CHAPTER I: INTRODUCTION

Palatal rugae are irregular, asymmetric ridges of the mucous membrane extending laterally from the incisive papilla and the anterior part of the palatal raphae. The uniqueness and the overall stability of palatal rugae suggest their use for forensic identification.[1]

Palatoscopy, or palatal rugoscopy is the name given to the study of palatal rugae in order to establish a person's identity. The palatal rugae are located on the anterior portion of the maxilla. Anatomically in hard mucosal palate ,one can identify an anterio-posterior thin central groove ,bordered, on each side by crest : the palatal raphae. From this crest ,literally ,three to seven smaller crest emerge[2]. These crests are called palatal rugae.Palatal rugae are irregular ,asymmetric ridges of mucous membrane extending laterally from the incisive papilla and the anterior part of the median palatal raphae. Palatal rugae are formed in the 3rd month in utero from the hard connective tissue covering the bone.[3]

The pattern of orientation of the rugae remains unchanged throughout life. The number of rugae on each side of the palate varies between three and five. The palatine rugae do not extend posteriorly beyond the anterior half of the hard palate and never cross the midline The anterior rugae usually are more prominent than the posterior rugae[6].

Two thirds of the rugae are curved, and the rest are angular . The last rugae frequently are divided in to the medial and lateral parts are not connected and do not continue in their axial orientation. Fragmentary rugae frequently are present ,particularly in the posterior half of the rugae territory.[6] The shape, length, width, prominence, number and orientation of palatine rugae vary considerably among people.

Once formed, they do not undergo any changes except in length , due to normal growth , remaining in the same position throughout an entire person's life . Not even diseases, chemical aggression or trauma seem to be able to change palatal rugae form. The ability of palatal rugae to resist decomposition changes for up to seven days after death was also noted. However, some events can contribute to changes in rugae pattern, including extreme finger sucking in infancy and persistent pressure due to orthodontic treatment[4].

The occurrence , number and arrangement of palatal rugae in mammals are species-specific .In humans they are asymmetrical , which is an exclusive feature of human beings. According to studies, the palatal rugae patterns are sufficiently charectristic to discriminate between individuals. [8]

Advantages

1. To facilitate food transportation through the oral cavity ,prevent loss of foof from the mouth and participate in the chewing process.[6]

2.Due to the presence of gustatory and tactile receptors they contribute to the perception of taste, the texture of food qualities and tongue position

Disadvantages

1. Palatal rugae are used in human identification due to their singularity and unchangeable nature , changes that occur from orthodontic movement, extraction, aging, and palatal expansion do not modify the rugae enough to hamper identification.

2.Low utilization costs[3]

3.It is impossible to have antemortem data established such as records found in dental practice in different forms to compare with post mortem data

4.Rugoscopy is rather simple technique not requiring any complex instrumentation.

