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# ROLE OF PALATAL RUGAE PATTERNS (RUGOSCOPY) IN FORENSIC FIELD

(PERAN POLA RUGAE PALATAL (RUGOSKOPI) DALAM BIDANG FORENSIK)

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## Abstract

The development of forensic identification in dentistry is growing significantly to serve judicial system, there are teeth, lip prints, bite marks, dental arches, dental records, DNA, palatal rugae patterns, etc., which is called forensic odontology. Another forensics identification in dentistry is restoration material used in oral cavity. All of them are used in forensic identification for disaster victim identification, criminal and research. Differences of them are allowing fast and secure identification process, however, in some cases, these techniques can not always be applied which is necessary to apply different and less known techniques. This article reviews some of the useful palatal rugae patterns as forensic identification or rugoscopy by using gypsum dental cast. The palatine rugae is an interested forensic because of its typical pattern of orientation, number, position, and size which can be used to differ ethnicity or sex, and palatine rugae is permanent and unique to each person, so it can be used to assist the forensic odontologist in the identification of a person. In conclusion, palatine rugae is significant use in clinical and forensic purposes.

**Key words:** palatal rugae patterns, dentistry forensic

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## INTRODUCTION

Palatal rugae, anatomical folds or wrinkles, are the ridges of mucous tissue located in the anterior third of the palate behind the incisive papilla. Despite of small parts in palatal, it is unique to each person and remains stable during someone's growth, thus, it will be an important things in clinical and forensic purposes.

Clinical purposes, palatal rugae has been used as a preference plane or landmark in orthodontic treatment, therefore diagnosis and planning treatment in orthodontic are mostly determined by them.<sup>1,2</sup> Obviously, human's voice product depends on tongue and palatal intimated contact, and causes specific voice for each person in phonetics. And then, it is also a consideration in prosthodontics treatment. In addition, palatal rugae is also used as a reference points for measuring tooth movement analysis'.<sup>1</sup>

The palatal rugae formed various configurations and it is unchanged and is capable of producing exactly in the same form suffering by heat, che-

mical, trauma, or diseases. Due to the stable condition and unique, each person's palatal rugae can be used as human identifications like fingerprint that has been used prominently for forensic identification.<sup>3</sup>

Generally, medicine forensic identification for criminal investigation and victim have three main method identifications namely fingerprint, visual and dental characteristics. In forensic purposes, each method is not occasionally used alone. However, they need additional methods which should have been proved by capability and convince as forensic procedures.<sup>4</sup> There are many dentistry contributions which have been used and have high accuracy in forensic investigation, some of them like the lips print, teeth assessment in the dental records, restoration used in oral cavity, and more recently DNA based techniques.<sup>5-8</sup> Using each method sometimes has some limitations and may become less effective and depends on the condition of the body investigations. Therefore studies that have potential in forensic purposes are keeping main-

tained to be done.

## CLASSIFICATIONS OF THE PALATAL RUGAE

There are some classifications of the palatal rugae that have been used to identification purposes. Not all classification technique can be used as identification technique for forensic identifications which some of them are merely for clinical purposes, so to chose a suitable classification technique is an important thing to obtain accurate yields. The first system classification of palatal rugae was invented by Groria in 1911 but it is unclear categories which have distinguished in two types; simple or primitive and more developed, where its system consists of two or more branches that have been counted as one group. In 1955, Lysell's classification was published by measuring a straight line from origin until the termination and categorized into three groups based on the length of rugae. There are primary, secondary, and fragmentary which the lengths are more than 5 millimetres, over 3 to 5 mm, 2 to 3 mm respectively, and smaller than 2 mm is not included.<sup>1</sup>

Various classifications had been introduced by other researchers; some of them are Carrea, Basauri, Lima, Caruso, Tzatscheva and Jordanov, Trobo, and Thomas and Kotze. Mainly, their classification sometimes noticed by symbols as a numerical and an alphabetical, were based on shapes, dimension, direction, number, branch, symmetry, radial, and unification (convergence or divergence) of rugae. However, most researches reported that pattern of rugae based on shapes, lengths, directions, the number and unification are being the judgment in forensic investigations where they may be used to determine ethnicity, sexes, and person.

