

ORIGINAL ARTICLE

Palatal Rugae : New Pathway Leading Towards Familial Hierarchy

Dhanodkar HD,¹ Thukral R,² Jaiswal SG,³ Patel NS,⁴ Bagulkar BB,⁵ Jain AS.⁶

1,3,5. Department of Oral pathology & Microbiology, Sri Aurobindo College of Dentistry, Sri Aurobindo University, Indore.

2. Department of Dentistry, Atal Bihari Vajpayee Govt. Medical College, Vidisha.

4. Department of Forensic Medicine & Toxicology, Atal Bihari Vajpayee Govt. Medical College, Vidisha.

6. Department of oral pathology and microbiology, Modern dental college and research center, MPMSU, Indore.

Abstract :

In the era of various technical and methodological advances, human identification becomes a herculean task especially in mass disasters cases where in the pile of flesh; one has to distinguish among own and others. Similar to fingerprint, palatal rugae also vary from person to person and may help to find the links between generations similar to DNA. This study aimed to carry out a comparative evaluation of palatal rugae, finger prints and lip prints in 3 consecutive generations. For this, photograph of palatal rugae, ink pad, dark coloured lipstick, white paper and cellophane tape were used. Participants were explained about the study and its purpose, their written consents was obtained. Photographs of palatal rugae were obtained by adjusting proper position, light and intraoral mirror. Fingerprints of hand fingers and thumbs were recorded on white paper using ink while lip prints were recorded by using cellophane tape and lipstick. With the help magnifying glass and marking pencil all the patterns were traced and analysed for repetition. Statistical analysis was done by using SPSS 20.0 version. Patterns of finger prints (66.7%) and palatal rugae (73.3%) showed repetition with maternal side while lip prints patterns showed more similarity (63.6%) with paternal side. Thus it can be concluded that palatal rugae & fingerprints are inherited as a maternal trait while lip prints tend to have a paternal influence.

Keywords: Forensic science; Palatal rugae; Finger prints; Lip prints.

Introduction :

For human identification fingerprints are considered as an ideal method as fingerprints neither change their pattern nor show similarity with others. Similarly, lip prints as well as shapes of palatal rugae also show individualistic patterns. That is why; dental identification is one of the most commonly used scientific methods in natural disasters.^{1,2} Fingerprints are the patterns of raised papillary ridges like loop, arch, whorl etc. present on fingertips of hand as well as on foot. Their analysis have been the gold standard for human identification since ancient times and is getting converted to modern form with the recent technical advances like in field of biometric devices or digital fingerprint analysis. In cases where fingerprint analysis is not possible such as earthquake or road traffic accidents etc then identification of palatal rugae pattern becomes the procedure of choice.^{2,3,4} It is also supported by Cheiloscopy, in which lip prints are used to identify the involvement of particular individual especially at crime scenes.⁵

In this study; we aimed to carry out a comparative evaluation of palatal rugae, finger prints and lip prints in 3 consecutive generations, in order to identify if these have any inheritance pattern.

Corresponding Author

Dr. Narendra Singh Patel

Email: drnspatel30@gmail.com

Mobile No.: 9644897901

Article History

DOR : 20.05.2024; DOA :02.08.2024

Material and methods:

For recording patterns, intraoral mirror, DSLR camera, ink pad, dark coloured lipstick, cellophane tape, drawing sheet and scissor were used. Analysis of patterns was done by using magnifying glass and marking pencil (Figure 1).

15 families having 3 consecutive generations (total of 80 participants) were selected. Participants were explained about the study and its purpose, their consents were obtained. Photographs of palatal rugae were recorded by professional photographer with DSLR camera (Canon EOS 60D) by maintaining proper position of individual, light and intraoral mirror (Figure 2).² Participants were asked to wash their hands and press their fingers one by one on ink pad with little pressure and then placing the same on white paper sheet. fingerprints of all fingers and thumbs of both the hands were recorded (Figure 3).^{1,3,4} While for recording lip prints participants were asked to colour their lips with dark colour lip stick then a piece of cellophane tape was taken and placed on lips; obtained lip prints were paste on white paper sheet (Figure 4).^{1,5} After recording all details; different patterns were analysed with the help of magnifying glass and marking pencil and compared for repetition between generations. The data was analysed using SPSS (Statistical Package for Social Sciences) 20.0 version. The association between the variables was assessed using Chi-square test. P value <0.05 was considered statistically significant.

Result:

For analysis of lip prints Tsuchihashi's classification (1974),¹ for finger prints Henry's classification⁴ and for palatal rugae classification of Thomas and Kotze (1983)⁶ were used (Figure 5).



Figure 1. Materials required for collection of different prints & patterns.



Figure 2. Recording pattern of palatal rugae.



Figure 3. Recording finger prints.

