



Comparative Study of Palatal Rugae Patterns in Two Populations (Arabs - Asian and Indians)

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Abstract

Palatal rugae are anatomical structures present in the roof of oral cavity; there is a significant association between rugae forms & ethnicity. The aim of this study is to compare rugae patterns in two different populations: Arabs (Asian) & Indians. 80 female participants were included in this study: 40 Arabs & 40 Indians. In the dental clinic / college of dentistry at university of Ajman in UAE. It has been found that the primary rugae lengths was significantly more in Arabs 8.325 ± 1.3 compared to Indians 5.575 ± 1.2 , the Arabs population showed predominant wavy shaped rugae [58%], while the Indians had straight shaped rugae [40%]. These differences of the shape & lengths of palatal rugae appear as a result of genetic & environmental factors.

Introduction & Review of Literatures:

Fingerprints and dental means be the most scientific & reliable methods of

recognition. Odontogenic data is the second most accurate recognition after

finger prints. Restorations, bony protuberances, teeth, and palatal rugae represent the majority of person's details⁽¹⁾. Palatal rugae are anatomical structures present in the roof of the oral cavity, they are asymmetrical, irregular mucosal ridges arranged in a transverse direction on either side of the median palatine raphe in the anterior third of the palate behind the incisive papillae⁽²⁾. Physiologically the palatal rugae help in swallowing, taste perception, participate in speech, suction in children and in the medico-legal identification process⁽³⁾. Palatal rugae pattern or shape stay stable and saved by the lips, the buccal pad of fat and the teeth which protect them during the challenging situations of mass disasters and incinerations⁽⁴⁾. Palatoscopy or palatal rugoscopy is the study of palatal rugae in order to establish a person's identity⁽⁵⁾. Human identification is one of the most challenging subjects that have been confronted with since ages, visual identification, use of dental records, fingerprints, and DNA comparisons probably are the most popular methods used in this context, allowing fast and secure reliable identification^(6,7). The aim of the study was to analyze the different rugae pattern: lengths & shape in two types of ethnic racial: Asian Arabs& Indians.

Materials and methods:

This study was conducted in the teaching clinic of dental college in Fujairah campus of Ajman University including, during 3 month from April till July. Two population groups that were randomly selected from Asian Arabs and Indian race females. It includes 80 female participants (40 Asian Arabs , 40 Indian) aged 18-50 years old, excluding edentulous patients, patients with previous trauma, and those with cleft lip and palate. After obtaining ethical approval for the study, a proper oral examination for the participants was performed, using the triple syringe to wash& clean the palate for removing of any trapped food debris, and a maxillary impression was taken using an irreversible hydrocolloid (alginate) in a perforated

impression tray, the impression was washed under running water and disinfected, and pouring was done by gypsum product. Rugae patterns were delineated using pencil with adequate light & magnification, analyzed macroscopically as seen in Fig. (1). The rugae pattern was analyzed according to the Thomas and Kotze classification (8) Fig. (2), according to length as primary, secondary, fragmentary, non-specific [ignored]. In which the primary measured more than 5mm, the secondary measured between 3mm and 5mm, fragmentary ranges between 2mm and 3mm, and non-specific [ignored] which are less than 2mm. Rugae were categorized According to shape as wavy Fig (3), curved Fig. (4), straight Fig. (5), and branched Fig. (6). The Shapes of rugae have been analyzed using descriptive statistics, while the length of the rugae using analytical statistics by t-test.

Results:

The results reveals the frequency of different lengths of palatal rugae in Asian Arabs& Indians: in which the most scored length of rugae for Asian Arabs was primary, secondary, fragmentary, & non-specific with a mean of (8.3 ± 1.3 , 2.4 ± 1.4 , 1.65 ± 1.8 , 0.9 ± 1.07) respectively. While for the Indians the most repeated length of palatal rugae was primary, non-specific, secondary, fragmentary with a mean of 5.5 ± 1.2 , 3.5 ± 1.8 , 2.1 ± 1.3 , 1.1 ± 1.1) respectively. Table (1) The results clarifies the different shapes& patterns of palatal rugae for both populations, in which the most scored shape of rugae for Asian Arabs was wavy, then curved, straight,& branched with percentage of 58%, 22%, 12%,&8% respectively, Fig. (7). Table (2) Also for Indian population the frequent shape was: straight, wavy, curved&branched with percentage of 40%, 38%, 16%,& 6% respectively, Fig. (8).

