VI CONGRESSO NAZIONALE
III INTERNATIONAL CONGRESS

FUTURO E UMANIZZAZIONE DELLE CURE NELLA MEDICINA ORALE. L'INTELLIGENZA ARTIFICIALE AL SERVIZIO DELLA PERSONA ASSISTITA

PALATAL RUGAE EVALUATION FOR PERSONAL IDENTIFICATION: MANUAL vs AI

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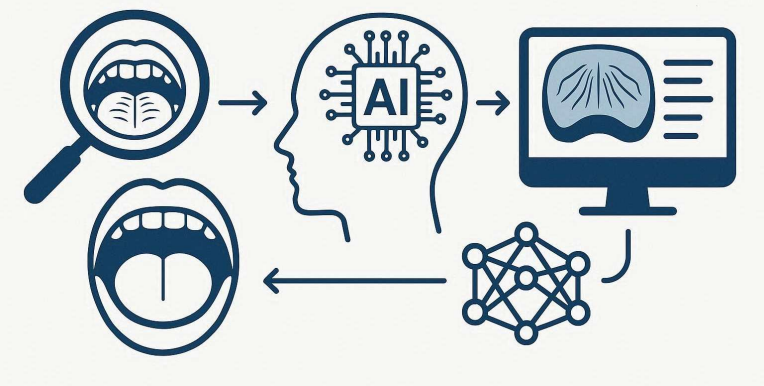
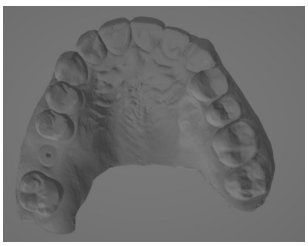


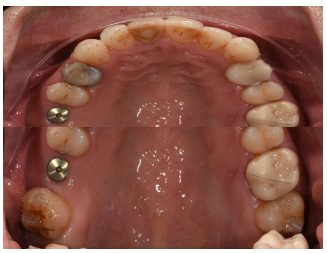
INTRODUCTION

Palatal rugae (PR) are asymmetrical and irregular mucosal elevations located in the anterior third of the palate. Due to their consistent and individualistic patterns, palatal rugae (PR) are used in forensic dentistry as an ancillary method for personal identification. The aim of this study was to evaluate the reliability of digital impressions of the PR compared with those obtained using alginate, and to determine whether significant differences exist between the two impression methods through the application of AI.

METHODS

Based on a previous study, we conducted this study using solely artificial intelligence, instead of an operator and landmark-based comparison software. In this study, 19 patients were enrolled. Two different impressions of the maxilla were obtained for each participant: a conventional impression using alginate impression material and a digital impression using an intraoral scanner. The impressions were compared with one another and with a clinical photograph of the palatal rugae of each patient, using the 'Google Gemini' platform (2.5 Flash version). For each patient, three sets of images (clinical palatal photograph, plaster model, and digital scan) were processed with artificial intelligence, which automatically superimposed, rotated, and aligned the images. Pairwise comparisons were then carried out for each patient (scanner vs. intraoral photograph; conventional impression vs. intraoral photograph) by prompting the system with: 'Could you tell how likely it is that the model shown belongs to the patient in the other picture? Output the likeliness of a match on a scale from 0 to 100%'. The artificial intelligence system performed the comparisons by analyzing tooth morphology, dental arch form, and palatal rugae as key parameters for feature matching.





RESULTS

For each comparison, percentage values were obtained. The mean value for the palate versus scanner comparison was 89.78, whereas the mean value for the palate versus plaster comparison was 87.58.

CONCLUSION

Both digital and traditional methods were found to be equally reliable in capturing palatal rugae patterns, in line with the previous study. The implementation of artificial intelligence markedly enhances both the accuracy and consistency of landmark identification in palatal rugae analysis. By automating the detection process, AI mitigates the impact of human error, yielding results that are more reliable and reproducible than those obtained through manual methods. This approach facilitates standardized assessments and significantly improves the overall precision of morphometric analyses. While further studies are warranted to assess the consistency and generalizability of these findings, AI, when properly trained by the operator using a structured and repeatable protocol, has the potential to substantially enhance performance, thereby proving highly valuable in both clinical and forensic contexts for human identification.

REFERENCES

Roselli L, Mele F, Suriano C, Santoro V, Catanesi R and Petruzzi M (2024) Palatal rugae assessment using plaster model and dental scan: a cross-sectional comparative analysis. Front. Oral. Health 5:1456377. doi: 10.3389/froh.2024.1456377

Funding: This research received no external funding.
Conflicts of Interest: The author declares no conflict of interest.