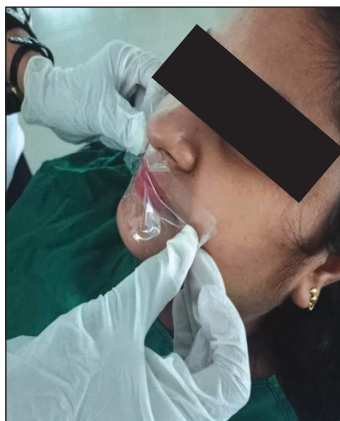


Figure 4. Recording lip prints.

On analysis, it was found that the pattern of palatal rugae and finger prints have more similarity with maternal side i.e. 73.3% and 66.7% respectively while repetition of lip print pattern show paternal dominance (63.6%) (Chart 1).

33.3% lip prints were found to be repeated in 2 consecutive generations and 40% in alternate generation. In siblings, around 20% lip print pattern were repeated while 26.6% lip print show no repetition at all. Around 60% patterns of finger prints were repeated in all 3 generations, 73.3% repetition was found in 2

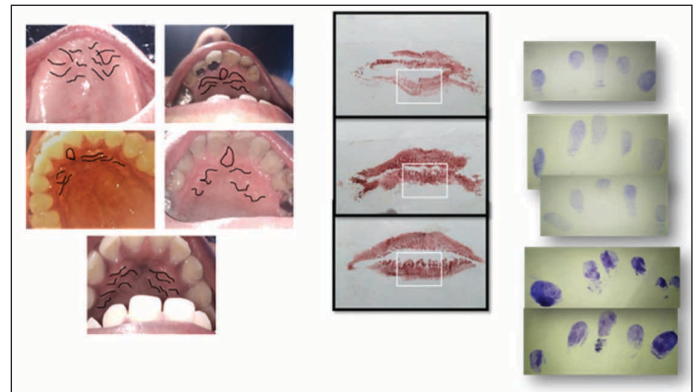


Figure 5. Analysis of different patterns.

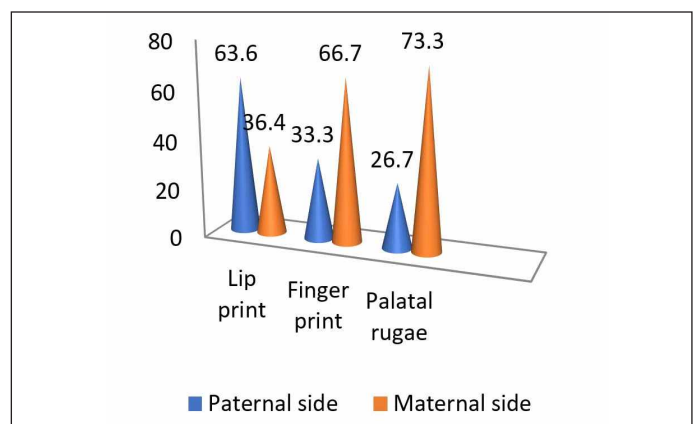


Chart 1. Comparison of frequency of repetition of lip print, finger print and palatal rugae on maternal & paternal side.

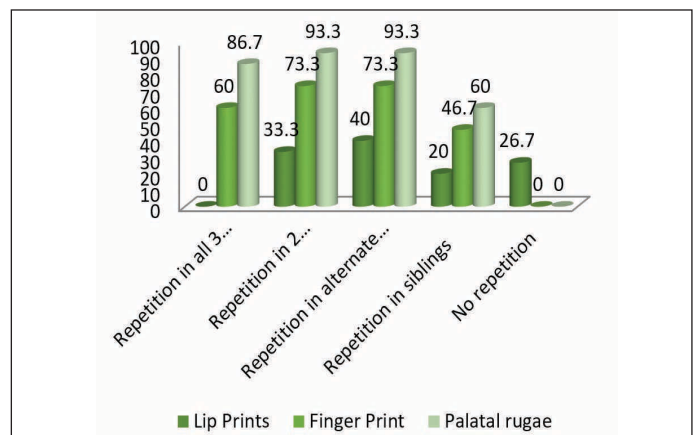


Chart 2. Comparison of repetition of palatal rugae, fingerprint & lip print pattern.

consecutive generations as well as in alternate generation while in siblings, 46.7% patterns were repeated. Pattern of palatal rugae showed maximum (86.7%) repetition in all 3 generations, 93.3% repetition was found in 2 consecutive generations as well as in alternate generation; along with this siblings showed repetition of 60% palatal rugae pattern (Chart 2).

During analysis of different patterns Type 1 (40%) lip print, Loop type (12.1%) finger print and Curved (10.2%) type palatal rugae was more commonly found while Type V lip print (3.7%) Arch pattern of finger prints (2.1%) and Bifurcated palatal rugae

(3.4%) were found to be least common.

