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RESEARCH ARTICLE

MORPHOLOGICAL STUDY OF PALATAL RUGAE IN CHILDREN RANGING 12-14 YEARS

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ABSTRACT

Background: In forensic odontology, identification of individuals is a challenging task. Various forensic parameters like bite marks, teeth marks on left over food, lip prints etc. are being used in identification of individuals. Palatal rugae is one such forensic parameter due to its uniqueness, consistency in shape throughout life and post mortem resistance. **Objective:** This study aims at identification and comparison of different morphological rugae patterns in male and females. **Methods:** A total of 100 plaster casts of children of age group 12-14 yrs were taken and equally divided between both sexes. The rugae on these casts were marked with sharp graphite pencil and their length was measured using magnifying glass and divider. The rugae were examined for morphological characteristics and classified according to *Thomas and Kotze Classification* of rugae shapes. Comparison was made between males and females for the various shapes of palatal rugae i.e. straight, wavy, circular, curved, convergent and divergent. The data was put to statistical analysis. **Results:** The study revealed a statistically significant difference between shape of rugae i.e. curved rugae were found higher in males and wavy rugae were found higher in females. **Conclusions:** Palatal rugae hold potential as an additional method of sex determination in conjunction with other forensic methods.

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INTRODUCTION

In forensic odontology, identification of individuals is a challenging task. Various forensic parameters like bite marks, teeth marks on left over food, lip prints etc. are being used in identification of individuals. Palatal rugae is one such forensic parameter. Palatal rugae are the transverse folds or asymmetric ridges located in the anterior portion of the palatal mucosa, bilateral to median palatal raphe, never crossing the midline. They are formed in the third month of intrauterine life. They are unique to every individual and are consistent throughout life. The morphology of palatal rugae includes the characteristics like length, shape, direction and unification which can be studied as they do not change throughout life except in size during growth. In this study, we have examined the maxillary casts of 100 children between the age group of 12-14 years for various shapes of the rugae patterns using classification given by *Thomas and Kotze*.

MATERIALS AND METHODS

A total of 100 study casts were taken from the children in age group 12-14 yrs in the city of Patiala, Punjab and equally divided between both sexes i.e. 50 males and 50 females.

The rugae on these casts were marked with sharp graphite pencil and were examined using magnifying glass and divider. All the rugae i.e. primary, secondary and fragmented were examined for the morphological patterns according to *Thomas and Kotze Classification* of rugae shapes i.e. straight, wavy, circular, curved, convergent and divergent. The most prominent rugae on each side of the cast i.e. Right and left side, were recorded separately. The data was put to statistical analysis.

RESULTS

The results revealed that curved and wavy were the most common shapes of palatal rugae. Out of the total 100 study casts, the most prominent rugae on the left side was curved in 48 casts, wavy in 41 casts, straight in 7 casts, convergent in 3 casts and divergent in only one cast. None of the casts had circular shaped rugae as the prominent one. On the right side, the most prominent rugae was curved in 44 casts, wavy in 43 casts and straight in 13 casts. The circular, convergent and divergent rugae were not found to be prominent in any cast on the right side. Rugae patterns on the left and right side of palate in males and females are given in the table 1 & 2.

Curved and wavy types were found to be the most common ones, while circular type was the least common. There was a highly significant sex difference in the curved type, which was found to be higher in males on both right and left sides. There was also a highly significant sex difference in the wavy type, which was higher in females on both right and left sides. However, side-wise comparisons of rugae shape remained statistically insignificant in both males and females.

Table1. Rugae patterns on the left and right side of palate in males and females

Rugae Shape	Present /Absent	Right Side		Left Side	
		Male	Female	Male	Female
Curved	Present	27	17	31	17
	Absent	23	33	19	33
Wavy	Present	14	29	15	26
	Absent	36	21	35	24
Straight	Present	9	4	4	3
	Absent	41	46	46	47
Circular	Present	0	0	0	0
	Absent	50	50	50	50
Converging	Present	0	0	0	3
	Absent	50	50	50	47
Diverging	Present	0	0	0	1
	Absent	50	50	50	49

