

# Palatal Rugae Pattern in Varied Adult Indian Population of Males and Females

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## Abstract :-

### Background:-

Rugae are the anatomical folds that are located on the anterior third of palate behind the incisive papillae. They are also known as "Plica palatine," and the study of these patterns is called palatoscopy. It can be used in various fields such as sex determination, orthodontics and forensic odontology

### Aim And Objective:-

The objective of this article is to analyse different palatal rugae pattern in adult males and adult females.

### Material And Methods:-

60 patients were selected for this study , 30 males ( 15 North Indian and 15 South Indian and 30 females (15 North Indian and 15 South Indian ). From the above sample, their casts were retrieved for sex determination analysis and rugae patterns.

### Reason:-

This topic was chosen because Palatal rugae are unique to every individual and can be used as an indicator in forensic odontology.

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**Keywords:-** Palatal rugae, rugae pattern, forensic identification, sex assessment, Population identification

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## INTRODUCTION:-

Human identification is one of the most challenging subjects that we have been confronted with since ages. (1) Visual identification, use of dental records, fingerprints, and DNA comparisons probably are the most common techniques used in this context, allowing fast and secure reliable identification. However, visual identification and use of fingerprints are limited by post-mortem changes associated with time, temperature, and humidity.(2) It is a well-established fact that the rugae pattern is as unique to humans as are his or her fingerprints and it retains its shape throughout life hence it can be useful as an identification method. (3)

Palatal rugae also called as rugae palatinae or plicae palatinae transversae refers to a series of transverse ridges on the anterior part of the palatal mucosa on each side of the median palatal raphe and behind the incisive papillae.(4) Palatal Rugoscopy i.e study of palatal rugae is one of the simple technique used by a forensic odontologist in human identification.(5)

Physiologically the palatal rugae aid in oral swallowing, taste perception, participate in speech, suction in children and in the medico-legal identification process.(6)

The anatomical position of the rugae inside the mouth is surrounded by cheeks, lips, tongue, buccal pad of fat, teeth, and bone which keeps them well-protected from trauma and high temperatures.(7)(8) Their application in forensic dentistry has been immense as they have been equated with fingerprints and are unique to an individual.(2)

The study is aimed at delineation of different types of rugae in two different populations.

## OBJECTIVE :-

1. The aim of the study was to analyse the different rugae pattern in the North Indian and South Indian population and to find whether palatoscopy is a useful tool in human identification and sex determination.
2. To identify the patterns of palatal rugae (in terms of number, size ,shape and uniqueness of palatal rugae ) in individual of North Indian and South Indian population
3. To compare the rugae patterns in males and females of different age groups of North Indian and South indian population.
4. To see whether the rugae pattern are sufficiently individualistic to confirm in the identification.

## MATERIALS AND METHODS:-

Materials for the study comprised of 60 subjects, 30 males(15 North Indian and 15 South Indian) and 30 females ( 15 North Indian and 15 South Indian) in the age group 18-35 years.

Maxillary impression trays were selected according to the shape and size of the patient's arches. Two levels of alginate impression material were taken in the scoop and mixed with 40 ml of water (using a measuring jar provided by the manufacturer), in a water/powder (W/P) ratio of 40 ml: 15 g, in a flexible rubber bowl with a mixing spatula. (9)(10)

A vigorous figure-eight motion was used for mixing. The mix was immediately transferred to the impression tray for insertion into the patient's mouth. The tray was held passively and motionless during the setting of impression material. After about 2 minutes (setting time of Alginate), the tray was separated quickly from the teeth to avoid rocking and possible deformation of the fine areas of the impression. Excess material at the periphery was trimmed.

(9)(11)Dental stone was mixed and poured on alginate impression tray. The cast was separated from the impression after 60 minutes. (9)(12) Base for the study casts was made using the base former and dental stone. Each cast was numbered for easy identification. All the measurements were taken by a two observer. The rugae were highlighted by a sharp graphite pencil on the cast . Measurement was done using a plastic ruler (Kenson) in millimeters.

Classification of rugae pattern according to Thomas and Kotze(13)

A. The rugae were classified based on their length as:

Primary >5mm Secondary 3 to 5mm Tertiary < 3mm

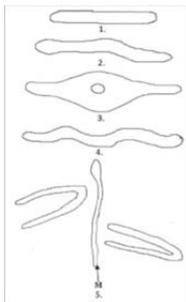
B. The rugae were divided into 4 types based on their shape as:

Curved: They had a crescent shape and curved gently. Evidence of even the slightest bend at origin or termination of a rugae led to it being classified as a curved rugae.

Wavy: If there was a slight curve at the origin or termination of a curved ruga, it was classified away.

Straight: They run directly from their origin to termination.

Circular: Rugae that form a definite continuous ring were classified as circular rugae.



**Figure 1** - various types of rugae

C. Unification was said to have occurred when two rugae are joined at their origin or termination:

Diverging- If two rugae had the same origin from the midline but immediately branched.

