Letter to the Editor

Integrating Artificial Intelligence Into Orthodontic Education and Practice

Dear Editor,—Orthodontic treatment aims to correct dental malocclusion and improve oral health and aesthetics, but adverse effects like gingival recession and tooth mobility can occur. Predicting these issues is crucial for optimizing patient care.

The integration of advanced AI technologies into orthodontic education is crucial, as highlighted by the study on Dental Sleep Medicine Education in Thailand, which underscores the need for comprehensive educational frameworks.[1] Similar to DSME, AI-based approaches in orthodontic curricula could enhance clinical competencies.

AI-based multi-modal transformers can improve predictions of gingival recession and tooth mobility by integrating patient-specific factors and treatment outcomes.[2-5] These models analyse diverse data types, employing self-attention mechanisms to capture complex relationships within and between modalities, resulting in more precise predictions than traditional methods.

For instance, a study on severe periodontitis used a mixed-effects logistic regression model, achieving high accuracy with an AUC of 0.983. Similarly, machine learning models like Random Forest have been used for orthodontic diagnosis and treatment planning with high accuracy.[3] Another study developed a model to predict orthodontic treatment duration using pre-treatment variables, with significant predictors including extraction decisions and intermaxillary relationships.[4]

Despite their potential, integrating transformer models into clinical workflows presents challenges. Data quality, computational power and generalizability across patient populations are critical issues.[3,4] Additionally, integrating these models with clinical software requires ensuring interoperability and designing user-friendly interfaces for clinicians.[2,5] Ethical and legal considerations also warrant attention to prevent biases in predictions. Collaboration among data scientists, clinicians and regulatory bodies is essential to address these challenges.

In conclusion, AI-based multi-modal transformers show great potential in predicting gingival recession and tooth mobility during orthodontic treatment. Further research and integration into educational programs could revolutionize the field, enhancing precision and effectiveness in predicting adverse outcomes in high-risk individuals.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical approval

Not required.

Author contributions

The authors contributed to the conception, analysis, interpretation of data and drafting of the manuscript.

REFERENCES

1. Peanchitlertkajorn S, Chalidapongse P, Jiansuwannapas T, et al. Dental sleep medicine education amongst accredited orthodontic programmes in Thailand. Int Dent J 2024;74(3):573–80. doi: 10.1016/j.identj.2023.10.020.
2. Gunpinar S, Sevinc AS, Akgül Z, Tasmektepligilc AA, Gunpinar E. Patient-specific gingival recession system based on periodontal disease prediction. Int J Comput Dent 2023. doi: 10.3290/j.ijcd.b4784721.
3. Leavitt L, Volovic J, Steinhauer L, et al. Can we predict orthodontic extraction patterns by using machine learning? Orthod Craniofac Res 2023;26(4):552–9. doi: 10.1111/ocr.12641.
4. Prasad J, Mallikarjunaiah DR, Shetty A, Gandedkar N, Chikkamuniswamy AB, Shivashankar PC. Machine learning predictive model as clinical decision support system in orthodontic treatment planning. Dent J (Basel) 2022;11(1). doi: 10.3390/dj11010001.
5. Volovic J, Badirli S, Ahmad S, et al. A novel machine learning model for predicting orthodontic treatment duration. Diagnostics (Basel) 2023;13(17):2740. doi: 10.3390/diagnostics13172740.

Pradeep Kumar Yadalam
Raghavendra Vamsi Anegundi
Department of Periodontics, Saveetha Dental College and Hospital, Saveetha Institute of Medical and Technical Sciences, SIMATS, Saveetha University, Chennai, Tamil Nadu, India

Carlos M. Ardila*
Biomedical Stomatology Research Group, Universidad de Antioquia U de A, Medellín, Colombia

*Corresponding author. Calle 70 No. 52-21, Medellín 050010, Colombia
E-mail address: martin.ardila@udea.edu.co (C.M. Ardila).