

Study Of Palatal Rugae For Forensic Identification

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Abstract - The unique individuality of the human body reflects in characteristics like finger prints, lip folds, palm prints, retina and the palatal rugae. The presence of these individualities in the body allows scientists to observe and record to be implicated in Forensic Science for personal identification[1]. In situations such as mass disasters where identification is not possible by other means the examination of palatal rugae can be beneficial. The technique of palatoscopy can be used for individualization and can provide aid in forensic investigation as rugae patterns are known to be individual in nature.

Key Words: Palatal Rugae, Forensic Science, Personal Identification, Palatoscopy

1. INTRODUCTION

Forensic Science helps in scientific examination of the crime and also in the legal justice system. Forensic odontology is that division of forensic science handling with accurate management & evaluation of teeth related evidences & preparation of the examination report for the interest of legal and justice system[2]. It deals with the identification of the person from dental evidences such as teeth, bite marks which can be found in the cases of child abuse, rape, dead remains and many other cases that involve the human dentition and bite impressions. Dental identification is a reliable method of individualization but is dependent on the ante mortem records of the person.

1.1 Palatal Rugae

In cases of mass disaster there may also be the possibility of teeth loss so there should be alternate method in forensic odontology to identify the victim. Palatal Rugae are asymmetrical fibrous tissue folds situated on anterior third of roof of mouth on one or both side of mid palatine raphe[3]. They're known to be individual and unique in nature. Thus they possess the feature to be used as a parameter in forensics. It is known that palatal rugae pattern are different for each person. The scientific examination of palatal rugae is termed as "Palatoscopy" or "Rugoscopy". The term "Palatal Rugoscopy" was initially coined by Thomas Hermosa in 1932.

1.2 Characteristics Of Palatal Rugae

1.4.2 Trobo Classification[9] : According to this system of classification, rugae were characterized into following :
1. Simple Rugae : Those rugae whose shape were outlined finely and more sub classified as A,B,C,D,E, F
2. Compound Rugae : In this two or more than two rugae combined together and are named as X.

Palatal Rugae are less susceptible to trauma as they are well protected in oral cavity surrounded by teeth, cheek, tongue, lip[4,5]. Palatal rugae don't alter in period of time except in size with growth up to a certain limit. Their shape, direction and unification remains stable throughout life. Palatal rugae may help in post-mortem identification if ante-mortem records exist. Palatal rugae analysis can also aid in sex identification as many studies have shown the gender differences. The individuality, stability, and resistance to trauma makes it ideal feature to be used in forensic investigations. There are studies that show that rugae pattern differs with geographical location.

1.3 Historical Background of Palatal Rugae

In 1732 Winslow[1] described rugae for the first time. Santorini in 1775 depicted palatal rugae, where he made a picture depicting three wavy lines intersecting the mid line of the palate. Gorla in 1911[6] put the first classification system where he characterized rugae pattern by specifying either the rugae count or their relative zone with teeth. The first thought of using palatal rugae as a technique for individualization was first put up in 1889 by Harrison Allen[7]. Thomas and van Wyke[8] have documented a successful identification of a badly burnt toothless body by the comparison of rugae patterns with ante-mortem records.

1.4 Classification of Palatal Rugae : Several scientists have attempted study on palatal rugae and had classified them in their sub categories on the basis of their shape, length and other parameters. Few of them commonly used are listed below :

1.4.1 Gorla Classification : In 1911 Gorla developed the first system of categorization[6]

They were divided in two ways:

- Counting the rugae
- Examining the area of the rugal zone with the teeth.

Gorla again divided rugae into two categories that is primary and which were developed further.







Classification	Rugae type	Shape
Type A	Point	
Type B	Line	
Type C	Curve	
Type D	Angle	
Type E	Sinuuous	
Type F	Circle	

Fig - 1 : showing Trobo classification

1.4.3 Kapali et al classification[10] : According to this system depending upon the shape the the palatal rugae could be divided as follows :

- Curved
- Wavy
- Straight
- Circular

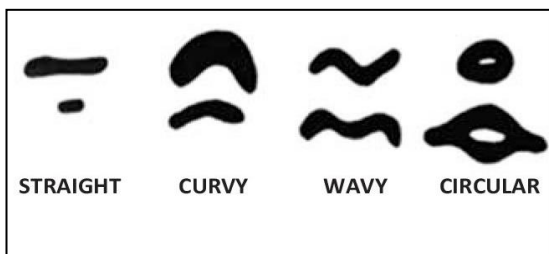


Fig - 3 : showing Kapali's classification

1.4.4 Thomas and Kotze classification[11] : They gave a detailed classification consisting of the following :

- Length : It is identified based on the current rugae size and is assessed primitive (less than 5mm), secondary(3-5mm) and fragment rugae (less than 2mm).

- Occurrence : It is identified by determining the rugae count and noting their frequency in each division (primitive and secondary).
- Surface : It is identified by noting the surface expanse of the primary rugae.

2. METHODS OF PALATAL RUGAE ANALYSIS

There are various methods of Palatal rugae analysis available as at present. The most used technique is Intra-oral examination as it is simple to conduct and is price effective. The main disadvantage is that the previous data don't exist with this methodology which results difficulty in comparison. Oral impressions and oral photographs are required to obtain exact analysis and to overcome the problem of comparison. The dental casts are advantageous as the analysis become simple and cost effective.

Firstly the maxillary impressions are taken on the impression the impression material and then the dental casts are prepared by pouring the dental material. The rugae outline are highlighted on the prepared casts using pencil or marker which shows the form of each ruga and also the length is calculated. The rugae are classified according to the classification systems which depends upon the investigator and their study design. Other technique such as superimposition of photographs of the Palatal rugae and Stereoscopy can be also be done to obtain 3-D image of the anatomy of the palatal rugae.

2.1 Palatal Rugae in Forensic Analysis

Allen in 1889[9] was the first to use palatal rugae in forensics, various studies were carried out to access the function of palatal rugae in individualization. The thought of using rugae pattern was that they were unique to every person same as fingerprints and also they don't change during the lifetime and they are quite protected from the trauma. The Rugae are classified on the basis of length & the shape. This established the basis of its use in personal identification and many studies have been conducted on palatal rugae in this regard.[13]

The Evidences recommend the soundness of palatal rugae in maximum heat as noticed in a study conducted to work out the conservation of palatal rugae so that it can be utilized as other determination tool in mass disasters, employing a study cluster consisting of burnt individuals and corpses simulating forensic cases of burning and decaying.



Fig - 4 : Outline of the Palatal Rugae

3. CONCLUSION

The uniqueness and specificity of palatal rugae have been found significant for personal identification when other methods of identification are not available. Several Studies have been conducted which shows the individual nature of the palatal rugae and its forensic significance in forensic identification. No two patterns are found to be alike in terms of its orientation, length and shape. Various parameters are used to analyse rugae patterns such as rugae count, shape and length. The limitation of using this method for personal identification is that it requires prior records for matching purpose. The records can be found if the person has gone through some dental treatment. It can be used as an alternate method of identification in natural disaster cases where the body is mostly burnt or other identifying features are not available.

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