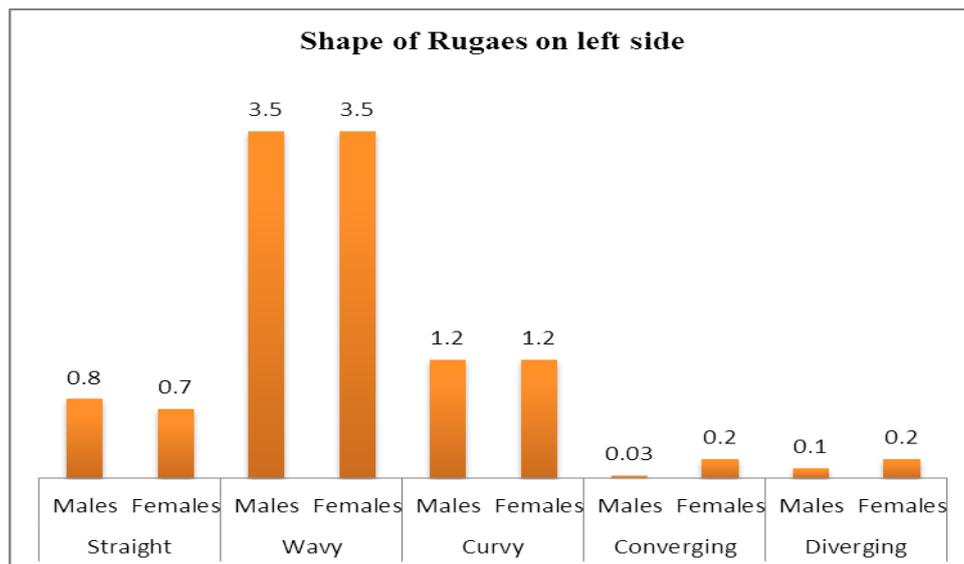


Diagram 3: Mean Number of different type of Rugaes on left side in comparison with gender.



DISCUSSION

Palatal rugoscopy was first proposed by Spanish investigator Troban Hermaso in 1932.^[4] It is generally recognized that the palatal rugae pattern is permanent like fingerprints and cheilogramma, it never alters by disease, trauma or chemical corrosion. Palatal rugae pattern is unique among individuals, even between twins. Palatal rugae pattern is mediated by genetic genes, showing various characteristics among population and retains unchanged in each individual.^[4]

In our study, the number of rugae was more on right side when compared to left side and slightly more in males when compared to Females, but were statistically insignificant. Our study showed similar results to study done by Indira AP^[5] where the number of rugae in males was slightly more than in females and also the total number of rugae were more on the right side. However study done by Shetty M^[6] showed that there was no significant difference in the total number of rugae on right or left side among males and females^[5] and Azab S^[7] et al study showed no significant difference in total number of rugae.

In the present study, the length of primary rugae was more when compared to secondary and fragmentary rugae and also did not show any significant difference between genders. Ahmed and Hamid^[8] study revealed the mean number of primary and secondary rugae in males was greater than females and fragmented rugae were comparable in both groups, however the study lacked any significant difference in genders. This study was comparable to our study where primary rugae were predominant in both sexes. Azab S^[7] et al also revealed that their study had primary rugae in predominance.^[6]

In our study, wavy patterns were more predominant in both groups. A study conducted by Nayak P^[9] et al showed wavy and curved patterns were most prevalent in both groups. This study was similar to our study where

unifications were few in number and circular rugae were not observed. Our study showed wavy pattern as predominant followed by curve and straight patterns. Study conducted by Subramanian P and Jagannathan N^[4] showed wavy pattern to be highest followed by curve, straight, circular and unification pattern. However our study did not show circular pattern.

In our study, diverging patterns were more when compared to converging patterns and was statistically insignificant between genders and was in comparison with study done by Mushannavar et al.^[10] Mutalik V et al^[11] study had wavy pattern as predominant pattern, followed by curve pattern, as in our study where wavy pattern was predominant followed by curve and straight patterns.

CONCLUSION

Palatal rugae possess the features of uniqueness, stability, low cost, reliability and post mortem resistance and are thus an important tool in forensic investigations. Rugae patterns are characteristic to particular population in terms of rugae number and shape. However, large-scale comparative study concerning different races, family members and monozygotic twins is urgently needed in the future.

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