Content available at: https://www.ipinnovative.com/open-access-journals

Journal of Oral Medicine, Oral Surgery, Oral Pathology and Oral Radiology

Journal homepage: www.joooo.org

Original Research Article

Comparitive analysis of palatal rugae in tribal and urban population of Madhya Pradesh

Poonam Pandey[1], Bhavana Gupta[2,*]

[1]*Public Health Dentistry, PCDS, Bhopal, Madhya Pradesh, India*
[2]*Dept. of Oral Pathology and Microbiology, Dental Institute, RIMS, Ranchi, Jharkhand, India*

ARTICLE INFO

Article history:
Received 03-04-2021
Accepted 29-04-2021
Available online 08-06-2021

Keywords:
Rugae
Palatoscopy
Forensic odontology

ABSTRACT

Background and Objective: Human identification is a major task undertaken in forensic sciences. The study of palatine rugae and the study of fingerprints are sometimes complementary and based on same scientific basis. The palatal rugae patterns are unique to every individual and are protected by the lips, buccal pad of fat and teeth. This study was conducted to examine shape and pattern of palatal rugae between tribal population and urban population of M.P state.

Materials and Methods: The study sample consisted of 60 subjects, 30 each from tribal(Gond) and urban population of Madhya Pradesh, in the age group ranging from 18 to 25 yrs. The impression of maxillary arch was obtained from each subject using alginate impression material and cast were made. The rugae were delineated on the cast using a sharp graphite pencil under adequate light and magnification and recorded according to classification given by Thomas and Kotze (1983).

Results: After analyzing the rugae patterns in both the groups and between the 2 sides of the palate, the wavy pattern was found to be predominant followed by curved, straight, unification, circular, and nonspecific in decreasing order in the overall population. There was an obvious difference between the Rugae shapes in tribal (gonds) and urban population of Bhopal city. No significant difference in number of rugae between right and left sides between the primary and secondary rugae patterns were observed.

Conclusion: The pattern of rugae was seen different in these ethnic groups. In the present study, significant difference exists between the rugae patterns in tribals and urban population of M.P.

1. Introduction

Forensic odontology is a speciality in dentistry which occupies a primary place within the total spectrum of methods applied to medico-legal identification.[1] The study of palate is known as Palatoscopy.[2] Palatal rugae are the ridges present on the anterior part of the palatal mucosa on either side of the median palatal raphae and behind the incisive papilla.[3] They are highly individualistic, and not identical even among twins.[4] They are also stable and consistent in shape throughout the life following completion of growth.[5] Rugae are well protected by the lip, cheek, tongue, buccal pad of fat and teeth. The study of the patterns of the grooves and ridges of the palate to identify individual patterns is called as Rugoscopy.[6] Rugae chronology seems to be different with age and time. At birth well-trained with a typical orientation pattern. In Adolescence it acquire the final feature, shape of each individual. Once formed it may change in their size, but its shape is always maintained. Rugae are of special interest in dental records which had proved to be inconclusive in edentulous cases where there are no fingers Rugae patterns may be specific to racial groups facilitating population identification**.** Thus, the objective of the present study was to record the distribution of the predominant rugae pattern (palatal rugae number, shape, length, unification and location) in M.P population and to compare the distribution of these parameters between males and females to know if gender differentiation is

* *Corresponding author*.
E-mail address: drbhavanagupta02@gmail.com (B. Gupta).

https://doi.org/10.18231/j.jooo.2021.019

possible.

2. Aim

The rationale of the current study was to compare the number and different patterns of palatal rugae in two different ethnic groups of Madhya Pradesh state. And also to assess the predominant pattern if any in the selected group of subject.

3. Materials and Methods

The present study was carried out on population of tribe of Raisen district (gonds) and urban subjects of Bhopal city. The study consisted of 60 subjects, 30 each from the two different ethnic groups of Madhya Pradesh. The sample size was equally distributed in the age range of 18 to 25 yrs. Ethical clearance was taken from the ethical commity of our institute and consent form was taken from all the subjects.

4. Method

Alginate impressions of maxillary arch were made. The rugae were delineated using a sharp pencil. The classification given by Thomas and Kotze(1983) was used to record the patterns. Unification was also assessed. Additionally, nonspecific rugae pattern was observed. Length was determined under two categories.

