2025 Research Aid Award
Dr. Mackenzie Stephens, Columbia University

Biography

Dr. Stephens is a postdoctoral orthodontic resident at Columbia University with a multidisciplinary background in biology, dental education, and clinical research. She earned her Bachelor's degree in Biology from Hofstra University and her DMD from Tufts University, where she developed a strong interest in educational research and public health. During dental school, she led a longitudinal study on students' adaptation to remote curricula and created a trauma-informed care module for third-year students, earning several research grants and honors, including election to Omicron Kappa Upsilon Honor Society, Tisch College Honos Civicus Society, TUSDM Research Honors Society, and the Everett Shapiro, DG49 Endowed Prize in Orthodontics for her graduating class. She also co-developed the "Dental Dictionary," a plain-language, patient-facing platform for improving health literacy. Currently, Dr. Stephens attends Columbia Orthodontics as Chief Resident. Her research at Columbia focuses on using ultrasound imaging to study bone remodeling in orthodontic patients, aiming to enhance diagnostic precision while minimizing radiation exposure. Her long-term goals include advancing equitable access to dental and orthodontic care through research, education, and innovation.

Description of the project

This study investigates the use of real-time ultrasound imaging to measure vertical alveolar bone changes during Invisalign treatment with a focus on tooth movements that are difficult to control. The primary aim is to correlate bone response with tooth movement to develop personalized treatment estimates, improve tooth tracking, and reduce the need for refinements.

Patients undergoing Invisalign therapy at Columbia University will receive ultrasound scans and iTero imaging at baseline and at 3-month intervals. The study will utilize superimposition analysis to measure changes in bone height and correlate them with actual tooth movement. By evaluating the predictability of these movements and the associated bone response, this research seeks to expand the range of cases treatable with clear aligners and contribute to the development of evidence-based treatment guidelines.

The study is designed as a prospective, observational clinical study. The use of non-invasive, radiation-free ultrasound offers a safe and effective means to monitor bone adaptation in real time, potentially enhancing treatment outcomes and efficiency in modern orthodontics.

Statement of how orthodontic education will benefit from your award

Orthodontic education stands to benefit significantly from this research award, as it supports the integration of emerging diagnostic technologies—specifically real-time ultrasound—into both clinical training and curriculum development. By incorporating a non-invasive, radiation-free method for monitoring bone changes during orthodontic treatment, educators can provide students with a deeper understanding of the biological response to tooth movement. The project offers a new perspective on difficult tooth movements such as anterior extrusion and rotations, and the findings can help shape evidence-based guidelines that students can apply in their own practice. Additionally, residents and students at Columbia University College of Dental Medicine will have the opportunity to engage directly in this research, enhancing their skills in data analysis, clinical imaging,

and treatment planning. Ultimately, this award promotes a more innovative, biologically driven approach to orthodontics that aligns with the evolving needs of patients and the profession.

4) Why the Foundation is important to your project

The Foundation's support is instrumental to the success of this project. This research involves novel applications of high-frequency ultrasound in orthodontics—technology that, while promising, requires financial investment for equipment, imaging software, and data analysis tools that are not typically covered by departmental budgets. The foundation's funding enables us to acquire these tools, conduct comprehensive patient monitoring, and support the personnel necessary to carry out the study. Beyond the financial support, the AAOF's recognition adds a level of credibility and visibility that helps in recruiting participants, fostering collaboration, and securing institutional support. This type of forward-thinking research—focused on personalized, non-invasive treatment enhancements—might not be feasible without the AAOF's commitment to advancing clinical orthodontic science.

5) How Foundation funding is expected to or has benefitted your career

Receiving this funding has already had a meaningful impact on my career trajectory. It has provided the opportunity to lead a research project that is not only clinically relevant but also innovative in its use of diagnostic technology. This experience has strengthened my skills in study design, data collection, and interdisciplinary collaboration, while also positioning me as a contributor to the growing body of evidence supporting biologically informed orthodontic care. The visibility and validation that come with AAO Foundation support have opened doors for mentorship, presentations, and potential publication opportunities—key elements for building a strong academic and clinical career in orthodontics. Looking forward, this project lays the groundwork for future research initiatives and contributes to my long-term goal of integrating cutting-edge imaging and personalized treatment strategies into mainstream orthodontic practice and education.