Journal of Population Therapeutics & Clinical Pharmacology

Rugoscopy pattern and its relation with dental caries and the permanent molar relationship among dental students - A cross sectional study

Sarika Balaganesh[1], Leelavathi L[2]*, Meignana Arumugham Indhiran[3]

[1]Junior Resident, Department of Public Health Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-77, India.

[2]Reader, Department of Public Health Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai- 77, India.

[3]Professor and Head of the Department, Department of Public Health Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai- 77, India

***Corresponding author:** Leelavathi L , Reader, Department of Public Health Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai- 77, India.

ABSTRACT

Introduction: Rugae pattern can be used as an identification tool in forensic dentistry as the palate is the most intact structure among the other parts of Human body. This study was designed on the purpose to determine whether rugae pattern can be used as a predictive tool in the identification of Dental Caries and Malocclusion status.

Materials and Methods: Rugae pattern was analysed by taking the upper elastomeric impression and pouring cast using dental stone. The rugae pattern was studied using Thomas and Kotze classification. For determining the dental caries prevalence DMFT index was recorded. Malocclusion status was determined by Angle's classification of Malocclusion.

Results: Curved rugae pattern was predominant among the Tamil population and Circular pattern was predominant among the Telugu population. No significant association was seen between the rugae pattern and dental caries, malocclusion status.

Conclusion: According to the results of this study, Rugae pattern cannot be used as a predictive factor to dental caries and malocclusion status determination.

Keywords: *Rugoscopy ,Dental caries, Malocclusion*

INTRODUCTION

The identification of oddity traits among the living or deceased person is the cornerstone of forensic sciences [1]. Dental features also play an important role in the identification of a person besides finger, palm or foot prints. Withholding shape and resisting decomposition are distinct features of palatal rugae located in the anterior third of the palate behind the incisive papilla[2]. Since the palate remains unblemished when most of the anatomical structures are broken or destroyed and also when there are no fingerprints, rugae pattern can be used as an identification tool in forensic sciences[3]. Thus in forensic dentistry, palatal rugae pattern can be used as an

identification tool because of its unique characteristic pattern[4].

The first person to describe palatine rugae was Winslow in 1753. The initial explanation was given by Santorini in 1775 by depicting the three wavy lines crossing the midline of the palate[5]. Goria in 1911 had put forth the first palatal classification. Palatal rugae as a personal identification tool was first given by Harrison Allen in 1889 [6]. Trobo Hermosa, a Spanish investigator, proposed the term palatal rugoscopy in 1932.

Palatal rugae or transverse palatine folds arranged in a transverse direction on each side of the median palatal raphae and behind the incisive papilla[7]. They appear as irregular elevations of the mucosa in the anterior third of the palate in the midsagittal plane. They appear toward the end of the first trimester of intrauterine life, from the covering connective tissue in the palatine process of the maxillary bone[8]. After formation of the rugae, they may experience changes in size due to growth or injuries to the palate, but the shape remains constant[9].

It is stated that lips, alveolus, teeth and palate develop during the same embryonic period [10, 21]. In case of palate the pattern of orientation is formed by 12th-14th weeks of intrauterine life from the hard connective tissue covering the palatal bone and their formation is under genetic control and remains stable until the oral mucosa degenerates after death [11,22]. Dental caries is a major oral health problem and is a widespread non-communicable disease [12,23]. Malocclusion is a deflection from the normal relation or alignment of the teeth to other teeth in the same arch and to the teeth in the opposing arch [13,24]. Since antiquity malocclusion has always been a source of concern for individuals [14,25]. Previous Studies have determined the association of malocclusion and Dental caries with rugoscopy patterns in the adult population[15,26]. But there is a lacuna in studies predicting the rugae pattern prevalence with respect to malocclusion and dental caries and also in racial diversity population .

Hence this study aims to determine the association between rugoscopy pattern and its relation with Dental caries and angle's molar relationship status among the dental students of Tamilnadu and Andhra Pradesh population.

MATERIALS AND METHODS

The study design is a cross sectional study. The study was done in Saveetha dental college in Chennai, among the dental students who have their origin from Tamil Nadu and Andhra pradesh.The inclusion criteria for the present study was the dental students with 18-30 years of age and are from Tamilnadu and Andhra Pradesh. Study included the participants whomever willing and consented to participate in the study. Students with pathological conditions of the lip are excluded from the study. A total of 60 students were included in this study. Out of these 60 students 30 students belong to tamilnadu and 30 students belong to Andhra Pradesh population.

