Palatal Rugae A Stable Landmark- A Comparison Between Extraction And Non-Extraction Patients.

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Abstract

This study was done with aim to determine the morphometric changes in dimensions that occur in palatal rugae pattern during extraction and non-extraction orthodontic treatment as palatal rugae are considered unique and stable landmark in the oral cavity. This study also help in proving reliability of palatal rugae in forensic to identify human whos fingerprints are unavailable and antemortem palatal rugae records are present, as palatal rugae pattern is considered highly individual-specific. After orthodontic treatment, palatal rugae are morphologically diverse, but these changes do not greatly influence the individual identification in the field of forensic dentistry. Hence carefully assessed rugaue pattern may have definite role in forensic identification. Palatal rugae hold potential as a supplementary tool, along with dentition, to establish the identity of an individual.

Keywords:- *Palatal rugae, stability, orthodontic treatment, rugoscopy, forensic identification.*

Introduction-

Several reports have suggested that palatal rugae patterns are unique[1-4]. The proposed individuality of palatal rugae patterns may facilitate their use in postmortem identification[5].This is reinforced by the fact that palatal rugae can resist postmortem decomposition changes for upto 7 days after death ad can withstand massive thermal insults like third degree burns[6]. Palatal rugae can be used as internal dental casts reference points for quantification of tooth migration in cases of orthodontic treatment[7]. Thus, they may serve as suitable reference points from which the clinician can derive the reference planes necessary for longitudinal cast analysis[8].

The study of palatal rugae finds application in the field of anthropology, comparative anatomy, genetics, forensic odontology, prosthodontics and orthodontics termed as Rugoscopy[9]. Winslow seems to have been the first to describe them, and the earliest illustration of them probably is by Sartorini[10,11], a drawing depicting three continuous wavy lines that cross the midline of the palate. Sassouni have stated that no two palates are alike in their configuration and that the palatoprint does not change during growth[12]. They are considered to be stable throughout life (following completion of growth), although

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there is considerable debate on the matter[13]. Once formed they donot undergo any changes except in length and remain in the same position throughout a person's entire life[14,15]. The pattern of human palatal rugae has genetic gene-matched individual-specific feature which remains unchanged during individuals lifetime[16].

The present study was undertaken to determine the changes in palatal rugae pattern post orthodontic treatment particularly extraction and non-extraction treatment modality. Here we consider classification of palatal rugae given by "Lysell" which is depending on length[17].

Aims And Objectives-

1.To study the changes in rugae pattern particularly during extraction and non-extraction orthodontic treatment.

2.To determine the stability of palatal rugae pattern during orthodontic treatment.

3.To verify the uniqueness and stability of palatal rugae pattern.

Material And Methods -

Study sample consist of 50cases -100 orthodontic casts were obtained from the Rural Dental college Loni, Department of Orthodontics.(25 extraction cases – 25 pretreatment and 25 post-treatment casts,25 non-extraction cases – 25 pretreatment and 25 post-treatment casts) Black marker, 0.5 Graphite pencil, vernier caliper are used to measure the palatal rugae.

The first group consists of 25 cases treated with "Extraction" approach where second group is of 25 cases treated by "Non-

extraction" approach. Pretreatment and post-treatment casts are compared in each case.

Casts were compared on basis of classification given by 'Thomas et al' and 'Lysell et al' to examine the individuality and stability of rugae pattern in orthodontically treated cases. Thomas et al. had given classification in 1983 which includes number, length, shape and unification of rugae. The shapes are classified into curved, wavy, straight and circular. Unification are divided into converge and diverge. When two rugae originates away from the centre and unites towards it, is called as converge where as diverse rugae originates from the centre and diverge away from it. "Vernier caliper" is used to measure distance between rugae. First of all midpalatine rahae and all primary, secondary and fragmentary rugae are marked.

Only first three rugae are considered for measurement. Transverse linear distance between first and second medial and lateral points of rugae were measured from both right and left side of the casts. Shape and number of rugae were also compared for male and female differentiation, if any.

Result

The pretreatment and post-treatment transverse changes of rugae points were measured and compared (table 1). In non extraction cases distance between rugae was more as compared to extraction cases, this distance was statistically insignificant in transverse direction (p>0.05). Pretreatment and post-treatment anteroposterior changes of rugae points were measured and compared (table 2). Anteroposterior distance was slightly decrease in both extraction and non-exraction cases, this difference was insignificant statistically (p>0.05). The position of palatal rugae points in relation to medial plane (table 3,4) did not show any statistically significant difference in pre and post treatment cases. There is also slight change in a shape of palatal rugae was observed in pretreatment and post-treatment cases which can be considered statistically insignificant for identification purposes. Changes in number of rugae observed according to male and female.

Table 1:- Pre and Post treatment distance between rugae

Variable		Treatment modality		
		Non-extraction cases (in mm)	Extraction cases (in mm)	Mean (in mm)
1st lateral rugae	Pre treatment	2.15	2.35	2.25
	Post treatment	2.20	2.20	2.20
1st medial rugae	Pre treatment	0.30	0.60	0.45
	Post treatment	0.25	0.50	0.375
2nd lateral rugae	Pre treatment	2.00	2.50	2.25
	Post treatment	2.10	2.40	2.25
2nd medial rugae	Pre treatment	0.35	0.25	0.30
	Post treatment	0.35	0.20	0.275
3rd lateral rugae	Pre treatment	1.35	2.65	2.00
	Post treatment	1.35	2.65	2.00
3rd medial rugae	Pre treatment	0.40	0.50	0.45
	Post treatment	0.45	0.45	0.45

