Biomedical Research Award

Dr. Kurt Kasper, *The University of Texas Health Science Center at Houston*

Dr. Kasper holds an appointment as Assistant Professor in the Department of Orthodontics at The University of Texas Health Science Center at Houston. He earned a doctorate in bioengineering from Rice University and a bachelor of science in biomedical engineering from Case Western Reserve University. His research applies fundamentals of engineering, materials science, and the biosciences toward the development and evaluation of biomaterial-based technologies to meet clinical needs. He has been recognized with a variety of honors, including the Young Investigator Award of the Society for Biomaterials and the Young Investigator Award of the North American Chapter of the Tissue Engineering and Regenerative Medicine International Society.

Advances in digital tools and 3D printing technologies associated with the fabrication of clear orthodontic aligners are driving an increased ease of use and a decreased cost. Accordingly, increasing numbers of orthodontists and orthodontic laboratories are engaging directly in the fabrication of clear aligners. In parallel, resins for 3D printing are beginning to emerge on the market that may be suitable for intraoral application and present the potential to enable the fabrication of clear aligners directly from digital files, eliminating the requirement to print the series of models and the thermoforming/trimming steps associated with the traditional workflow. However, a variety of tunable aspects of the 3D printing process present the potential to affect the dimensional accuracy of clear aligners fabricated directly via 3D printing. The objective of this project is to investigate the impact of key aspects of the 3D printing process on the dimensional accuracy of clear aligners fabricated directly via 3D printing to inform the application of appropriate conditions in clear aligner fabrication by the orthodontic community.

As increasing numbers of orthodontists acquire 3D printing technologies, it is important that resources are available to guide them in the selection of appropriate printing parameters to support the clinical utility of the printed parts. However, research to this end is not presently a high priority for funding through federal sources. Furthermore, companies engaged in the clear aligner space might choose not to disseminate findings of their research in the area. Accordingly, generous support of the project through The American Association of Orthodontists Foundation (AAOF) provides crucial resources for the completion of the research and the potential publication of the findings for the benefit of the profession.

In addition, the project will involve the participation of residents in the research, thereby enhancing their professional training during residency. The project will also enable acquisition of digital technologies to support continued investigation of 3D printing tools for applications in orthodontics through follow-up projects. The additional infrastructure will foster greater hands-on exposure of residents to applications of digital and 3D printing technologies in orthodontics. Moreover, the project will foster continued professional mentorship and exposure of Dr. Kasper to clinical orthodontics as he expands his research program at the exciting intersection of bioengineering and orthodontics.