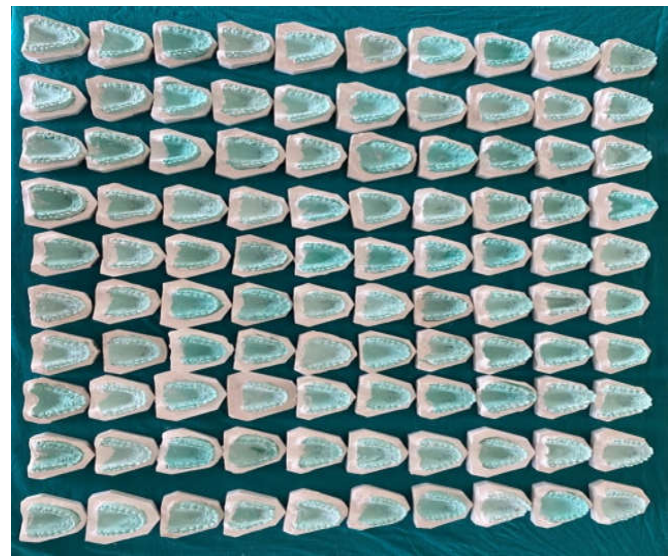


Fig 3. plaster casts of 100 children aged 12-14 years

Table 2. Rugae patterns on the left and right side of palate in males and females are given in the table below

Patterns on left side	Male	Female	P Value	Result
Curved	31	17	0.009	Significant
Wavy	15	26	0.042	Significant
Straight	4	3	1.000	Not Significant
Circular	0	0	N.A	N.A
Convergent	0	3	0.241	Not Significant
Divergent	0	1	1.000	Not Significant



Fig. 1. Thomas and Kotze Classification



Fig2: Palatal rugae marked with graphite pencil

DISCUSSION

Palatal rugae are the anatomical folds or wrinkles, formed from irregular connective tissue located on the anterior third of the palate. They are also called “plica palatinae” or “rugae palatine”. No two palates are alike in their configuration and the palatal print do not change with time. Even between twins, the rugae patterns are similar but not identical. However, changes in the length of rugae with age results from the underlying palatal growth. According to Van der Linden, the anterior rugae do not increase in length after 10 years of age. While other morphological characteristics such as shape, direction and unification remain stable throughout life. Some authors reported the diversity of shapes in rugae patterns and their sex discrimination potential among different ethnic groups. The study of palatal rugae in order to ascertain a person’s identity is known as Palatal rugoscopy. It was first proposed in 1932 by a Spanish investigator Trobo Hermosa. So, in this study we have examined the shapes of rugae patterns. Their uniqueness to individuals has been recognised in forensic science as a potentially reliable source of identification. In the present study, curved and wavy types were more commonly found in both the sexes. These findings were in accordance with some previous studies of Nallamali et al. [2015], Kapali et al. [1997], Hauser et al. [1989] and contradicting those of Paliwal et al. [Paliwal, 2020] and Kallianpur et al. [2011], who reported the most predominant shape as wavy in their studies. Comparisons of rugae shape revealed significant difference in distribution of the curved type of rugae, which was found to be higher in males, and in the wavy type, which was higher in females. This finding is in accordance to the findings of study by Nallamali et al. [2015] but this finding is not in line with the findings of Saraf et al. [2011] and Chatterjee et al. [2011] who reported a significant difference in the converging type in females and circular type in males.

Contrasting to these results, Sharma et al. [2009] and Nayak et al. [2007] individually observed no gender-related variations in the shape of palatal rugae patterns. Side-wise comparisons of rugae shape patterns revealed no statistical difference between the rugae patterns on left and right side of the palate. This is supported by the study conducted by Nallamali et al. [2015] where no significant difference was found in shape of rugae on the right and left side of the males and females. But this is not in agreement with the findings of Paliwal et al. [2010] who reported that straight rugae pattern on the right side of the palate was significantly predominant in the male subjects of Madhya Pradesh population, whereas wavy shape was predominant in the population of Kerala. The explanation for these differences may be attributed to the variations in the populations studied and their individual sample sizes.

CONCLUSION

- The study revealed that out of all the shapes of rugae patterns, curved and wavy were the most common shapes of palatal rugae.
- When the shapes were compared in male and female casts, there was a statistically significant difference between the predominant shapes of rugae i.e.
 - Curved rugae were found more in males.
 - Wavy rugae were found more in females.
- However, no statistical difference was found between the rugae patterns on left and right side of the palate.
- Hence, shapes of palatal rugae can be used for identification of sex, along with other forensic methods.
- In this study, the sample size is small, so further studies with larger sample size must be carried out to support the findings.

Conflicts of interest: There are no conflicts of interest.