Table 2:- Pre and Post treatment anteroposterior distance between rugae

Variable		Treatment modality		
		Non extraction cases (in mm)	Extraction cases (in mm)	Mean (in mm)
1st- 2nd lateral rugae (right side)	Pre treatment	0.50	0.35	0.425
	Post treatment	0.35	0.30	0.325
1st-2nd medial rugae (right side)	Pre treatment	0.20	0.05	0.125
	Post treatment	0.30	0.05	0.175
2nd-3rd lateral rugae (right side)	Pre treatment	0.20	0.30	0.25
	Post treatment	0.15	0.35	0.25
2nd-3rd medial rugae (right side)	Pre treatment	0.40	0.25	0.325
	Post treatment	0.30	0.25	0.275
1st- 2nd lateral rugae (left side)	Pre treatment	0.50	0.45	0.475
	Post treatment	0.20	0.40	0.30
1st-2nd medial rugae (left side)	Pre treatment	0.25	0.55	0.40
	Post treatment	0.20	0.45	0.325
2nd-3rd lateral rugae (left side)	Pre treatment	0.20	0.40	0.30
	Post treatment	0.15	0.35	0.25
2nd-3rd medial rugae (left side)	Pre treatment	0.40	0.50	0.45
	Post treatment	0.25	0.40	0.325

Non-extraction case — Pretreatment cast — Post-treatment cast

Extraction case — Pretreatment cast — Post-treatment cast

Table 3: Pre and Post treatment distance of rugae to median plane on right side

Variable		Non extraction cases (in mm)	Extraction cases (in mm)	Mean (in mm)
		Treatment modality		
1st medial to median plane	Pre treatment	0.20	0.30	0.25
	Post treatment	0.20	0.30	0.25
1st lateral to median plane	Pre treatment	1.00	1.20	1.15
	Post treatment	1.10	1.10	1.10
2nd medial to median plane	Pre treatment	0.20	0.20	0.20
	Post treatment	0.25	0.15	0.20
2nd lateral to median plane	Pre treatment	1.00	1.15	1.07
	Post treatment	1.00	1.05	1.02
3rd medial to median plane	Pre treatment	0.20	0.30	0.25
	Post treatment	0.30	0.30	0.25
3rd lateral to median plane	Pre treatment	1.15	1.30	1.225
	Post treatment	1.20	1.30	1.25

Table 4:- Pre and Post treatment distance of rugae to median plane on leftside

Variable		Non extraction cases (in mm)	Extraction cases (in mm)	Mean (in mm)
		Treatment modality		
1st medial to median plane	Pre treatment	0.10	0.30	0.20
	Post treatment	0.15	0.20	0.175
1st lateral to median plane	Pre treatment	1.15	1.15	1.15
	Post treatment	1.10	1.10	1.10
2nd medial to median plane	Pre treatment	0.15	0.05	0.10
	Post treatment	0.10	0.05	0.075
2nd lateral to median pane	Pre treatment	1.00	1.35	1.17
	Post treatment	1.10	1.35	1.225
3rd medial to median plane	Pre treatment	0.20	0.20	0.20
	Post treatment	0.15	0.15	0.15
3rd lateral to median plane	Pre treatment	1.20	1.35	1.275
	Post treatment	1.15	1.35	1.25

Discussion

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.[4] It had been suggested that, changes in the length of rugae with age result from underlying palatal growth.[18,15,19] Many reports have suggested that the medial ends of rugae are stable and can thus be used as reference points to measure teeth migration during orthodontic treatment.[20] Housser observed orthodontically treated patients and concluded that, the lateral edges of the rugae moved forward about one half the distance of the migration of the adjacent teeth, while the medial

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rugae were not affected. In a study of changes occurring in 14 patients who underwent extraction of premolars, Peavy and Kendrick reported that the lateral ends of the rugae that terminated close to the teeth followed the movement of the teeth in the sagital plane, but not in a transverse plane.[17]

It is difficult to measure palatal rugar patterns and there has no accepted measurement method. Pattern measurement is the first used method, followed by image overlapping method and use of image analysis system.[16]

Results by Bailey et al proved that extraction of first premolar creates a large space for distal retraction of the maxillary anterior teeth, which affects the positions of the lateral points of the first rugae, thus changing the transverse distance between them.[21]

These features were first noted by Peavy and Kendrick who said "the closer the rugae are to the teeth, the more prone they are to stretch in the direction that their associated teeth move." According to Housser, there were no significant changes in transverse values for the medial and lateral points of the second and third rugae. This may be due to a decrease in arch circumference which primarily affects the anterior part of the palate.[22,23,21,24]

Study by Shukla D. Chowdhry A. suggested that, space closure has some effect on the stability of the palatal rugae.[27] It has been said that the more posterior rugae are less susceptible to changes with tooth movement : the third palatal rugae pair being the most stable reference.[22,25]

In our study, we noticed that, pretreatment and post-treatment casts can be easily matched with each other, thus palatal rugae pattern are unique for individual and do not change. In non-extraction cases, distance between rugae was more as compared to extraction cases in anteroposterior direction. In transverse direction, extraction cases shows slightly more inter-rugae distance as compared to non-extraction cases. Thus, palatal rugae pattern are characteristic for discriminating individuals. There is insignificant change in size, shape and number of rugae irrespective of gender of patient.

Conclusion

In the present study, it was concluded that, statistically significant changes not occurred in shape and size of palatal rugae pattern, post orthodontic treatment, this proves the potential of palatal rugae in human identification. It is noticed that, in spite of slight change in distance, morphology remains stable throughout life.

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