Study of Palatal Rugae Pattern (Rugoscopy) in Chennai Population

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Abstract

Palatal rugae, also called as plicae palatinae transverse or rugae palatine refers to the ridges or elevations on the anterior part of the palatal mucosa present on either side of the mid palatine raphe behind the incisive papilla. It is widely present in mammals. Studies of palatal rugae (rugoscopy) can be successfully implemented to reveal the identity of an individual. Rugoscopy can be used as compensatory process to dactyloscopy. Palatal rugae had been applied in various fields such as anthropology, comparative anatomy, genetics, forensic odontology, prosthodontics and orthodontics. This study analyzes the rugae pattern in dentulous and edentulous patients and also evaluates the association of rugae pattern between male and female.

Key words: Forensic Identification; Palatal Rugae; Rugoscopy.

Introduction

Palatine rugae are irregular, asymmetric ridges of mucous membrane extending laterally from the incisive papilla and the anterior part of the median palatal raphe. There are approximately four rugae on each side of the palate. Slightly more rugae are found in males and on the left side in both genders. Generally, there is no bilateral symmetry in the number of primary rugae or in their angulations from the midline (1). Catastrophic accidents involving plane crashes, fires and explosions can destroy fingerprints, but interestingly palatal rugae patterns are preserved (2).

Kuppler, 1897 was the first person to study the palatal anatomy for identifying various races. However the term Rugoscopy (Palatoscopy) was first proposed by Trobo Hermosa in 1932. There are various classification of palatine rugae based on their form, position, shape, size, direction, unification of the rugae, and a person's personality (3). This study aims to investigate rugae patterns in dentulous and edentulous patients of both sexes.

Materials & Methods

Four hundred out patients from Sree Balaji Dental College and Hospital were included in

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the study. The study group was equally divided between the sexes, which was further categorized into 100 dentulous and edentulous patients respectively. The primary impressions were made using alginate impression material and the study cast was prepared with dental stone (Type-3 Gypsum products). It was air dried in natural sun light and was prepared for analytical procedure. Under day light a magnifying lens was used to imprint palatal rugae from the study model. The different morphological rugae patterns appreciated were – circular, straight, wavy, curve, unification and non specific. Data's were analyzed using SPSS system. Student T- test analysis was done and P- value was determined.

Result

The rugae pattern of four hundred individuals was evaluated. When the mean of male & female rugae were analyzed irrespective of their dental status, the

Table 1: Table showing the mean value of different rugal patterns among edentulous subjects

Types	Male edentulous	Female edentulous	P value
straight	2.20	2.50	0.020*
curve	2.40	2.30	0.488
Wavy	0.00	0.10	<0.001*
circular	0.10	0.05	0.048
unification	0.20	0.10	<0.001*
Nonspecific	0.10	0.00	0.001*

Table 2: Table showing the mean value of different rugal patterns among dentulous subjects

Types	Male dentulous	Female dentulous	P value
straight	1.40	2.10	<0.001*
curve	3.00	2.80	0.197
Wavy	3.30	2.60	<0.001*
circular	0.10	0.10	1.000
unification	0.40	0.50	0.342
Nonspecific	0.20	0.10	0.048

Table 3: Table showing the mean value and stastically significant p value in different rugal patterns of dentulous and edentulous subjects

Type	Dentulous	Edentulous	P value
straight	1.75	2.35	<0.001*
curve	2.90	2.35	<0.001*
Wavy	2.95	2.50	<0.001*
circular	0.10	0.05	0.058
unification	0.45	0.15	<0.001*
Nonspecific	0.15	0.05	0.001*

predominant patterns were wavy, curve and straight. Males showed wavy pattern followed by curve and straight, while females showed a predominance of curve, and equal ratio of straight and wavy patterns. When the patterns between the sexes were analyzed by t-test, there was statistically significant difference in straight (p<0.001), wavy (p<0.001), circular (p=0.058) and nonspecific (p=0.001) pattern. The mean values of dentulous and edentulous patients were compared irrespective of their gender, wavy, curve and straight patterns were predominant in both the groups. When the patterns were analyzed between the dentate and non-dentate population there existed a significant difference in the order of straight (p<0.001), curve (p<0.001), wavy (p<0.001), circular (p=0.058), unification (p<0.001), non-specific (p=0.001) patterns.

Considering the dental status in the sexes, the dentate male and female showed a statistically significant difference in non-specific (p=0.048), straight (p=0.001) and wavy (p=0.001) patterns, while the edentulous group showed significant difference in straight (p=0.020), wavy (p<0.001), unification (p<0.001), non-specific (p=0.001) and circular (p=0.048) patterns.

When the mean of individual rugae patterns were compared between the sexes and the dental status the edentulous male showed highest mean of wavy pattern and total absence of circular pattern while the edentulous female group showed a highest mean of curved pattern and total absence of non-specific pattern, while dentate population showed similar value as that of the overall population such as straight, wavy, curved patterns.

Discussion

The palatal rugae are considered to be unique for an individual and stay unchanged during one's lifetime (4). However, some events can contribute to changes in rugae pattern, including extreme finger sucking in infancy and persistent pressure due to orthodontic treatment (5). In fact, palatal rugae stability is considered an important factor when teeth are extracted In humans they are symmetrical, which is an exclusive feature of human beings (6, 1).

According to English's studies (7), palatal rugae patterns are sufficiently characteristic to discriminate between individuals. In fact, these authors found it legitimate to base identification upon their comparison (7), allowing for human identification even in extreme circumstances (8). Furthermore, the ability of palatal rugae to resist decomposition

changes for up to seven days after death was also noted (9).

Our study reveals that there is similar pattern of distribution between male and female dentate population while there is varied pattern between the sexes of edentulous population. However the most predominant patterns were straight, wavy and circular patterns. There exist a statistically significant difference between some of the patterns between the sexes and they may provide a valuable tool in identifying the gender.

Various methods of paltatoscopy

Intraoral inspection, Study of models, Calcorrugoscopy or overlay print, Stereoscopy, sterophotogrammetry. Although there is considerable debate on this matter. (10, 11).

Limitations of Palatoscopy

As this method is not the primary source of forensic investigation, this can be utilized as an adjunctive source for human identification. In fact, contrary to lip prints, it is possible to have ante-mortem data in different forms (dental casts, old prosthetic maxillary appliances & intra oral photographs). However pictures might not be so useful in decomposed body in crime investigation. One more limitation of palatal rugae is possibility of rugae pattern forgery (12, 3). Investigators aim to assess its identification. Characteristic of palatal rugae pattern did not change as a result of growth; remain stable from the time of development until mucosa is degenerated by death.

Conclusion

Rugoscopy in forensic sciences can be equated to fingerprinting as they are considered to unique in person identification. Studies relating to the ethinicity are available in literature however our study aimed at differentiating the gender. Though there are statistically significant differences between the sexes, a study with large group including the samples from various other countries is mandatory establish a wide application of rugoscopy.

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