Discussion:

There seems to be a significant association between rugae forms and ethnicity, Kapali et al⁽⁹⁾ studied the palatal rugae pattern in

Australian Aborigines and whites, they observed the number, length, shape, direction and unification of rugae. The authors concluded that the mean number of primary rugae in Australian Aborigines was higher than that in whites, although whites had more primary rugae that exceeded 10 mm in length. Kashima⁽¹⁰⁾ in a study compared the palatine rugae and shape of the hard palate in Japanese and Indian children & found the following Japanese children had more primary rugae than did Indian children, but both groups had the same number of transverse palatine. Shetty et al⁽¹¹⁾ compared the palatine rugae patterns in Indians with those in a Tibetan population. Bahara et al⁽¹²⁾ stated that the most easiest & practical method of analyzing rugae patterns was done by Thomas & Kotze⁽⁸⁾ who categorized the rugae according to their length into primary (more than 5 mm), secondary (3 – 5 mm) and fragmentary (2 – 3 mm). Rugae less than 2 mm were non-specific. Palatal rugae are a focus of interest due to their utilization in anatomy, anthropology, and genetics⁽¹³⁾, it has been suggested that the characteristic pattern of palatal rugae remains stable from development up to seven days after death^(14,15). This study was conducted on two populations: Arabs Asian & Indian to investigate the different shapes & patterns of palatal rugae, in which the most frequent length of rugae in Arabs was the primary, secondary, fragmentary & then nonspecific, while for the Indians the most obvious length was the primary, nonspecific, secondary and then fragmentary, however the difference was significant concerned with primary rugae of Arabs ethnicity. The shapes of palatal rugae were varied for Arabs from wavy, curved, straight & then branched, the most predominant shape was wavy which constitute 58% of the participants. While the straight patterns for Indians was a frequent shape that constitute (40%), followed by wavy (38%), curved & then branched. This variation in lengths & shapes of rugae may be due to genetic or environmental factors, some authors have indicated clearly that environmental factors play a minimal role in affecting the formation of rugae and that the main

determinant factor in the formation is the genetic background⁽¹¹⁾. These differences can also be attributed to differences in palatal width; it was indicated that differences in the mean number of rugae between populations are a reflection of greater ridge development, both qualitatively and quantitatively associated with the presence of broader palates⁽¹⁶⁾. The findings in this study regarding the shape of palatal rugae is brought in accordance with a study reported by Swetha⁽¹⁷⁾, however the results of this study in considering the straight pattern of palatal rugae is most predominant in Indian females which disagreed with the findings reported by Swetha⁽¹⁷⁾ the most frequent shape was the wavy for Indian females. Also the results in this study is of the wavy & curved pattern rugae was predominant in Arabs which comes in agreement with a survey performed by Abeer et al who stated that the predominant pattern of rugae in Saudi participants were wavy & curved⁽¹⁸⁾. Hemnath et al⁽¹⁹⁾ stated that India is a country endowed with genetic complexity that does not always correlate to ethnicity, geography, or language. In addition, sub structuring exists in some populations like that of southern India, reflective of their genetic isolation. Regarding the shape, wavy rugae were found to be more in the Asian Arabs, whereas straight shapes were more in Indian. In addition, according to the length, the primary and secondary rugae were significantly predominant in Asian Arabs, but the primary and non-specific type rugae were significantly predominant in Indian.

Conclusions

From this study, it has been clarified that most of Asian Arabs exhibited with significant primary and secondary length of palatal rugae in comparing to Asian Indians, & the wavy shape of rugae was predominant in Arabs in contrast to Indians in which the straight shape of rugae was most predominant. The finding are of great importance in the forensic dentistry.



Fig.(1): Illustrates the delineation of the rugae.