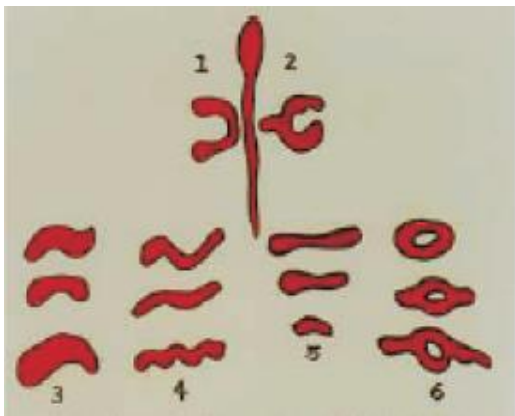


Figure 1. Various shapes of the rugae based on Thomas *et al* classification: 1. Divergen, 2. Converge, 3. Curve, 4. Wavy, 5. Straight, 6. Circular<sup>2,9</sup>

## DISCUSSION

Characterization and differentiation of each race in a country, need to consider the history and genetic, and have been done by some researchers. The researchers think that it is an important work and useful in some cases, like maintain the further genetic and can be used as antemorten information in forensic odontology, etc. For instance, one of the studies in dentistry that is potentially used as races identification is palatal rugae. The person who comes from the same ethnicity is expected has the same genetic and nearly the same appearance and palatal rugae, therefore it may be used as a source of race features.

Some studies have been reported that the shape, number, and direction of palatal rugae can inform and can be different in each race. Kapali, *et al.* said that the mean number of primary rugae had differences in each from race, in which Aborigine is higher than Caucasian. All of them showed the most common shapes are wavy and curved forms.<sup>10</sup> The same case was reported by Jurado, *et al.* that Caliracially mixed population and Colombian Amazons natives have no identical rugograms between subjects.<sup>11</sup> In the newest study, Paliwal, *et al.* had also reported that the straight rugae pattern on the right side of the palate in a male subject was found to be significantly predominant in the Madhya Pradesh people than Kerala. In addition, both groups have the wavy pattern that was found more predominant.<sup>12</sup> It is obviously that parts of palatal rugae can differ the ethnicity, nevertheless, they need more researches to obtain characteristic patterns of palatal rugae of each of ethnicities. It has been mentioned before that palatal rugae pattern is unique for an individual.<sup>2</sup> Furthermore, the length of rugae increased significantly with age but the total number of rugae remained constant.<sup>9</sup> Thus a pre-mortem record for comparison with postmortem records contributing to the identification or previous data base.<sup>5,13</sup>

However, there has still doubt to differ sexes based on palatal rugae patterns, but some studies have informed that they can categorize the sexes both male and female. Venegas *et al* reported that by using trobo's classification the distribution of palatal rugae from 120 subjects of both sexes were higher in male than female.<sup>4</sup> And then in other study has been done by Fahmi *et al*, the female showed a significant difference in converge type while the male had a significant difference in the circular type. In addition, Paliwal *et al* reported that the rugae pattern on the right side of the palate in female subject showed that there was no significant dif-

ference whereas the male pattern has been different from both Madhya Pradesh and Kerala races.<sup>12</sup>

Palatal rugae has extraordinary patterns and has been used potentially both clinical and forensic application. For forensic purposes, they can be used as supporting for identification methods eventhough based on superiority of palatal rugae could be as the main manner.

In conclusion, palatine rugae is significant use in clinical and forensic purposes. In forensic can be used to differ ethnicities, person, and sexes. However, they need more studies as the forensic identifications. They can be used effectively as antemortem's data because less information have informed accurately as the mainly forensic identification.

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