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QUANTITATIVE AND QUALITATIVE ANALYSIS OF PALATAL RUGAE AS AN AID IN PERSONAL IDENTIFICATION AMONG THE EAST GODAVARI DISTRICT POPULATION

Forensic Dentistry

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ABSTRACT

The palatal rugae are asymmetric, irregular ridges that run transversely from the mid-palatine raphe, extending laterally from the incisive papillae towards the anterior third of the palate. The Palatal rugae pattern's uniqueness in the individuals can aid in personal identification in forensic sciences. **Aim:** To identify a pattern of palatal rugae among the East Godavari population for size, shape, and number. **Materials &Methods:** A total of 500 subjects were selected from the OPD of Oral Medicine and Radiology at Lenora Institute of Dental Sciences. The rugae patterns were then identified and classified according to Lysell's and Modified Kapali's classification systems. **Result:** All the recorded patterns and values were tabulated and statistically analyzed using SPPS Version 26 software. The sample population had 8 rugae on the palate, and the common shape was curved type followed by wavy and straight patterns.**Conclusion:** It has been observed that no two individual patterns exhibit the same conglomeration regarding size, shape, and number.

KEYWORDS

Palatal Rugae, Personal Identification, Rugae Pattern.

INTRODUCTION

Palatal rugae are irregular, asymmetric ridges extending laterally from incisive papillae, towards the anterior third part of the palate, arranged in a transverse direction from the mid palatine raphe. The palatal rugae emerge from the palatine process of the maxillary bone's covering connective tissue.[1,2] The palatal rugae emerge from the connective tissue covering the palatine process of the developing maxilla during the third month of intrauterine life.[2] The aim was to analyse the pattern of palatal rugae for size, shape, and number, and as an aid in personal Identification among the East Godavari district population.

Methodology:

The study was carried out among 500 subjects attending the Department of Oral Medicine and Radiology, Lenora Institute of Dental Sciences. The ethical clearance and approval for the study were obtained from the institutional ethical committee. The 500 subjects aged 20-50 years willing to participate in the study were included and divided into 250 males and 250 females. However, Subjects with craniofacial abnormalities like cleft lip& cleft palate, any surgical defects, severe malocclusion & those with the absence of any anterior teeth were excluded from the study.

A thorough clinical examination was carried out for the subjects in the dental chair, under artificial illumination for the presence of palatal rugae. Maxillary impressions were taken using an irreversible hydrocolloid in a perforated impression tray, following the instructions specified by the manufacturers for water, powder ratio. Impressions were washed under running tap water. Casts are obtained by using high-strength plaster. Then the obtained maxillary casts were sterilized using the cold sterilization method, trimmed in the cast trimmer, and dried up. On the collected diagnostic maxillary casts, a midline was drawn using graphite pencil from the mid palatine raphe up to the incisive papillae to the most posterior extent of rugae on the palate (4–5 mm beyond) thereby dividing the rugae and palate into two halves. The size of each rugae was measured using a magnifying glass, a pointed divider, and a scale by measuring the length from one end to the other end of the rugae, recorded in the study table. The rugae were highlighted using a sharp graphite pencil and magnifying glass under adequate light on the cast. After identification, the number of rugae was recorded later the rugae patterns were analyzed for size as Primary(measuring 5 mm or more), Secondary(measuring 3-5 mm), Fragmentary(measuring 2-3 mm), according to Lysell's classification(figure1). However, rugae <2mm were ignored. The shape of the rugae was classified by modified Kapali's characterized as Circular, Convergent, Wavy, Curved, straight, divergent, and nonspecific (table 1).

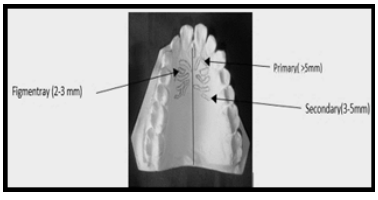


Figure1: Classification of Palatal Rugae Patterns based on size.

Table-2: Number Of Rugae With The Mean And Standard Deviation

	Male	Female	Total
Count	1990	1930	3920
Mean	7.96	7.97	7.96
Sd	0.37	0.45	0.41

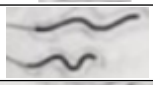
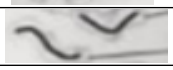
RESULTS:

The data obtained from the study was compiled, tabulated, and subjected to statistical analysis using SPPS Version 26 software.

Comparison In Total Number Of Rugae In Males And Females

A total of 3920 palatal rugae were seen in 500 subjects. The average number of rugae in each individual was eight. In 250 females a total number of 1930 rugae were identified the mean value in females-(mean ± SD) 7.97± 0.45. In 250 males a total no of 1990 rugae was observed the mean value in males was (mean ± SD) 7.96± 0.37 and the total number of rugae was 3920 the mean value in the total population was (mean ± SD) 7.96± 0.41 (table:2). Statistically, no significant differences were observed in the number of rugae among males and females(p-value 0.343).