classification

Classification of rugae based on shape

a) curve

b) wavy

c) straight

d) circular

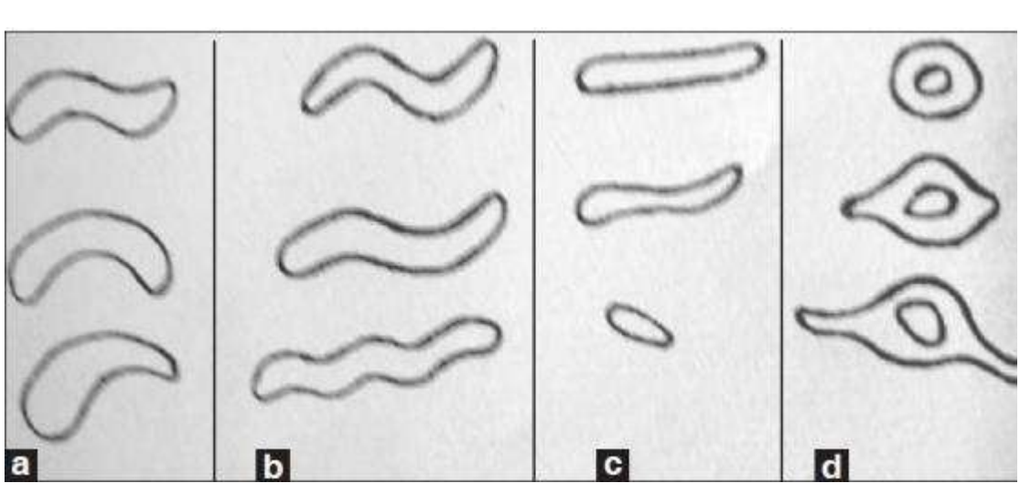

Fig 1

Classification based on unification

a)Converging rugae

b)Diverging rugae

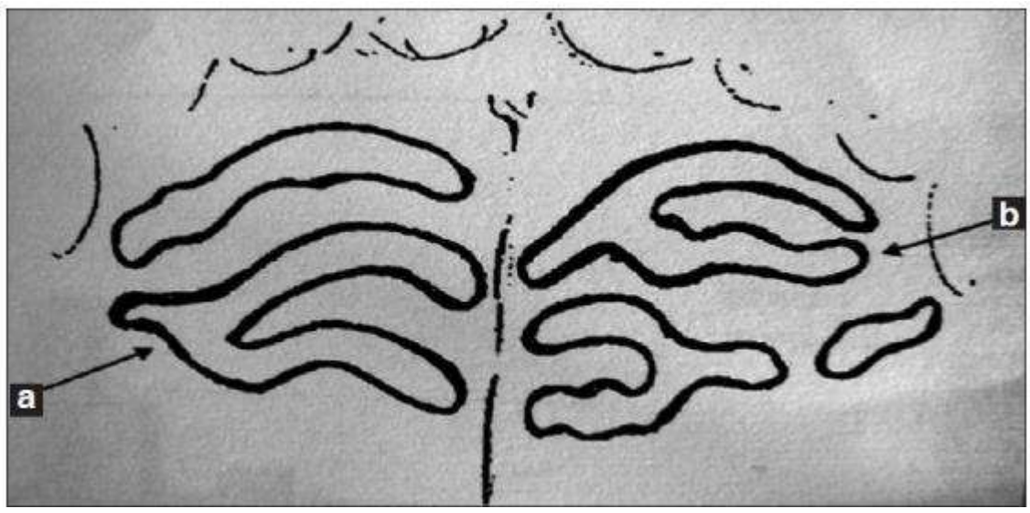

Fig 2

Forensic significance

Identification of individuals is a challenging task in forensic odontology. In circumstances where identification of an individual by fingerprint or dental record comparison is difficult , the palatal rugae may be considered as an alternative source. Palatal rugae have been shown to be highly individualistic and unique and it mainatains consistency in shape throughout life[5]. In forensic dentistry, palatal rugae patterns can lead us to important information and help in persons identification.

Establishing a person's identity can be a difficult task in cases of traffic accidents or in mass disaster situations. The records collected to identity a decedent should be accurate and totally inclusive of objective findings. When a victim has no teeth, information for use in personal identification based on methods available in forensic odontology is much more limited than in the case of dentate victims. Palatal rugae have been considered relevant for human identification due to its stability, which is equivalent to the fingerprint, in that it is unique for each rugae pattern. Palatal rugae appear to posses the features of an ideal forensic identification parameter, that is ,uniqueness , postmortem resistance ,and stability[5].

Identification of living or dead people is often a difficult, challenging and time consuming process. Palatal rugae have been shown to be highly individualistic and

consistent in shape throughout of the life. It is well- established fact that the palatal rugae pattern is unique to human being, as his fingerprints, thus its use in forensic identification is fairly justified. Analysis of palatal rugae pattern combined with other methods is an important alternative and complementary technique for human identification , providing a significant contribution in cases of criminal investigation. Rugoscopy is rather simple technique not requiring any complex instrumentation. Palatoscopy has been successfully used in necro identification. Thus,palatal rugae hold potential as a supplementary tool, along with the dentition to establish the identity of an individual.[5]

From the recent studies done in the Indian population, it was postulated that palatal rugae can be used as a personal soft-tissue oral print in forensic identification. The rugae pattern can be recorded by means of dental impressions and casts made from them. The study of maxillary dental casts is the most widely used technique due to its simplicity, cost, and reliability. The overlay print of palatal rugae in a maxillary cast can be used to perform a comparative analysis. Computerized recording of the palatal rugae pattern is also introduced in forensic identification.