Primary rugae - more than 5mm

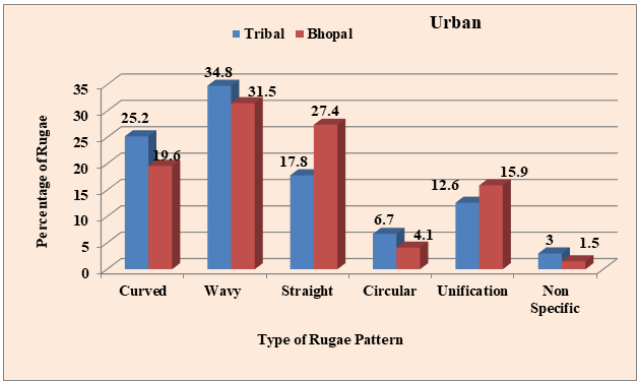
Secondary rugae - 3 - 5mm

4.1. Statistical analysis

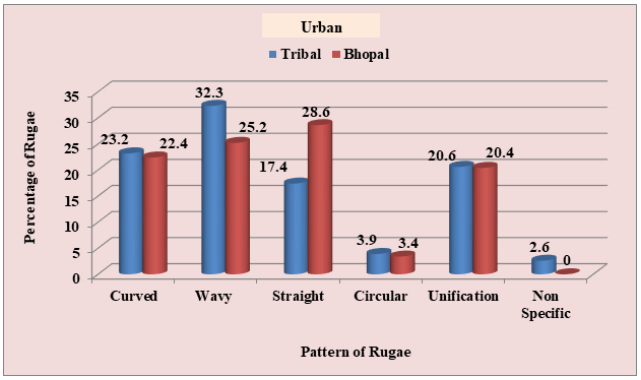
The association between rugae shape and ethnicity was tested using Chi-square analysis and comparison between the 2 groups for different parameters was done using Student t test.

5. Result

There was an obvious difference between the Rugae shapes in tribal (gonds) and urban population of Bhopal city. It was seen that in Graph 1 χ^2= 11.928 and P value= 0.036 (<0.05), which showed that there was significant difference. Wavy pattern was predominant followed by straight and curved in urban group, whereas wavy was followed by curved and then straight in the tribal group. Overall in urban group, wavy and straight patterns were predominant whereas wavy was followed by curved pattern in the tribal (gond) population. The total number of rugae in the 2 populations and between the 2 sides of the palate showed no statistically significant difference (Graphs 2 and 3). The graph 2, χ^2= 5.437 and P value= 0.245 (>0.05) and in graph 3 the value of χ^2= 9.284 and P value= 0.096 (>0.05), which showed that both were not statistically significant. As shown in graph 2, straight-shaped rugae pattern for right side of the palate was significantly more in the urban group followed by wavy and curved rugae. On contrary wavy pattern was more predominant in tribal population followed by curved and unification. Whereas on left side of palate both groups showed predominance of wavy pattern (Graph 3). In urban population, wavy pattern was followed by straight and then curved and in tribal population wavy pattern was followed by curved and then straight rugae pattern. On observing the length between primary and secondary rugae (Graph 4), where χ^2= 1.850 and P value= 0.174 (>0.05), which also showed that the difference was not statistically significant. In both the study groups primary rugae were more prominent as compared to secondary.



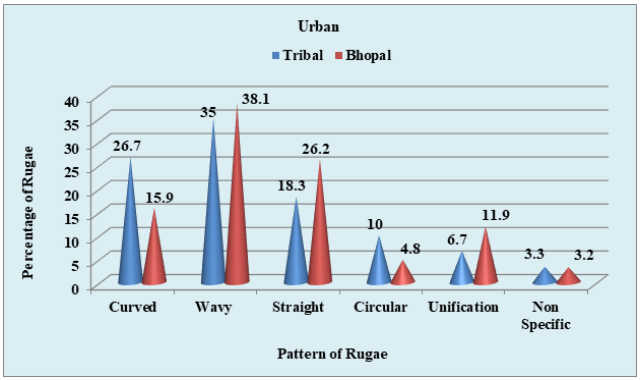
Graph 1: Distribution of different Rugae shapes in tribal an durban population. χ^2 = 11.928 P value=0.036 (<0.05) Significant difference



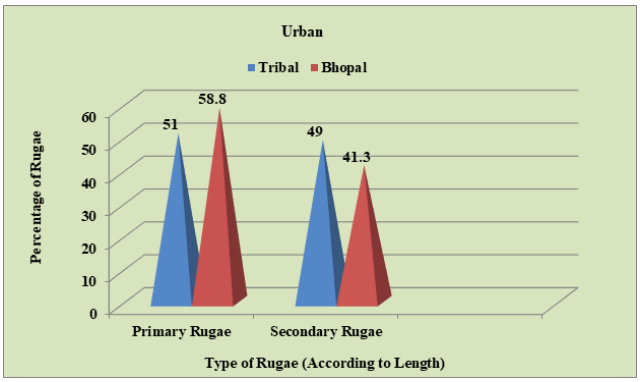
Graph 2: Distribution of total number of rugae Shapes on right side of palate in tribals and urban population.
χ^2 = 5.437, P value= 0.245(>0.05) Not Significant