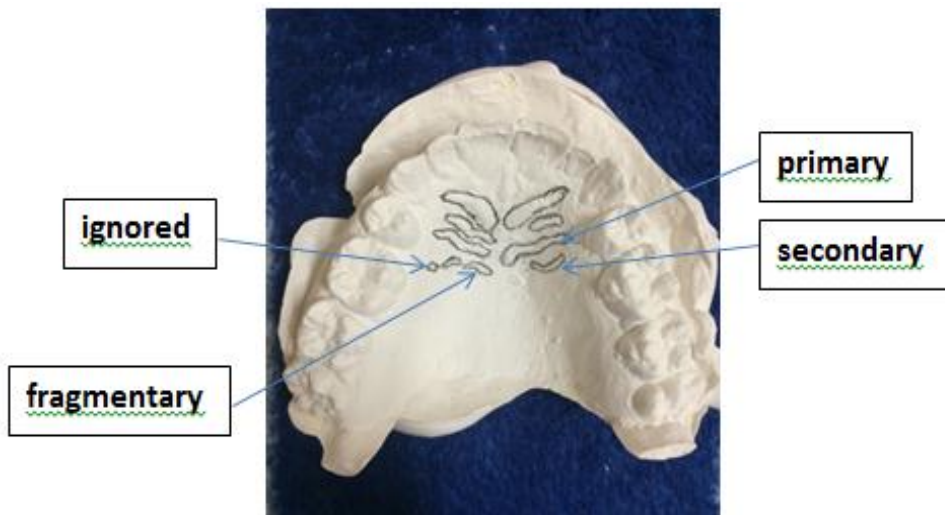


Fig.(2): Illustrates the different lengths of the rugae

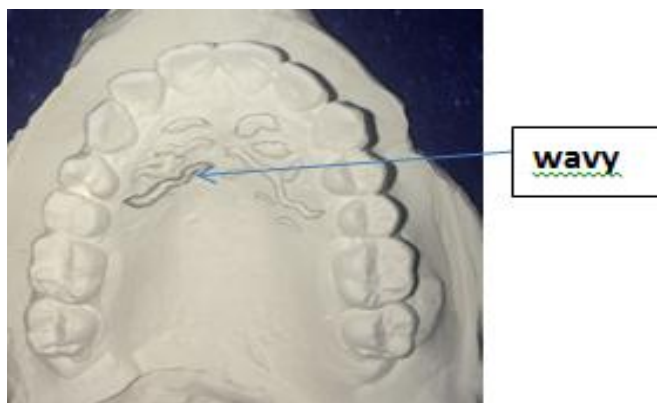


Fig. (3): Illustrates the wavy shape of the rugae

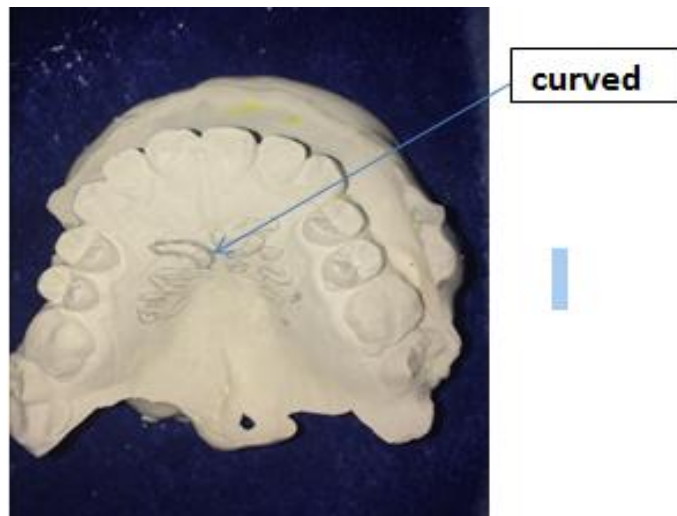


Fig. (4): Illustrates the curved shape of the rugae.