Converging - Rugae with different origins from midline, but which joined on their lateral portions.

The association between different population and different sexes was analyzed with chi-square test .The readings were reported for each study cast and observations were tabulated.

#### Statistical Analysis:-

All data were separated according to the group and sex. The differences in rugae patterns between groups and sexes were analysed using SPSS version 14.0. One-way ANOVA test was used to compare the rugae length. The

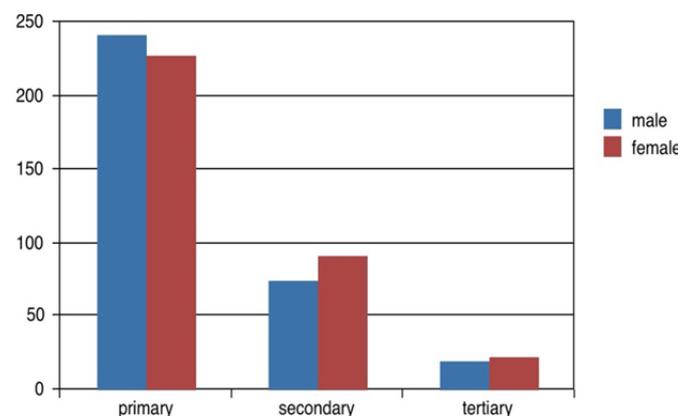
shape and unification were compared by Chi-square test and the number was compared by Kruskal-Wallis test, between the different groups. The p value less than 0.05 was considered significant.

#### RESULTS:-

A total of 60 maxillary dental casts taken from 30 males (15 North Indian and 15 South Indian ) 30 females ( 15 North Indian and 15 South Indian) were examined for the palatal rugae patterns by applying the classification of Thomas &Kotze. The total number of rugae in both male and female was 674. It was 340 in males and 334 in female which was equal in both the population. The total number of rugae in North Indian was 343 and 333 in South Indian . The primary rugae were more in males whereas secondary and tertiary rugae were more among females but the results were statistically insignificant ( $p>0.05$ ).(table 1)

**Table 1** - different types of rugae based on length of the palatal rugae

Gender	Total no.of Rugae	Primary rugae	Secondary rugae	Tertiary rugae
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
Male	7.5 $\pm$ 1.78	8.06 $\pm$ 1.97	4.1 $\pm$ 1.46	1.6 $\pm$ 0.78
Female	6.2 $\pm$ 1.16	7.5 $\pm$ 1.69	3.6 $\pm$ 1.16	1.7 $\pm$ 0.75