Table-1 : Classification of palatal rugae patterns based on shapes

	Circular
	Convergent
	Wavy
	Curved
	Straight
	Divergent
	Nonspecific

Male Female Total Count 199019303920Mean7.967.977.96Sd 0.370.450.41

Comparison in different shapes of rugae in males and females

Based on the comparison of the shape rugae patterns in males and females the most common shape was found to be curved type 1066-(27.6%) maximum, wavy type was 910 - (23.6%), straight type 620 -(16.1%), circular 373(9.7%), unification divergent type 405-(10.5%), Unification converging type 204-(5.3%), and nonspecific type is 279(7.2%) which was negligible in number. In females the most common shape was found to be curved type 506(26.4%) maximum, wavy type 426(22.2%), straight type294(15.3%), circular229 (11.9%), unification divergent type212(11.1%), Unification converging type 93(4.8%), and nonspecific type was158(8.2%) which was negligible in number. In males the most common shape was found to be curved type 560(28.9%) maximum, wavy type 484(25.0%), straight type326(16.8%), circular144 (7.4%), unification divergent type193(10.0%), Unification converging type 111(5.7%), and nonspecific type was121(6.2%) which was negligible in number. The average mean size of palatal rugae –is 11.30±0.56mm with significant differences in males and females. The average mean length of rugae in males and females was 11.21±0.56 mm, and 11.35 ±1.42 mm respectively(table:3). Statistically, there was a significant difference in the size of the palatal rugae between the two genders (p-value 0.00033).

DISCUSSION :

Winslow in the year 1753 first described palatal rugae later Brinon in the year 1983 divided palatal rugae into two groups as fundamental and specific types which was similar to that of the fingerprints. Palatal rugae are formed in the 3rd month in utero from the hard connective tissue covering the bone[1]. The position of rugae remains the same throughout the individual's life. They can withstand thermal effects in burn victims and decomposition changes for up to seven days after death.[2]

A total of 3920 palatal rugae were seen in 500 subjects. The average number of rugae in each individual was eight. In 250 females a total number of 1930 rugae were identified the mean value in females-(mean ± SD) 7.97± 0.45. In 250 males a total no of 1990 rugae was observed the mean value in males was (mean ± SD) 7.96± 0.37 and the total number of rugae was 3920 the mean value in the total population was (mean ± SD) 7.96± 0.41(table:3). Statistically, no significant differences were observed in the number of rugae among males and females. The T-test for 2 independent means was a 95%confident level and 5% is the significant level which was similar to the study conducted by Kapali et al.[4,5]

Based on the comparison of the shape rugae patterns in males and females the most common shape was found to be curved type 1066-(27.6%) maximum, wavy type was 910 - (23.6%), straight type 620-(16.1%), circular 373(9.7%), unification divergent type 405-(10.5%), Unification converging type 204-(5.3%), and nonspecific type is 279(7.2%) which was negligible in number (Graph3, pie chart 1).In females the most common shape was found to be curved type 506(26.4%) maximum, wavy type 426(22.2%), straight type294(15.3%), circular229 (11.9%), unification divergent type212(11.1%), Unification converging type 93(4.8%), and nonspecific type was158(8.2%) which was negligible in number (pie chart 2). In males, the most common shape was found to be curved type 560(28.9%), wavy type 484(25.0%), straight type326(16.8%), circular144 (7.4%), unification divergent type193(10.0%), Unification converging type 111(5.7%), and nonspecific type was121(6.2%).

Table – 3 Shapes, Number, and Length of Palate Rugae In Total Sample Population.

Male	Curve	Wavy	Straight	Circular	Divergent	Convergent	Non Specific	number	length		
Sum	560	484	326	144	193	111	121	1990	2803.5		
%	28.14%	24.32%	16.38%	7.24%	9.70%	5.58%	6.08%	100.00%			
								Avg length = 11.214		SD = 0.5645	
Female	Curve	Wavy	Straight	Circular	Divergent	Convergent	Non Specific	number	length		
Sum	506	426	294	229	212	93	158	1930	2758.1		
%	26.22%	22.07%	15.23%	11.87%	10.98%	4.82%	8.19%	100.00%			
								Avg length= 11.35		SD = 0.5688	
Total	Curve	Wavy	Straight	Circular	Divergent	Convergent	Non Specific	number	length		
Sum	1066	910	620	373	405	204	279	3920	5561.6		
%	27.19%	23.21%	15.82%	9.52%	10.33%	5.20%	7.12%	100.00%			
								Avg length= 11.30		SD = 0.5686	

Shetty et al[5,7]. report that the former have significantly higher numbers of curved rugae while the latter have a greater incidence of wavy rugae. Kapali et al.[4] report higher wavy rugae in Australian Aborigines while straight rugae, although constituting relatively low percentages in Aborigines and Caucasians, are more in the latter. Which was in contrast to the present study.

Rugae dimensions may be construed as continuous variables while rugae shapes are discrete variables. Based on the comparison of palatal rugae length in males and females. The average mean size of palatal rugae in the total sample– was 11.30±0.56mm. The average mean length of rugae in males and females was 11.21±0.56 mm &11.35 ±1.42 mm respectively. Statistically, there was a significant difference in the size of the palatal rugae between the two genders. Babu et al.[6,8,9,10] found no significant difference between men and women in the length and shape of palatal rugae which was in contrast to the present study.

CONCLUSION:

In the present study, most of the sample population had 8 rugae on the palate, and the common shape was curved type followed by wavy and straight patterns. Based on the findings of the study it can be stated that 'no two individual patterns exhibit the same conglomeration of features regarding size, shape and, pattern numbers'. As, the palatal rugae appear to possess the features of an ideal identification trait, in terms of the conglomeration of features i.e. uniqueness, postmortem resistance, and stability, the recording and analysis of palatal rugae can be considered an adjuvant tool in personal identification in forensic sciences along with other parameters. However, a large sample size involving different geographic regions may be required to validate the existing findings and contribute to any further information.

Conflicts Of Interest:

Nil.

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