

# Role of Palatal Rugae in Forensic Identification of the Pediatric Population

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## Abstract

Palatal rugae, are the ridges on the anterior part of palatal mucosa, each side of the median palatal raphe and behind the incisive papilla. Rugae patterns have been studied for various purposes, and have been established to have a role in positive identification of individuals in suspected cases. The present study aims at determining the effect of growth, on palatal rugae patterns and to analyse uniqueness of palatal rugae in identification of paediatric patients over a period of time. In the present study all the casts were matched with significant ease, thus palatal rugae patterns are unique and do not change. Furthermore, no statistically significant effect was seen on the position of the palatal rugae in orthodontically treated cases. Thus, palatal rugae pattern are sufficiently characteristic to discriminate between individuals.

## INTRODUCTION

Palatal rugae, also called plicae palatinae transversae and rugae palatine, refer to the ridges on the anterior part of palatal mucosa, each side of the median palatal raphe and behind the incisive papilla. Rugae patterns have been studied for various purposes, in the field of anthropology, comparative anatomy, genetics, forensic odontology, Prosthodontics and orthodontics.<sup>1</sup> Various investigators have implied that palatal rugae are unique to each individual and they can be used successfully in human identification. However, researchers have disagreed as to whether or not legal identification could be based solely on palatal rugae.<sup>2,3</sup> Controversy exists about stability of rugae and changes in their pattern if any due to growth, sexes and ethnicity. Some events can also contribute to changes in rugae patterns, including trauma, extreme finger sucking in infancy, and persistent pressure with orthodontic treatment<sup>1</sup>. Furthermore it has been documented that rugae count decreases significantly following cleft repair.<sup>4</sup> Median rugal region increases significantly in anteroposterior length with growth and these changes are greater in orthodontically treated cases.<sup>5,6</sup> The present study aims at determining the effect of growth on palatal rugae patterns and to analyse uniqueness of palatal rugae in identification of paediatric group over a period of time.

Objectives: the objectives of the study are; to study the rugae pattern in pediatric patients and to compare the patterns over

a period of time and to evaluate any changes if any in terms of their relation to each other and to median plane for stability and individuality.

## MATERIALS AND METHOD

Twenty five casts of pediatric patients who came for routine treatment two year back were selected and patients were randomly recalled for taking fresh casts for comparison. All the casts were selected from Department of Pediatric Dentistry of PDM Dental College and Research Institute Bahadurgarh India.

## METHOD

The method of rugae identification was based on the classification of Thomas et al (1983). This classification includes number, length, shape and unification of rugae. The shapes are classified into curved, wavy, straight and circular. Fragmented rugae are those which have length less than 5 mm. Unification is divided into converge where two rugae originate away from the centre and unite towards it. While diverging ones are those rugae which originate from the centre and diverge away from it (Fig. 1).

The casts were compared based on classification of Thomas et al to find the individuality and stability of palatine rugae. All the casts were digitized and palatal rugae landmarks were measured with image j analyzer software (Fig 2).

The collected data were analyzed using paired t-test to detect

any significant differences between the pre- and post-treatment records for the three different groups of measurements. Statistical analysis was performed using SPSS.

Variable which were studied (Fig 2):

Transverse linear distances between medial and lateral points of the right and left rugae;

Anteroposterior linear distances between the first and second medial and lateral points of both the right and left rugae as well as the second and third ones;

Perpendicular distance from the median palatal plane to the rugae medial and lateral points for right and left sides on each cast.

Shape and unification of rugae were also compared.

Figure 1

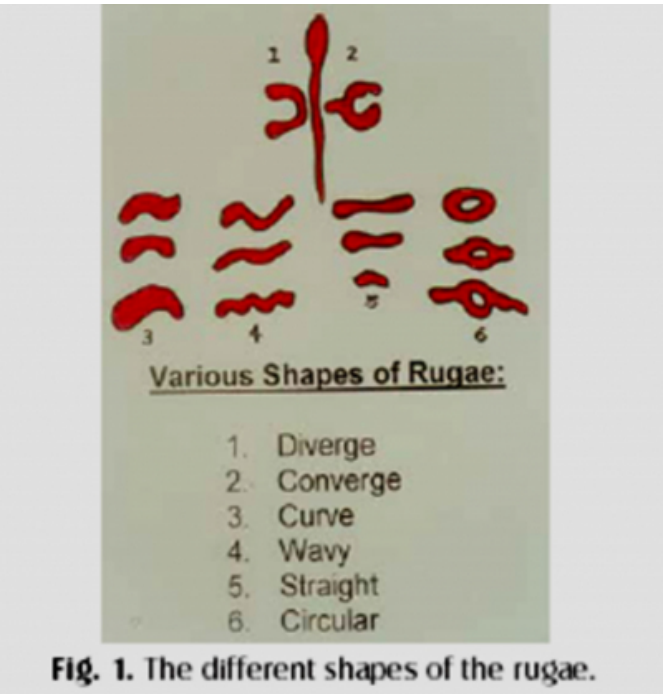
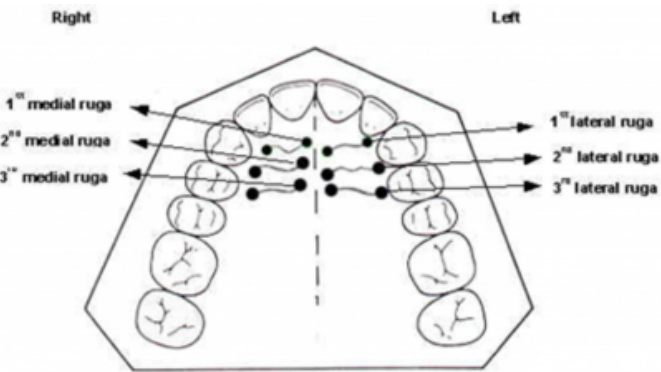


Figure 2

Fig 2: Landmarks on Dental cast for measurement.