The identity of any individual is always questionable in situations of mass massacres and disasters. The professional obligation of a dental surgeon to mankind is not only to serve in diagnosis and treatment of orofacial diseases, but also to serve in determining a person's identity at the scene of crime and disasters with the support of these unique of these unique orofacial tissues.[2]

The palatal rugae pattern can act as a fingerprint in identification of a person. The uniqueness of rugae to each individual has already been accepted as a possible aid to personal identification. The analysis of palatal rugae combined with other methods is an important alternative and complementary technique for human identification, which thereby provides a multitude of aid in forensic odontology and significantly contributes in forensic investigations.[9]

The study consisted of 50 subjects, 25 each from the 2 groups (Male & Female) of geographically different regions of India, namely, Malappuram, Kerala. The sample size was equally distributed among both the sexes in the age range of 17–40years. After obtaining informed consent, alginate impression of maxillary arch was made and the study models were prepared in dental stone for interpretation. After determining the length of all the rugae, we considered 2 categories

1. Primary rugae: more than 5 mm

2. Secondary rugae: 3–5 mm.

The shapes of individual rugae were classified into 4 major types: curved, wavy, straight, and circular . Straight types ran directly from their origin to insertion. The

curved type had a simple crescent shape with a gentle curve. Wavy rugae were serpentine in shape .

Unification occurs when 2 rugae are joined at their origin or termination. Rugae were considered diverging if 2 rugae had the same origin but immediatey branched, whereas rugae with different origins, which joined on their lateral portions were considered converging. The collection of rugae pattern is done by using the maxillary impression method. Then examine the pattern through naked eye or using photographs.[9]

*Through this study, can collect the sample which contains palatal rugae of 50 peoples

*Due to the unique character of rugae , it will helpful for personal identification

CHAPTER II: LITERATURE REVIEW

Palatal rugoscopy was first proposed in 1932, by a Spanish investigator Troban Hermaso. Since then various classifications had been given. Most studies are based on systems devised by Lysell and Thomas and Kotze, although they may differ in detail.

In the literature, the consensus of opinion is that the rugae remain fairly stable in number and morphology except when there is trauma, such as loss of tooth, persistent pressure extreme finger sucking, orthodontic tooth movement, which may modify the alignment.Thomas and Kotze (1983) studied the rugae patterns of 6 South African populations to analyze the interracial difference. They found that rugae were unique to each ethnic group and that it can be used successfully as a medium for genetic research.

Hauser et al. (1989) compared the rugae pattern of Swazi and Greek populations and found definite differences in the rugae pattern between the 2 populations. It was seen that the degree of development of rugae was dependent on the growth of the palate. According to English et al. (1988), palatal rugae pattern is sufficiently characteristic to discriminate between individuals. They are unique, and identification could be based on their comparison. However, the subjective nature of observation and interpretation within and between observers poses a problem. Lack of complete standardization in interpretation raises the validity of comparisons between different studies.

Despite the controversy about the stability of qualitative and quantitative characteristics of rugae and the extent of differences between ethnic groups and sex, the uniqueness to individuals has been recognized in forensic science as providing potential source of identification The present study was undertaken to evaluate the qualitative and quantitative characteristics of rugae in 2 different populations. The total number of rugae in the MP and Kerala groups of population and between the 2 sides of the palate did not show any statistically significant difference. Dhoke and Usato (1994)] reported that the right side of the palate had fewer rugae than the left side. It was explained that this was due to the phenomenon of regressive evolution, dominating the right side of the palate. However, Shetty et al. (2005) in their study on the population in Tibet and Mysore found no statistical difference in the total number of rugae between the races or the side of the palate

