

Rugoscopy: A Fingerprint of Oral Cavity in Forensic Dentistry

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Abstract

It is a well-known fact that the pattern of palatal rugae is very unique, similar to fingerprints. Rugal length and transverse palatal rugal region width advances with age in both male and females. This advancement stops once the somatic growth stops. Also, there appears to be a significant correlation between rugae patterns and ethnicity. Palatal rugae pattern of an individual may be considered as a useful adjunct in the field of forensic dentistry for identification purposes. Hence, this review article aims at providing a detail insight into the role of palatal rugae in the field of forensic dentistry.

Keywords: Palatal rugae, Forensic dentistry.

Introduction

Confirming a person's identity can be a typically complicated procedure, one of the main standpoints of the forensic sciences. Be it dental records, fingerprints, lip-prints and DNA; all have their limitations for identifying the deceased. Rugoscopy is the study of palatal rugae for establishing a human's identity. Palatal rugae pattern of a human being may be considered as an important aid for sex determination for identification purposes [1].

Palatal rugae are irregular, asymmetric ridges of mucous membrane extending lateral from the incisive papilla and the anterior part of the median palatal raphe, behind the maxillary central incisor teeth [2]. Any changes owing to tooth extraction, growth, ageing and disease do not affect the stability of palatal rugae [3].

As quoted in the Glossary of Prosthodontic Terms, "Rugae are anatomical folds or wrinkles of irregular fibrous connective tissue located on the

anterior third of the palate". They are also called "plica palatinae" or "rugae palatine" [4].

The earliest reference to rugae was in anatomy book by Winslow in 1732 and was first illustrated by Santorin in 1975 [5]. Harrison Allen in 1889 suggested that palatine rugae can be used as an adjunctive method for a person's identification [6]. Rugoscopy was first proposed in 1932, by a Spanish scientist named Trobo Hermosa [7]. In 1937, Carrea designed a detailed study and found a way to classify palatal rugae [7]. A year afterwards, Da Silva proposed another classification and, in 1946, Martins dos Santos proposed a classification based on rugae location [8].

In 1983, Brinon divided palatal rugae into two groups- 1. fundamental and 2. specific; in a similar manner as the fingerprints [8]. In this way, dactyloscopy and palatoscopy were united as similar methods based on the same scientific fundamentals because sometimes, palatoscopy can be of importance in cases where there are no fingers to be studied [9].

Classification

Goria in 1911 gave the first system of classification. He divided the rugae pattern in two ways: according

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to the number of rugae and according to the extent of the rugal zone. In this system, compound rugae of two or more branches were counted as one. Gorla further categorised rugae into two types: simple or primitive and more developed [10].

In 1955 Lysell's classification came into force and has been widely used in research surrounding rugae [11]. It is comprehensive and includes the incisive papillae. Rugae are measured in a straight line between the origin and termination and are grouped into three categories: (a) Primary: 5 millimeters or more; (b) Secondary: 3 to 5 mm; (c) Fragmentary: 2 to 3 mm, and Rugae smaller than 2 mm are not considered.



Fig. 1: Clinical Photograph of Palatal Rugae in a Patient

Carrea in the year 1955, grouped four major variants of rugae according to direction, giving roman numerals, and the shape denoted by letters [7]. Basauri's classification consists of two types of rugae; simple and compound, which is further subdivided into ten subtypes that denote particular shapes: 0, pointed; 1, straight; 2, curved; 3, angled; 4, sinuous; 5, circular; 6, Greek; 7, calyx shaped; 8, racket-shaped; 9, branched [12].

Forensic Identification

The anatomical position of the rugae inside the mouth—surrounded by cheeks, lips, tongue, buccal pad of fat, teeth and bone—keeps them well-protected from trauma and high temperatures. Thus, they can be used as a reliable reference landmark during forensic identification process. A severely burnt victim was successfully identified by comparing the pattern of the rugae to the rugae pattern on the victim's old denture [13].



Fig. 2: Photograph of Cast Model Showing Palatal Rugae

The extent of palatine rugae preservation for use as an identification tool in burn victims and cadavers was studied by Muthu subramanian et al. to examine Patients with pan facial third-degree burns, who were examined within 72 hours after their accident. A palatal mirror was used by the authors to take photographs of the palatine rugae. The study revealed that among the subjects with third-degree panfacial burns, 93 percent of the palatine rugae were normal.

They also found no changes in the color or surface anatomy of the palatine rugae in 77 percent of the cadavers. They gave a conclusion that the palatal rugae could be used as a stable reference landmark for forensic identification purposes [14].

Palatal rugae pattern analysis has been used for human identification successfully. However, reports of the authenticity of the methodology are conflicting. So, a proper research protocol needs to be developed to find if there is a statistical significance in utilizing digital photographs of palatal rugae for forensic identification of humans [15].

Conclusion

In dental as well as in forensic practice; the palatal rugae play a very crucial role. Since, they remain stable over a person's life, they can also be used to evaluate dental movements. Also, they show a substantial correlation between shapes and ethnicity. Hence, the palatal rugae can be used as a reliable tool for forensic identification purposes.

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