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REFERENCES

- Almeida, MA, Phillips, C, Kula, K, Tulloch, C 1995, 'Stability of the palatal rugae as landmarks for analysis of dental casts' *Angle Orthod*, vol. 65, pp. 43-8.
- Bailey, JT, Esmailnejad, A, Almeida, MA 1996, 'Stability of the palatal rugae as landmarks for analysis of dental casts in extraction and nonextraction cases', *Angle Orthod*, vol. 66, pp. 73-8.
- Bansode, S, Kulkarni, M 2009, 'Importance of palatal rugae in individual identification', *J Forensic Dent Sci*, vol. 1, pp. 77-81.
- Bharath, ST, Kumar, GR, Dhanapal, R, Saraswathi, R 2011, 'Sex determination by discriminant function analysis of palatal rugae from a population of coastal Andhra', *J Forensic Dent Sci*, vol. 3, pp. 58-62.
- Caldas, IM, Magalhães, T, Afonso, A 2007, 'Establishing identity using cheiloscopia and palatoscopy', *Forensic Sci Int*, vol. 165, pp. 1-9.
- Chateerjee, S, Khanna, M 2011, 'Dimensional analysis of various rugae patterns in north Indian population subset', *J Forensic Dent Sci*, vol. 3, pp. 86-8.
- Eboh, DE 2012, 'Palatal rugae patterns of urhobos in Abraka, South-Southern Nigeria', *Int J Morphol*, vol. 30, pp. 709-13.
- El-Fotoh, MM & El-Sharkawy, GZ 1998, 'A study of palatal rugae pattern (rugoscopy) in an Egyptian population', *Egypt Dent J*, vol. 44, pp. 3177-84.
- Fahmi, FM, Al-Shamrani, SM, Talic, YF 2001, 'Rugae pattern in a Saudi population sample of males and females', *Saudi Dent J*, vol. 13, pp. 92-5.
- Hauser, G, Daponte, A, Roberts, MJ 1989, 'Palatal rugae', *J Anat*, vol. 165, pp. 237-49.
- Indira, AP, Gupta, M & David MP 2012, 'Palatal rugae patterns for establishing individuality', *J Forensic Dent Sci*, vol. 4, pp. 2-5.
- Kallianpur, S, Desai, A, Kase, S, Sudheendra, US, Joshi, P 2011, 'An anthropometric analysis of facial height, arch length, and palatal rugae in the Indian and Nepalese population', *J Forensic Dent Sci*, vol. 3, pp. 33-7.
- Kapali, S, Townsend, G, Richards, L, Parish, T 1997, 'Palatal rugae patterns in Australian Aborigines and Caucasians', *Aust Dent J*, vol. 42, pp. 129-33.
- Muthusubramanian, M, Limson, KS, Julian, R 2005, 'Analysis of rugae in burn victims and cadavers to simulate rugae identification in cases of incineration and decomposition', *J Forensic Odontostomatol*, vol. 23, pp. 26-9.
- Nallamilli, SM, Tatapudi, R, Reddy, SR, Chennoju, SK, Kotha R, Kotha P 2015, 'Diversity of palatal rugae patterns and their reliability in sex discrimination in a South Indian population', *J Indian Acad Oral Med Radiol*, vol. 27, pp. 9-12.
- Nayak, P, Acharya, AB, Padmini, AT, Kaveni, H 2007, 'Differences in the palatal rugae shape in two populations of India', *Arch Oral Biol*, vol. 52, pp. 977-82.
- Paliwal, A, Wanjari, S, Parwani, R 2010, 'Palatal Rugoscopy: Establishing identity' *J Forensic Dent Sci*, vol. 2, pp. 27-31.
- Rodriguez-Flórez, CD & Fonseca, GM 2007, 'Sexual dimorphism of palatal rugae in children of the city of Cordova, Argentina', *Antrpo*, vol. 15, pp. 63-70.
- Saraf, A, Bedia, S, Indurkar, A, Degwekar, S, Bhowate, R 2011, 'Rugae patterns as an adjunct to sex differentiation in forensic identification', *J Forensic Odontostomatol*, vol. 29, pp. 14-9.
- Sharma, P, Saxena, S, Rathod, V 2009, 'Comparative reliability of cheiloscopia and palatoscopy in human identification', *Indian J Dent Res*, vol. 20, pp. 453-7.
- Simmons, JD, Moore, RN & Erickson, LC 1987, 'A longitudinal study of anteroposterior growth changes in the palatine rugae', *J Dent Res*, vol. 66, pp. 1512-5.
- Venegas, VH, Valenzuela, JS, López, MC, Galdames, IC 2009, 'Palatal rugae: Systematic analysis of its shape and dimensions for use in human identification', *Int J Morphol*, vol. 27, pp. 819-25.
- Wichniewski, C, Franco, A, Ignácio, SA, Batista, PS 2012, 'Comparative analysis between dactyloscopy and rugoscopy', *J Morphol Sci*, vol. 29, pp. 174-7.