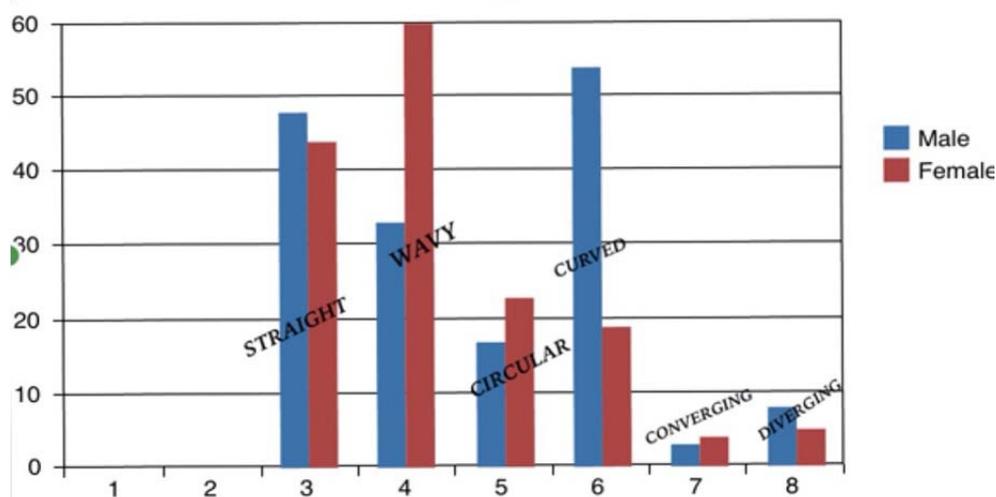


**Graph 1** different types of rugae based on length of the palatal rugae

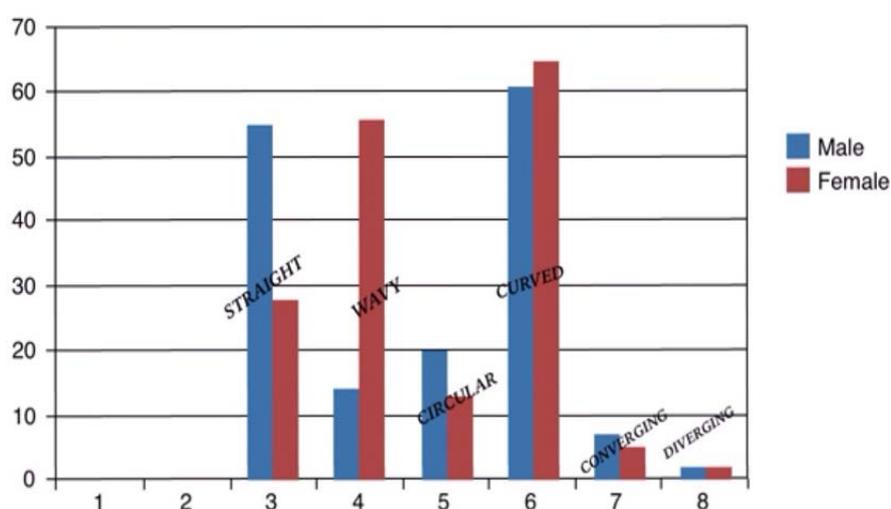
The occurrence of different rugae shapes in the two populations in the present study is presented in table 1. Wavy, curved and straight rugae were the most common forms in both groups. Circular rugae constituted less than 10% of rugae in the entire sample of 674 casts. The North Indian group had a predominantly curved rugae shape while the South Indian had wavy rugae (Table 2).

**Table 2** - different types of rugae based on shape and unification of palatal rugae

Gender		Straight	Wavy	Circular	Curved	Converge	Diverge
		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
North Indian	Male	16 $\pm$ 1.97	4 $\pm$ 0.68	6 $\pm$ 0.72	18 $\pm$ 2.07	2 $\pm$ 0.32	2 $\pm$ 0.32
	Female	14 $\pm$ 1.55	48 $\pm$ 1.77	5 $\pm$ 0.71	16 $\pm$ 1.81	1 $\pm$ 0.15	8 $\pm$ 0.85
South Indian	Male	8.3 $\pm$ 0.77	17 $\pm$ .96	4 $\pm$ 0.68	19.5 $\pm$ 2.97	2 $\pm$ 0.31	2 $\pm$ 0.31
	Female	13 $\pm$ 1.35	18 $\pm$ 2.18	7 $\pm$ 0.75	5.8 $\pm$ 0.73	1.5 $\pm$ 0.34	5 $\pm$ 0.63



**Graph 2** - different types of rugae based on shape and unification of palatal rugae in North Indian



**Graph 3** - different types of rugae based on shape and unification of palatal rugae in South Indian

The unification of the rugae showed predominant covering pattern in males and diverging pattern among females with a p value of 0.04 which shows that difference is statistically significant.

#### DISCUSSION:-

The characteristic pattern of the palatal rugae does not change as a result of growth and remains stable from time of development until the oral mucosa degenerates at death. Events such as trauma, extreme finger sucking in infancy and persistent pressure from orthodontic treatment and dentures can contribute to the change in rugae patterns. Changes in rugae form seen in diseases, chemical aggression or trauma are less pronounced than those seen in the generalized body state. The palatal rugae have the ability to resist decomposition for up to seven days after death.

Researchers had found difficulty in the task of classification of the rugae patterns due to the subjective nature of observation and interpretation within and between observers. Numerous classifications have been devised by several authors to record the palatal rugae patterns and

amongst all, Silva, Lysell, Thomas and Kotze. classifications are often used in recording the patterns. Thomas and Kotze in their literature highlighted the difficulties in observing, classifying and interpreting the limitless and minute variations in palatal rugae and emphasized the necessity for standardizing the procedures in recording. After a thorough review on all classifications from the literature, the method of identification used in this study (Thomas et al, 1983) was found to be the most practical and easy to apply compared with other methods.(14)

According to Thomas 1983, palatal rugae do not undergo any changes except in length, throughout a person's life. Van der Linden in 1978 also stated that the changes in the length of rugae with age result from underlying palatal growth. The anterior rugae do not increase in length after 10 years of age. The mean rugae count and other qualitative characteristics such as shape, direction and unification remains unchanged throughout the life. In contrast, Lysell in 1955 stated that the number of rugae decreased from 23 years of age onwards. Hence, in the present study the age range of 18 to 35 years was considered.(14)

In the present study, there were no significant quantitative and qualitative differences found in rugae pattern between males and females. Earlier studies of J.D. Simmons et al (1987), Kapali S (1997) found gender differences to be inconclusive. (15)(16)

Wavy rugae shapes were most commonly observed in the present study followed by straight and curved shape. The most South Indian subjects showed wavy pattern while in North Indian population mostly curved form was observed. According to Thomas and Kotze (1983), rugae shape is a discrete variable, which provides better results than using continuous variables like rugae measurements. It retains its shape throughout the life. (16)(17)(18)

The unification of the rugae showed predominant covering pattern in males and diverging pattern among females .

#### CONCLUSION:-

The uniqueness and overall stability of palatal rugae suggests their use as a viable alternative for forensic identification in different groups. Hence, the study of palatal rugae is one of the simple and reliable tools for population identification in forensic science.

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