Discussion:

In our study we found 86.6% repetition in pattern of primary palatal rugae, 60% repetition of fingerprints among all three generations of family; 40% repetition of pattern of lip prints in alternative generations and 33.3% repetition in 2 consecutive generations. Mala et al in 2017 conducted a study to correlate repetition of fingerprints, lip prints and palatal rugae in 3 consecutive generations of a family. They found that palatal rugae showed 10% repetition, and fingerprints (especially thumbprints) showed 30% repetition amongst the 3 generations while lip prints showed 20% repetition amongst alternate generations.¹

In our study palatal rugae pattern showed 73.3% resemblance with maternal and 26.7% resemblance with paternal lineage. Contrary to this; Burhanuddin et al in 2017 found palatal rugae pattern based on lineage and concluded that pattern of palatal rugae of a child showed 25% resemblance with father while 15% with mother.⁶

Type 1 (40%) lip prints were common in our study while Abarnalingam et al in 2019 found Type 2 lip prints more commonly followed by Type 3.⁷ This could be attributed to geographical & racial diversity of study population.

In our study, loop pattern of finger prints were commonly (12.1%) found. These findings were similar to Hassan Solhi et al who in 2010 found maximum number (54%) of loop pattern in fingerprints.⁴ Among the pattern of palatal rugae; curved (10.2%) type of rugae was a common finding in our study. Contrary to this Abarnalingam et al in 2019⁷ and Rani S. Thabitha et al in 2015⁸ found wavy type of palatal rugae more commonly followed by curved type; in their respective studies. This could again be attributed to variation in the study population.

Conclusion:

Although palatal rugae, finger print and lip print patterns are unique for every individual but there can be repetition of patterns in consecutive generations. Palatal rugae and finger print pattern show more similarities with maternal side while lip print pattern have more similarities with paternal side. Among different patterns of palatal rugae, fingerprints and lip prints curved type, loop pattern and type I lip prints were more commonly found respectively while bifurcated rugae, arch pattern and type V pattern were least common.

Hence, it can be concluded that these patterns are genetically transferred and rugoscopy, dactyloscopy and cheiloscopy can also be used for identifying link between generations.

Acknowledgments: I would like to acknowledge Dr. Preyasi

Gupta & Dr. Deepika Jain for providing help during data collection & statistical analysis.

Financial support : Nil

Conflict of interest : The authors declare no conflicts of interest.

References :

1. Mala S, Rathod V, Pundir S, and Dixit S. Pattern self-repetition of fingerprints, lip prints, and palatal rugae among three generations of family: A forensic approach to identify family hierarchy. *J Forensic Dent Sci.* 2017 Jan-Apr; 9(1): 15–19. doi: 10.4103/jfo.jfds_115_15.
2. Mohammed R.B, Patil R.G, Pammi V.R, Sandya M.P, Kalyan S.V, and Anitha A. Rugoscopy: Human identification by computer-assisted photographic superimposition technique. *J Forensic Dent Sci.* 2013 Jul-Dec; 5(2): 90–95. doi: 10.4103/0975-1475.119771: 10.4103/0975-1475.119771.
3. Kaushal N and Kaushal P. Human Identification and Fingerprints: A Review. *J Biomet Biostat.* 2011, 2:4 DOI: 10.4172/2155-6180.1000123.
4. Solhi H, Hashemieh M, Dezfuli M.L, Khoddami H.R, Vishteh and Rahmati M. Diagnostic value of fingerprint patterns: An explorative study on beta-thalassemia diagnosis. *Bangladesh Med Res Counc Bull* 2010; 36: 27-31.
5. Dineshshankar J, Ganapathi N, Ragunathan T Y, Maheswaran T, Kumar S M, and Aravindhyan R. Lip prints: Role in forensic odontology. *J Pharm Bioallied Sci.* 2013 Jun; 5(Suppl 1): S95–S97. doi: 10.4103/0975-7406.113305: 10.4103/0975-7406.113305.
6. Pasiga B.D & Lestari Hardianti S L. Palatal Rugae Pattern Based on Lineage . <https://edupediapublications.org/journals> e-ISSN: 2348-6848 p-ISSN: 2348-795X Volume 04 Issue 13 October 2017. (accessed on 24.09.2021)
7. Abarnalingam, Desai D, Shubhalakshmi, Christopher G.S. Comparison of Lip Prints, Rugae Pattern and Tongue Prints among Karnataka, Kerala and Tamil Nadu Population – A Short Study. *International Journal of Innovative Science and Research Technology.* Volume 4, Issue 7, July – 2019. ISSN No:-2456-2165.
8. Thabitha R.S, Reddy R.E, Manjula M, Sreelakshmi N, Rajesh A, and Kumar V.L. Evaluation of palatal rugae pattern in establishing identification and sex determination in Nalgonda children. *J Forensic Dent Sci.* 2015 Sep-Dec; 7(3): 232–237. doi: 10.4103/0975-1475.172447: 10.4103/0975-1475.172447.