Qualitative assessment of palatal rugae in the total subjects of both the groups showed that wavy pattern was predominant, followed by curved and then straight. This finding goes in accordance with Kapali et al. (1997);in their study of Australian Aborigines and Caucasians, the most common shapes in both the ethnic groups were wavy and curved, whereas straight and circular were least common. On the contrary, in the present study we found that straight form was considerably high in number

On comparing the 2 sides of the palate, right side showed a significantly more number of straight palatal rugae in males from MP, whereas wavy pattern was predominant in Keralite males. Furthermore, in the present study we found that unifications were moderate in number. Moreover, circular rugae were present in both the ethnic groups of population, although constituting only (4%) of the total rugae shapes. It was also noticed that circular pattern was more commonly seen as the first primary rugae antero posteriorly Whereas in the study done by Preethi et al.[6] (2007) on Western and South Indian population circular group was found to be absent and unifications were few in number. Thus the comparative studies showed varying patterns of palatal rugae shapes between the populations. As suggested this may be due to the apparent lack of systemic trends and the need for more comprehensive understanding by further studies.

CHAPTER III: AIM AND OBJECTIVES

AIM

Examination of palatal rugae and compare the male & female rugae pattern of people in Malapuram district,kerala

OBJECTIVE

* To identify palatal rugae patterns (in terms of number and shape) in males and female

*To compare the palatal rugae patterns in males and females

*To analyze whether palatal rugae pattern can be used as a tool for sex identification

CHAPTER IV: MATERIALS AND METHODOLOGY

MATERIALS

*Plaster of paris (impression plaster)

*Impression compound

*Zinc oxide eugenol plaster (impression paste)

*Tray

CAST PREPARATION

The impression of the upper arch - from this, the upper dental cast is obtained.

*All impressions are thoroughly dried with air.

*A specific plaster (gypsum) is prepared by mixing the powder and water together.

*When gypsum reaches optimum consistency, it is poured inside the Impression so it reaches all its details.

*After the plaster sets, the impression is carefully removed from the cast.

* When the upper dental casts are ready, they have to be positioned in the correct bite.

METHODOLOGY

* collecting the palatal rugae from the 50 peoples (25 from male & 25 from female) using maxillary impression method

*Maxillary impression method : A maxillary impression tray contains paste/cast which is inserting in to the mouth which covers the rugae[8]

*It is made by placing an appropriate material in a stock or custom dental impression tray which is designed to roughly fit over the dental arches. Impression material is of liquid or semi-solid nature when first mixed and placed in the mouth. It then sets to become an elastic solid.

*After setting of cast ,the patterns should be mark using graphite pencil for more visibility.

*Then take accurate photographs of the patterns using camera.

*palatal rugae patterns were examined in both the sexes on right and left sides of the palate for the total number (quantitative),length, shape, and predominant direction(qualitative)[6]

CHAPTER V: OBSERVATION

For the palatal rugae examination, 50 samples of different peoples in malappuram district(Kerala, India) collected and the sample photographed using camera.

Fig 3

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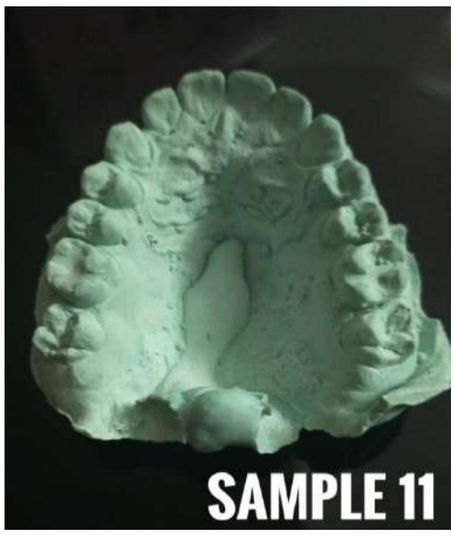
Fig 12