The sample size was calculated using Epi Info sample size calculation software.

$$N = z\, p\, (1-p)\, /d2$$

Where, z=1.96 for 95% confidence interval, 1.645 for 90% confidence interval

p =Highest prevalence of dental caries among types of lip pattern i.e.95%

d=acceptance margin of error i.e 5%

The sample size was calculated to be 51

Hence the sample size can be rounded off to 60.

METHODOLOGY

For recording the palatal pattern, upper alginate impression was taken and cast is poured with dental stone. The rugae patterns are studied with the cast and were analysed using Thomas and Kotze classification. For determining the dental caries prevalence DMFT index was recorded. Malocclusion status was determined by Angle's classification of Malocclusion.

FIGURE 1: Palatal Rugae pattern from model cast

The rugae were divided into four types based on their shape.

1.Curved: This pattern is gently curved and have crescent shape.
2.Wavy: Slight curve at the origin or termination of curved rugae
3.Straight: They run directly from their origin to termination
4.Circular: Rugae that form a definite continuous ring.

Unification was said to have occurred when two rugae joined at their origin or termination:

1.Diverging: If two rugae had the same origin from the midline but immediately branched
2.Converging: Rugae with different origins from the midline, but joined on their lateral portions.

Infection control

Disposable mouth masks and gloves were used during the examination.Diagnostic instruments were autoclaved and were used for clinical examination.

Statistical analysis: Descriptive analysis was done to determine the predominant rugae pattern in Tamil and Telugu population.Chi-square test was used to determine the predilection of malocclusion and dental caries status based on rugae pattern in SPSS Version 21.

RESULTS

The recorded palatal rugae patterns were thoroughly studied.Out of the 60 people, 30 were from Andhra pradesh and 30 were from Tamil nadu. 50% of the study participants were males and 50% were females. Assessing the rugae pattern, among tamil population, Straight rugae pattern (10%), curved rugae pattern (46.67%), circular pattern (6.67%), wavy pattern (23.33%).Among telugu population, Straight pattern (26.67%), curved rugae pattern (6.67%), circular pattern (26.67%), wavy pattern (13.33%). (Figure 1)

With respect to the Diverging and Converging pattern, Tamil population had 13.33% divergence pattern and 86.67% converging pattern. In the Telugu population, 53.33% had a divergent population and 46.67% had a converging pattern. (Figure 2).Males showed a wavy pattern followed by curve and straight, while females showed a highest curved pattern followed by straight and wavy patterns.

TABLE 1: Rugae patterns in Tamil and Telugu population

Rugae pattern	Tamil population	Telugu population
Straight	10%	26.67%
Curved	46.67%	6.67%
Circular	6.67%	53.33%
Wavy	23.33%	13.33%

TABLE 2: Diverging and converging pattern in Tamil and Telugu population

Rugae pattern	Tamil population	Telugu population
Converging	86.67%	46.67%
Diverging	13.33%	53.33%

Correlating the rugae patterns of Tamil and Telugu population, there was no significant association between rugae pattern and dental caries status according to chi-square test (p-value=0.207). Also there is no significant association between rugae pattern and malocclusion status (p-value=0.132).

DISCUSSION

This study was done to determine the correlation of rugae pattern among the population susceptible to Dental caries and with malocclusion status. This study does not show any association of rugae pattern with Dental caries status or with malocclusion status among the Tamil and Telugu population. Whereas the study determined that curved rugae pattern was predominant among the Tamil population and circular pattern was more predominant among the Telugu population. The converging rugae pattern was mostly found among the Tamil population and Diverging rugae pattern was mostly found among the Telugu population.

In a previous study conducted by Radhika kalyani et al in 2017, the Wavy, curved and straight rugae were predominant among Andhra pradesh population and circular rugae pattern was predominant among Telangana population [31]. Wavy and curved rugae patterns were most common among the Uttar Pradesh population[16,27]. Studies done by Preethi et al, on two Indian populations showed that wavy and curved patterns were the most prevalent rugae shapes in the study groups, followed by straight rugae. Unifications were few in number while circular rugae were not observed.[17,28]

In a study done by Surekha et al in 2012, Manipuri population showed a curved rugae pattern than the Kerala population [32]. Wavy pattern was predominant in Kerala population[18,29].Study done by Deeksha et al (2013) reported that the wavy pattern was most common among the kodavas [33]. Studies done by Kapali et al, on Australian and Caucasians revealed that the most common shapes in both ethnic groups were wavy and curved forms, whereas straight and circular types were least common.[19]

In a study done by Manisha et al in 2018 which compared the rugoscopy pattern with dental caries, the wavy pattern was most common among the kannada population[30]. There was no significant difference between the rugoscopy pattern and Dental caries which is similar to the present study.[20,34] In a study done by Dandamudi Lalitya et al in 2019, no definite rugae patterns was found in association with the malocclusion status of the kannada population.[11,35]

CONCLUSION

Curved rugae pattern was the predominant pattern among the Tamil population and Circular pattern was the dominating pattern among the Telugu population. The converging pattern was more among the Tamil population and the Diverging pattern was predominant among Telugu population. No association was seen between the Rugae pattern and Dental caries, Malocclusion status.

