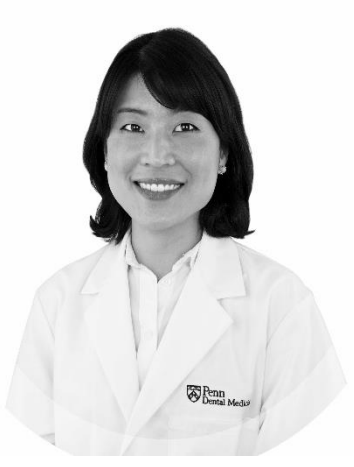
Biomedical Research Award

Dr. Hyeran Helen Jeon, *University of Pennsylvania*

Biography



Dr. Hyeran Helen Jeon is an Assistant Professor in the Department of Orthodontics at the University of Pennsylvania. Dr. Jeon has received her DDS at Pusan National University, Periodontics training and a MSD degree at Ewha Womans University, and Orthodontics training and a DScD degree at the University of Pennsylvania. Dr. Jeon is a Korean Board of Periodontology Board-certified periodontist (2008) and an American Board of Orthodontics Board-certified orthodontist (2014). Recently Dr. Jeon received her DMD at the University of Pennsylvania (2021). Her main research interests are (1) bone remodeling, (2) wound healing, (3) maxillary expansion using temporary anchorage devices (TADs), (4) clear aligner treatment, and (5) Artificial Intelligence (AI).

Project Description

Maxillary transverse deficiency is a common skeletal deformity of the craniofacial region with about 21% of children in the primary dentition. It leads to occlusal disharmony, facial asymmetry, and breathing problems. To address this, the maxillary expansion procedure has been used for more than 50 years, including the separation of two maxillae and allowing new bone to fill in the midpalatal suture area for about six months. Even though it has been one of the most common procedures in the orthodontic field, the underlying mechanisms of how the mechanical force converts into biochemical responses are largely unknown. Mesenchymal stem cells (MSCs) in the midpalatal suture have been suggested to proliferate and differentiate into osteoblasts when the suture is expanded. MSCs maintain craniofacial bone homeostasis and interact with osteoclasts and osteoblasts in bone remodeling. The Gli1+ cells within the suture mesenchyme are considered the main MSC population for craniofacial bones, whereas their ablation leads to craniosynostosis and arrest of skull growth, demonstrating the importance of these cells. The nuclear factor kappa B (NF-kB) is a central regulator of inflammation and bone homeostasis and controls cell proliferation, apoptosis, and differentiation. Interestingly, a recent study supports that the sterile inflammation-induced bone resorption must precede the anabolic response to tensile force during the maxillary expansion. We will test the possible mechanisms using the transgenic mice with a lineage-specific inhibition of NF-kB in MSCs.

Benefit to Orthodontic Education

While only limited information is available on the cellular and molecular events during maxillary expansion, the transgenic animal models described here will provide an opportunity to examine how MSCs respond to tensional force via NF-kB and clarify the cause-and-effect relationship. In addition, the findings of our study can affect the treatment of craniofacial syndrome patients, including distraction osteogenesis, bone remodeling, and tissue engineering.

Importance of AAOF funding

In 2019, 2020, and 2022 Dr. Jeon received the Orhan C. Tuncay Teaching Fellowship Award, the Willie and Earl Shepard Fellowship Award, and the Biomedical Research Awards from the AAOF. This funding has been used mainly for Dr. Jeon's research support, allowing her to produce the preliminary data for future extramural grant proposals. This generous funding from the AAOF will greatly help Dr. Jeon's academic and scientific growth.