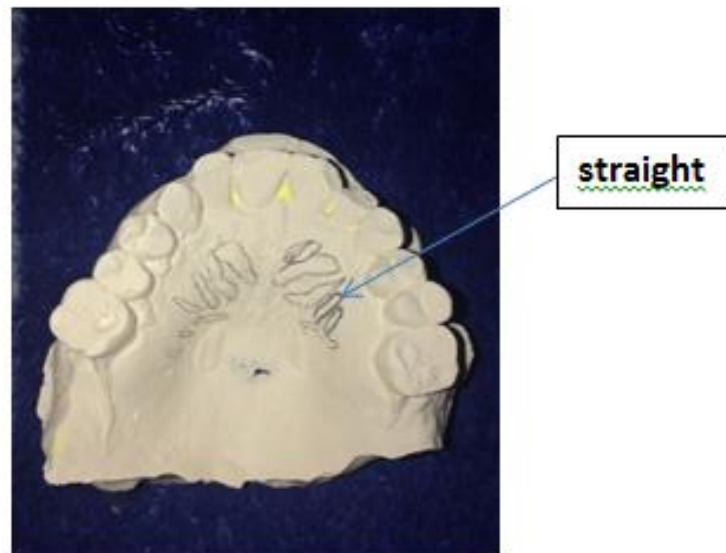


Fig. (5): Cast illustrates the straight shape of the rugae

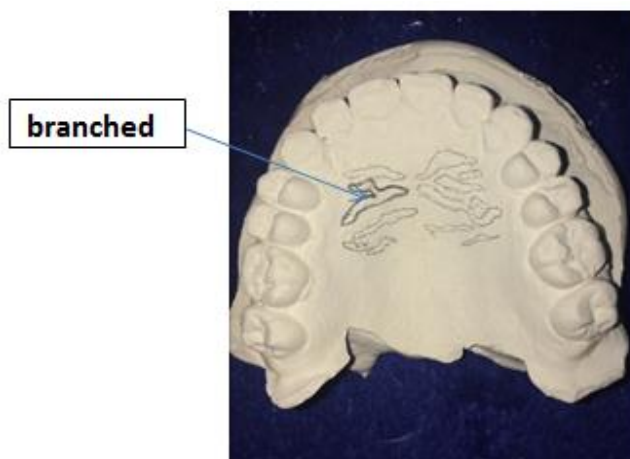


Fig. (6): Illustrates the branched shape of the rugae.

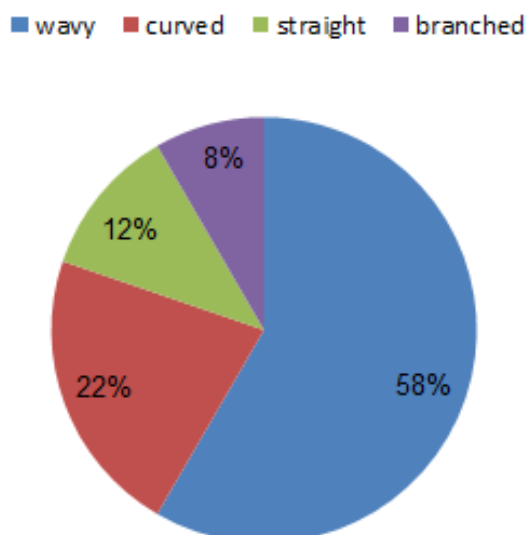


Fig. (7): Pie chart illustrates the rugae shapes of the Asian Arabs.

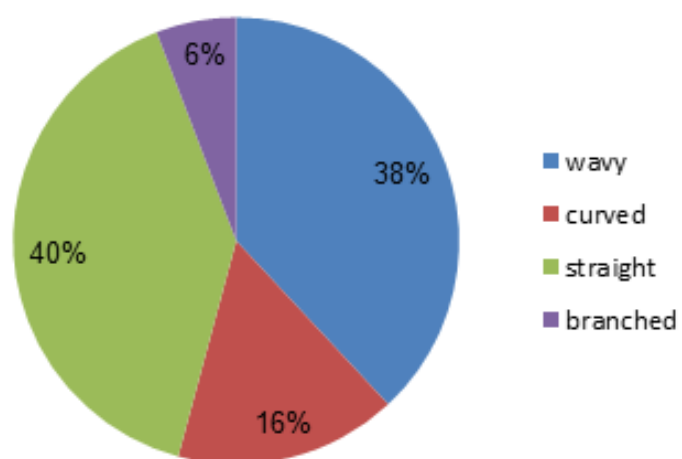


Fig. (8): Pie chart illustrates the rugae shapes of the Indians

Table (1): Reveals the frequency of different lengths of palatal rugae in both populations.

Rugae length type	Asian Arabs	Indian
	Mean &SD	Mean &SD
Primary(more than 3mm)	8.325±1.3	5.575±1.2
Secondary(3-5mm)	2.425±1.4	2.1±1.3
fragmentary(2-3mm)	1.65±1.8	1.15±1.1
ignored(less than 2mm)	0.975±1.07	3.525±1.8

Table (2): Clarifies the frequency of different shapes of palatal rugae in both populations.

Rugae shape	Asian Arabs		Indian	
	Mean &SD	percentage	Mean &SD	percentage
Wavy	6.275±1.5	58%	2.95±1.4	38%
Curved	2.35±1.1	22%	1.25±1.05	16%
Straight	1.225±1.1	12%	3.1±1.8	40%
branched	0.9±0.7	8%	0.45±0.6	6%

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