REFERENCES

1. Gupta, T., Sharma, M. and Garg, N., 2015. Role of cheiloscopy, rugoscopy, and dactyloscopy for human identification.
2. Mutalik, V.S., Menon, A., Jayalakshmi, N., Kamath, A. and Raghu, A.R., 2013. Utility of cheiloscopy, rugoscopy, and dactyloscopy for human identification in a defined cohort. Journal of forensic dental sciences, 5(1), p.2.
3. AC, K., 2019. Comparing the Potential Role of Palatal Rugae Pattern in Paternal Testing-A Cross Sectional Study. Indian Journal of Forensic Medicine & Toxicology, 13(2).

4. Shetty, D., Juneja, A., Jain, A., Khanna, K.S., Pruthi, N., Gupta, A. and Chowdhary, M., 2013. Assessment of palatal rugae pattern and their reproducibility for application in forensic analysis. Journal of forensic dental sciences, 5(2), p.106.

5. Indira, A.P., Gupta, M. and David, M.P., 2012. Usefullness of palatal rugae patterns in establishing identity: Preliminary results from Bengaluru city, India. Journal of forensic dental sciences, 4(1), p.2.

6. Swetha, S., 2015. Palatal rugae pattern in varied adult Indian population of males and females. Journal of Pharmaceutical Sciences and Research, 7(9), p.736.

7. Jain, A. and Chowdhary, R., 2014. Palatal rugae and their role in forensic odontology. Journal of investigative and clinical dentistry, 5(3), pp.171-178.

8. Jain, A. and Chowdhary, R., 2014. Palatal rugae and their role in forensic odontology. Journal of investigative and clinical dentistry, 5(3), pp.171-178.

9. Chitroda, P., Katti, G., Ghali, S. and Baba, I.A., 2013. Palatal Rugae Pattern as an Aid for Personal Identification: A Review. Medico-Legal Update, 13(1).

10. Freitas, J.A.D.S., Garib, D.G., Oliveira, M., Lauris, R.D.C.M.C., Almeida, A.L.P.F.D., Neves, L.T., Trindade-Suedam, I.K., Yaedú, R.Y.F., Soares, S. and Pinto, J.H.N., 2012. Rehabilitative treatment of cleft lip and palate: experience of the Hospital for Rehabilitation of Craniofacial Anomalies-USP (HRAC-USP)-Part 2: Pediatric Dentistry and Orthodontics. Journal of Applied Oral Science, 20, pp.268-281.

11. Lalitya, D., Srinivasan, I., Setty, J.V., Pamnani, S., Dindukurthi, M.K. and Allani, S., 2019. Rugoscopy as a gender determination tool and its appositeness in malocclusion among adolescents aged 13–18 years. International Journal of Clinical Pediatric Dentistry, 12(4), p.307.

12. Wolf, T.G., Cagetti, M.G., Fisher, J.M., Seeberger, G.K. and Campus, G., 2021. Non-communicable diseases and oral health: An overview. Frontiers in oral health, 2.

13. Angle, E.H., 1900. Treatment of Malocclusion of the Teeth and Fractures of the Maxillae: Angle's System. White Dental Manufacturing Company.

14. Baskaradoss, J.K., Geevarghese, A., Alsaadi, W., Alemam, H., Alghaihab, A., Almutairi, A.S. and Almthen, A., 2022. The impact of malocclusion on the oral health related quality of life of 11–14-year-old children. BMC pediatrics, 22(1), pp.1-6.

15. Subramani, P., Lakshmi, Y.S., Sarika, K. and Shalini, S., 2022. Association Between Palatal Rugae Pattern And Dental Caries Among The General Population: A Cross-Sectional Study. International Journal of Forensic Odontology, 7(2), pp.20-25.

16. Sekhon, H.K., Sircar, K., Singh, S., Jawa, D. and Sharma, P., 2014. Determination of the biometric characteristics of palatine rugae patterns in Uttar Pradesh population: a cross-sectional study. Indian Journal of Dental Research, 25(3), p.331.

17. Byatnal, A., Byatnal, A., Kiran, A.R., Samata, Y., Guruprasad, Y. and Telagi, N., 2014. Palatoscopy: An adjunct to forensic odontology: A comparative study among five different populations of India. Journal of natural science, biology, and medicine, 5(1), p.52.