## RESULTS

The pre- and post-transverse changes of the rugae points were compared (Table 1). Although a slight decrease in the distance between the lateral point of the second rugae and the medial of the third was observed, this difference was statistically insignificant for all the points in the transverse direction. When we compared the pre- and post-anteroposterior changes of the rugae points (Table 2), no statistically significant difference was found ( $P > 0.05$ ). Comparison between the casts for changes in the position of palatal rugae points in relation to the median palatal plane showed no statistically significant difference recorded on right and left side.

**Figure 3**

<b>TABLE 1(TRANSVERSE CHANGES)</b>		
<b>VARIABLE</b>		<b>MEAN</b>
1 <sup>st</sup> lateral rugae	Pre	684.3
	Post	687.8
1 <sup>st</sup> medial rugae	Pre	100.8
	Post	103.7
2 <sup>nd</sup> lateral rugae	Pre	807.8
	Post	802.3
2 <sup>nd</sup> medial rugae	Pre	132.8
	Post	135.1
3 <sup>rd</sup> lateral rugae	Pre	773.61
	Post	775.4
3 <sup>rd</sup> medial rugae	Pre	109.49
	Post	105.2

**Figure 4**

<b>TABLE 2 (ANTERO-POSTERIOR CHANGES)</b>		
<b>VARIABLE</b>		<b>MEAN</b>
1 <sup>st</sup> -2 <sup>nd</sup> lateral rugae (right)	Pre	165.01
	Post	160.8
1 <sup>st</sup> -2 <sup>nd</sup> medial rugae (right)	Pre	201.5
	Post	196.4
2 <sup>nd</sup> -3 <sup>rd</sup> lateral rugae (right)	Pre	89.2
	Post	87.8
2 <sup>nd</sup> -3 <sup>rd</sup> medial rugae (right)	Pre	99.8
	Post	95.7
1 <sup>st</sup> -2 <sup>nd</sup> lateral rugae (left)	Pre	145.01
	Post	140.8
1 <sup>st</sup> -2 <sup>nd</sup> medial rugae (left)	Pre	161.5
	Post	158.4
2 <sup>nd</sup> -3 <sup>rd</sup> lateral rugae (left)	Pre	92.2
	Post	90.8
2 <sup>nd</sup> -3 <sup>rd</sup> medial rugae (left)	Pre	96.8
	Post	93.7

Figure 5

TABLE 3 (MEDIAL PLANE)		
VARIABLE (right)		MEAN
1 <sup>st</sup> medial to median plane	Pre	105.4
	Post	107.1
1 <sup>st</sup> lateral to median plane	Pre	372
	Post	376
2 <sup>nd</sup> medial to median plane	Pre	58.5
	Post	61.2
2 <sup>nd</sup> lateral to median plane	Pre	381.6
	Post	384.5
3 <sup>rd</sup> medial to median plane	Pre	93.6
	Post	97.1
3 <sup>rd</sup> lateral to median plane	Pre	432.5
	Post	434.1

Figure 6

TABLE 4 (MEDIAL PLANE)		
VARIABLE (left)		MEAN
1 <sup>st</sup> medial to median plane	Pre	109.4
	Post	113.1
1 <sup>st</sup> lateral to median plane	Pre	351
	Post	354.3
2 <sup>nd</sup> medial to median plane	Pre	61.2
	Post	65.4
2 <sup>nd</sup> lateral to median plane	Pre	391.6
	Post	394.5
3 <sup>rd</sup> medial to median plane	Pre	91.6
	Post	95.1
3 <sup>rd</sup> lateral to median plane	Pre	412.5
	Post	414.1

## DISCUSSION

Estimation of changes in rugae patterns may aid in the diagnosis of individual in forensic cases.<sup>5</sup> It has been shown that total number of rugae do not change throughout early childhood and adolescence and changes occur in rugae relates to their length only.<sup>1</sup> Measurement and comparison of palatal rugae length and patterns was done with the aim to evaluate their stability and individuality. It has been reported that rugoscopy was absolutely individual and could be used as a personal print for identification, and that it was completely independent of sex and age.<sup>1,2,8</sup> Computerized analysis was done to measure different variables to obtain a standardized result. The incident of change in rugae shape was low on comparing casts which were randomly selected. Furthermore, the lateral third rugae point seems to be more stable in anteroposterior direction then other variables.

In the present study all the casts were matched with significant ease, thus palatal rugae patterns are unique and do not change. Furthermore, no statistically significant effect was seen on the position of the palatal rugae over a period of time. Thus, palatal rugae pattern are sufficiently characteristic to discriminate between individuals.

## CONCLUSION

In the light of these results, one can conclude that palatal rugae patterns are unique for an individual. No statistically significant change was seen on the position of the palatal rugae pattern over a period of time in paediatric group. Thus, palatal rugae pattern are sufficiently characteristic to discriminate between individuals; and this study supports the hypothesis that palatal rugae are unique and identification could be based upon their comparison.

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