6. Discussion

Palatal rugoscopy was first proposed in 1932, by a Spanish investigator Troban Hermaso.[5] 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.[6] It is seen that the rugae remain



Graph 3: Distribution of total number of rugae Shapes on left side of palate in tribals an durban population.
χ^2 = 9.284, P value= 0.096 (>0.05) Not Significant



Graph 4: Distribution of primary and secondary rugae in tribals and urban population.
χ^2 = 1.850, P value= 0.174 (>0.05) Not Significant

Fig. 1: Showing the edentulous maxillary cast with rugae marked with HB pencil

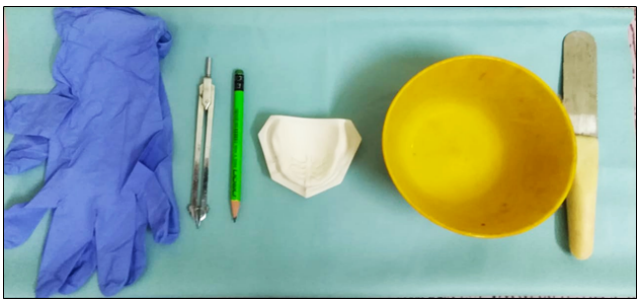


Fig. 2: Showing the materials used for study design

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.[1] 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.[3,4] According to Hauser et al., there were definite differences in the rugae pattern between Swazi and Greek populations. It was observed that the degree of development of rugae was dependent on the growth of the palate.[5] Denture wear, tooth malposition, and palatal pathology can cause alterations in rugae patterns.[4] Paliwal et al. showed that Straight rugae pattern on the right side of the palate in the male subjects was found to be significantly predominant in the MP population, whereas wavy shape was predominant in Keralites.[2] English et al. suggested that palatal rugae pattern is the characteristic feature which can discriminate between individuals, as they are unique, and can be identified based on their comparison.[7] Dhoke and Usato suggested that the right side of the palate showed fewer rugae as compared to the left side. It was due to the phenomenon of regressive evolution, dominating the right side of the palate.

The present study was done to evaluate various characteristics of rugae pattern between tribal group (Gonds)and urban population of M.P. Our result showed that there was an obvious difference between the Rugae shapes in tribal and urban population of Bhopal city. Wavy pattern was predominant followed by straight and curved in urban group, whereas wavy was followed by curved and then straight in the tribal group. Overall in urban group, wavy and straight patterns were predominant whereas wavy was followed by curved pattern in the tribal (gond) population. This finding is in accordance with the study of Kapali et al.[1] which showed that the most common shapes in both the ethnic groups (Australian Aborigines and Caucasians) were wavy and curved, whereas straight and circular were least common.

Also in our study, the total number of rugae in both the groups of population and between the 2 sides of the palate did not show any statistically significant difference.

Our results goes in accordance with the study of Shetty et al.[3] which wasdoneon the Tibet and Mysore population and evaluated that there was no statistical difference in the total number of rugae between the races and between two sides of the palate. Our study showed that (Qualitative assessment) the straight-shaped rugae pattern present on the right side of the palate was significantly more in the urban group followed by wavy and curved rugae. On contrary wavy pattern was more predominant in tribal population followed by curved and unification. Whereas on left side of palate both groups showed predominance of wavy pattern. In urban population, wavy pattern was followed by straight and then curved and in tribal population wavy pattern was followed by curved and then straight rugae pattern. This was in accordance with the study of Shetty et al.[3] which showed that wavy pattern was predominant, followed by curved and then straight. Our results are in contradiction with the study of Paliwal et al.[2] which showed that straight form was considerably high in number. On comparing the 2 sides of the palate, right side showed significantly more number of straight palatal rugae in urban population of MP, whereas wavy pattern was predominant in tribal population, which was in accordance with the result of Paliwal et al.[2] In the our study there were unifications seen more on right side of the palate as compared to the left side on both the study groups. Further, circular rugae were observed more in the tribal population than urban population on left side of the palate. Our study showed that primary rugae were more prominent as compared to secondary in both tribal and urban population. This is in accordance with the study done by Preethi et al.,[7] which showed that circular group was found to be absent and unifications were few in number.