18. Surekha, R., Anila, K., Reddy, V., Hunasgi, S., Ravikumar, S. and Ramesh, N., 2012. Assessment of palatal rugae patterns in Manipuri and Kerala population. Journal of forensic dental sciences, pp.93-96.

19. Goyal, S. and Goyal, S., 2013. Study of palatal rugae pattern of Rwandan patients attending the dental department at King Faisal hospital, Kigali, Rwanda: a preliminary study. Rwanda Med J, 70(1), pp.19-25.

20. Agarwal, M., Alex, A. and Konde, S., 2018. Relationship between dermatoglyphics, cheiloscopy, rugoscopy, and dental caries: A cross-sectional study in Bengaluru, Karnataka. Contemporary Clinical Dentistry, 9(4), p.577.

21. Ashok, V. and Ganapathy, D., 2019. A geometrical method to classify face forms. Journal of oral biology and craniofacial research, 9(3), pp.232-235.

22. Pandian, K.S., Krishnan, S. and Kumar, S.A., 2018. Angular photogrammetric analysis of the soft-tissue facial profile of Indian adults. Indian J Dent Res, 29(2), pp.137-43.

23. Ravindra, V., Rekha, C.V., Annamalai, S., Sharmin, D.D. and Norouzi-Baghkomeh, P., 2019. A comparative evaluation between cheiloscopic patterns and the permanent molar relationships to predict the future malocclusions. Journal of clinical and experimental dentistry, 11(6), p.e553.

24. Ravindra, V., Rekha, V., Annamalai, S., Sharmin, D. and Norouzi-Baghkomeh, P., 2018. A comparative evaluation between dermatoglyphic patterns and different terminal planes in primary dentition. Journal of clinical and experimental dentistry, 10(12), p.e1149.

25. Charles, A., Ramani, P., Sherlin, H.J., Dilip, S., Srinivas, S. and Jayaraj, G., 2018. Evaluation of

dermatoglyphic patterns using digital scanner technique in skeletal malocclusion: A descriptive study. Indian Journal of Dental Research, 29(6), p.711.

26. Muruganandan, J., Priya, V.V. and Shamsudeen, S.M., 2018. Knowledge and attitude among senior dental students on forensic dentistry: A survey. World Journal of Dentistry, 9(3), pp.187-191.

27. Arvind TR, P. and Felicita, A.S., 2021. Correlation between collum angle and lower lip position in different Class II malocclusions-A retrospective cephalometric study. Orthodontic Waves, 80(2), pp.81-86.

28. Sreenivasagan, S. and Sivakumar, A., 2021. FSA Angle: A Soft Tissue Approach for Assessing Sagittal Skeletal Discrepancy. International Journal of Clinical Pediatric Dentistry, 14(Suppl 1), p.S54.

29. Murugesan, A. and Sivakumar, A., 2020. Comparison of accuracy of mesiodistal tooth measurements made in conventional study models and digital models obtained from intraoral scan and desktop scan of study models. Journal of Orthodontics, 47(2), pp.149-155.

30. Venugopal, A., Ghoussoub, M.S., Manzano, P., Mehta, P., Marya, A., Vaid, N.R., Ludwig, B. and Bowman, S.J., 2021. Molar protraction on an adult with severe high-angle class III malocclusion and knife-edge residual ridges. Orthodontic Waves, 80(3), pp.161-169.

31. Murugesan, A. and Jain, R.K., 2020. A 3D comparison of dimension of infrazygomatic crest region in different vertical skeletal patterns: A retrospective study. International orthodontics, 18(4), pp.770-775.

32. Varghese, R.M., Subramanian, A.K. and Sreenivasagan, S., 2021. Comparison of dentoskeletal changes in skeletal class II cases using two different fixed functional appliances: Forsus fatigue resistant device and powerscope class II corrector—A clinical study. J Int Oral Health, 13(3), p.234.

33. Kumar, M.S., 2021. Dermatoglyphic Pattern Configurations: A Review. Int J Dentistry Oral Sci, 8(6), pp.2816-2827.

34. Kumar, M.S., 2021. Role of Dermatoglyphics as a Diagnostic Tool in Syndromes and Systemic Disorders. Int J Dentistry Oral Sci, 8(5), pp.2390-2400.

35. binti Shahroom, N.S., Jain, R.K. and Nasim, I., 2021. Prevalence and Associated Factors for Crossbite Malocclusion in South Indian Subjects-A Retrospective Study. Int J Dentistry Oral Sci, 8(8), pp.4109-4113.