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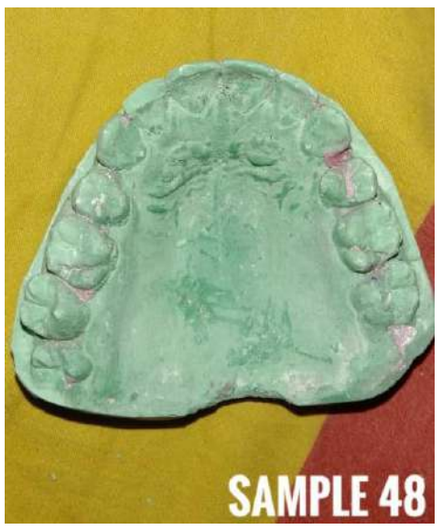

Fig 50

Fig 51

Fig 52

FEMALE SAMPLE : 1 TO 25

MALE SAMPLE : 26 TO 50

OBSERVATION TABLE

Table 1

Distribution of rugae numbers among 50 peoples in Malappuram

SAMPLE No.	ON RIGHT	ON LEFT	GENDER
1	3	4	F
2	3	4	F
3	3	3	F
4	5	4	F
5	5	4	F
6	2	4	F
7	3	5	F
8	4	5	F
9	6	5	F
10	5	4	F
11	4	5	F
12	5	7	F
13	3	5	F
14	4	3	F
15	5	5	F
16	3	6	F
17	4	5	F
18	5	4	F
19	4	3	F
20	7	5	F
21	3	3	F
22	3	4	F
23	3	3	F
24	3	3	F
25	4	4	F
26	4	3	M
27	5	6	M
28	3	6	M
29	3	6	M
30	4	5	M
31	5	5	M
32	4	5	M

33	5	5	M
34	3	6	M
35	3	4	M
36	5	4	M
37	3	4	M
38	5	4	M
39	4	4	M
40	4	4	M
41	3	5	M
42	5	5	M
43	4	5	M
44	6	3	M
45	5	3	M
46	4	6	M
47	4	7	M
48	4	6	M
49	5	5	M
50	6	3	M

Table 2

Distribution of rugae length (primary and secondary rugae)

GROUP	SAMPLE NO.
Primary rugae	1, 4,5,6,7,9,11,12,13,15, 17,20,21,22,23,25,26,27 8,30,32,33,34,36,37,39 41,43,44,46,47,48
Secondary rugae	2,38,10,14,16,18,19,24,29,31,35, 38,40,42,45,49,50

Table 3

Distribution of total numbers of different rugae shapes

Group	Sample	total number
Straight	10,19,20,21,22,32,37, 39,41,44,46	11
Wavy	2,3,4,6,8,11,14,23,26, 27,28,30,34,35,36,40 42,45,47,48,49,50	22
Curved	1,5,7,9,12,13,16,,18 24,29,31,32,33,43	14
Circular	17,25,50	3
Unification	1,3,6,7,8,9,11,13,14 17,21,23,25,26,27,29 30,32,35,37,38,39,42,44,47,50	26

CHAPTER VI: RESULT AND CONCLUSION

RESULT

*The total number of rugae in the 2 populations and between the 2 sides of the palate showed statistically significant difference . On observing the length, primary rugae were predominant as compared with secondary rugae

*Even though the number of rugae in males was greater than that found in females

*Wavy pattern were found to be the most predominant type.

*Unification convergent and divergent types were found in relatively lesser number

*In males, wavy pattern was the most predominant type while in females, it was curvy rugae pattern. However, differences between males and females for curvy, wavy, and straight rugae pattern were found to be statistically insignificant

*Females had significantly higher proportion of unification convergent type of rugae as compared to males. On the other hand, males had significantly higher number of unification divergent type of rugae in comparison to females.

CONCLUSION

The uniqueness of rugae pattern in an individual is promising. In the present study, on comparing the 2 sides of the palate, rugae pattern on the right side of male subjects showed straight shape as significantly predominant in the Malappuram district group, whereas wavy shape was predominant in the peoples. Similar pattern were seen in the total subjects of both the groups on the right side palate. Thus a statistically significant association between the rugae shape in the 2 populations exists although subtle. This requires further extensive study for establishing its significance in personal and racial identification.

CHAPTER VII: REFERENCES

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