AAO Foundation Award Final Report

Principal Investigator	Dr. Sarandeep S. Huja, Division of Orthodontics, University of Kentucky College of Dentistry
Co-Investigator	Dr. Richard Kryscio, Professor and Chair of Biostatistics in the College of Public Health at the University of Kentucky, Division of Biostatistics,
Secondary Investigators	Dr. W Eugene Roberts: Professor Emeritus at Indiana University. Dr. L. Scott Stephens: Chair and Engineering Alumni Professor Mechanical
Award Type	Biomedical Research Award
Project Title	Rigidity and Osseointegration of Implants Intended for Orthodontic Applications
Project Year	2012-13, NCE 2013-2014.
Institution	University of Kentucky
Summary/Abstract (250 word maximum)	Failure rate of miniscrew devices remains relatively high. It is generally accepted that the biologic adaptation of miniscrew implants is similar to rigid endosseous implants. However, newer clinical and recent histologic data suggest miniscrew implants, which are typically 1.5-2 mm in diameter are not rigid and displacement of miniscrews within the bone is common. The purpose of the study was to understand the role of device diameter on biologic response of bone in an environment with and without loading. Our **specific aims** were to determine the effect of device diameter on implant rigidity and osseointegration as measured by histomorphometric measurements. We selected a canine animal model in which we placed custom machined TiAlloy implants of 1.6,2,3 and 3.75 mm diameter in the maxilla and mandible bilaterally after dental extractions. Using a split mouth design, implants were inserted and loaded on one side of the jaw and remained undisturbed (no load) on the opposite side. At 12 weeks post-implant insertion, the animals were sacrificed and tissue including the implants obtained for histomorphometric analyses. The mean bone remodeling rate showed a trend for increase with larger diameter implants (range 28.0 to 40.9%/yr). Measurements of bone contact and rigidity are unavailable at this time.
Were the original, specific aims of the proposal realized?	Yes
Were the results published? If not, are there plans to publish? If not, why not?	Results will be published and 1-2 publications are likely. Results will likely have far reaching impact in newer extraalveolar implants for orthodontic and orthopedic applications of skeletal anchorage.

Have the results of this proposal been presented? If so, when and where? If not, are there plans to do so? If not, why not?	No analytical results have not be presented yet. Preliminary results were presented at the following meetings below. September 13, 2014 — Bone Anchors – Can You Hitch Up Your Wagon? COAST/FASEB Meeting, Itasca, IL September 06, 2013 — Biologic Innovations in Skeletal Anchors, Angle Society, Biennial Meeting, Vancouver, BC
To what extent have you used, or how do you intend to use, AAOF funding to further your career?	Current funding is very scarce, by having the support of the AAOF I can continue my research on Skeletal Anchorage and is of great benefit to my career and to the knowledge in orthodontics with translational benefits to our patients.

Failure rate of miniscrew devices remains relatively high. It is generally accepted that the biologic adaptation of miniscrew implants is similar to rigid endosseous implants. However, newer clinical and recent histologic data suggest miniscrew implants, which are typically 1.5-2 mm in diameter are not rigid and displacement of miniscrews within the bone is common. The purpose of the study was to understand the role of device diameter on biologic response of bone in an environment with and without loading. Our **specific aim** were to determine the effect of device diameter on implant rigidity and osseointegration as measured by histomorphometric measurements. We selected a canine animal model in which we placed custom machined TiAlloy implants of 1.6,2,3 and 3.75 mm diameter in the maxilla and mandible bilaterally after dental extractions. After healing, using a split mouth design, implants were inserted and loaded on one side of the jaw and heal undisturbed on the opposite side. At 12 weeks post-implant insertion, the animals were sacrificed and tissue including the implants obtained for histomorphometric analyses. The mean bone remodeling rate showed a trend for increase with larger diameter implants (range 28.0 to 40.9%/yr). Measurements of bone contact and rigidity are unavailable at this time.