Thus the comparative studies showed varying patterns of palatal rugae between the populations. This may be due to the apparent lack of systemic trends and require larger sample size and the need for more comprehensive understanding by further studies. Interobserver variability and lack of complete standardization may lead to difference in opinion or results in various studies.[8–15]

7. Conclusion

Despite the controversy about the stability of qualitative and quantitative characteristics of rugae and the extent of differences in tribal and urban population, the uniqueness to individuals has been recognized in forensic science as providing potential source of identification. The uniqueness of rugae pattern in race differentiation is promising. In the present study, significant difference exists between the rugae patterns in tribals and urban population of M.P. Larger sample size is required along with other tribal population for more extensive study and to correlate the difference between rugae pattern among them. Further more recent advancement in forensic odontology can be helpful in establishing its significance in personal and racial identification.

8. Source of Funding

None.

9. Conflict of Interest

The authors declare that there is no conflict of interest.

References

1. Kapali S, Townsend G, Richards L, Parish T. Palatal rugae patterns in Australian Aborigines and Caucasians. *Aust Dent J*. 1997;42(2):129–33. doi:10.1111/j.1834-7819.1997.tb00110.x.
2. Paliwal A, Wanjari S, Parwani R. Palatal rugoscopy: Establishing identity. *J Forensic Dent Sci*. 2010;2(1):27–31. doi:10.4103/0974-2948.71054.
3. Shetty K, Kalia S, Patil K. Mahima V G Palatal rugae pattern in Mysorean and Tibetan populations. *Indian J Dent Res*. 2005;16:51–5.
4. Thomas CJ, Tjvw K. The palatal ruga pattern in six southern African human populations, Part I: a description of the populations and a method for its investigation. *J Dent Assoc South Afr*. 1983;38:547–53.
5. Selvamani M, Hosallimath S, Madhushankari, Basandi PS, Yamunadevi A. Dimensional and morphological analysis of various rugae patterns in Kerala (South India) sample population: A cross-sectional study. *J Nat Sci Biol Med*. 2015;6(2):306–9. doi:10.4103/0976-9668.159985.
6. Kashima K. Comparative study of the palatal rugae and the shape of the hard palate in Japanese and Indian children. *Aichi Gakuin Daigaku Shigakkai Shi*. 1990;28:295–320.
7. Nayak P, Acharya AB, Padmini AT, Kaveri H. Differences in the palatal rugae shape in two populations of India. *Arch Oral Biol*. 2007;52(10):977–82. doi:10.1016/j.archoralbio.2007.04.006.
8. English WR, Robison SF, Summitt JB, Oesterle LJ, Brannon RB, Morlang WM. Individuality of Human Palatal Rugae. *J Forensic Sci*. 1988;33(3):718–26.
9. Thomas CJ, Kotze TJ. The palatal rugae pattern: A new classification. *J Dent Assoc S Afr*. 1983;38:153–7.
10. Caldas IM, Magalhaes T, Afonsa A. Establishing identity using chieloscopy and palatoscopy. *Forensic Sci Int*. 2007;165:1–9.
11. Hauser G, Daponte A, Roberts MJ. Palatal rugae. *J Anat*. 1989;165:237–49.
12. Acharya AB, Sivapathasundaram B. Forensic odontology. In: Rajendran R, Sivapathasundaram B, editors. Shafer's Textbook of Oral Pathology. New Delhi, India: Elsevier Publications; 2007. p. 886.
13. Indira AP, Gupta M, David MP. Usefullness of palatal rugae patterns in establishing identity: Preliminary results from Bengaluru city, India. *J Forensic Dent Sci*. 2012;4(1):2–5. doi:10.4103/0975-1475.99149.
14. Manjunath S. Palatal rugae patterns among the Indians at Manipal, India. *J Pharm Biomed Sci*. 2012;20:10.
15. Mohammed RB, Rao TH, Rani S, Chowdary MS, Prasanthi B, Pakki SK. Analysis of various rugae patterns among coastal Andhra (South Indian) population: Digitized method. *Oral Maxillofac Pathol J*. 2014;5:418–22.

Author biography

Poonam Pandey, Reader

Bhavana Gupta, Tutor

Cite this article: Pandey P, Gupta B. Comparitive analysis of palatal rugae in tribal and urban population of Madhya Pradesh. *J Oral Med, Oral Surg, Oral Pathol, Oral Radiol* 2021;7(2):98-101.