Schulich Dentistry 2017/18 IRG (Internal Research Grant) Competition Results

Congratulations to Drs. Les Kalman and Ali Tassi, Clinician Scientists, who were each awarded a Schulich Dentistry IRG of $10,000 each.

Dr. Les Kalman, Assistant Professor, Restorative Dentistry and Coordinator, Dental Outreach Community Service (DOCS)

‘In vitro Testing and Validation of a 3D Printed Titanium Tempcap for Dental Abutment Systems’
Abstract: Dental implants are an important elective option for the replacement of a missing tooth or teeth. The abutment acts an interface between the implant and artificial tooth/teeth. A novel dental implant abutment has been developed and patented, called Tempcap. Although initial Tempcap testing showed promising results for its potential clinical use, the manufacturing of its design may be costlier with current manufacturing techniques, due to the small size and geometrical features within the design. This proposal presents a final design for the Tempcap, which has been optimized for additive manufacturing (AM) fabrication. The modified Tempcap was determined based on design parameters that were feasible for 3D printing, while still meeting the clinical requirements. The objectives of this investigation are: (1) to compare the maximum torques experienced during insertion of conventional and 3D-printed Tempcaps into dental implants and (2) to assess the mechanical stability and fatigue life of 3D-printed Tempcaps under cyclic compression loading. It is expected that the 3D printed Tempcaps will show similar or higher maximum insertion torques to the conventional Tempcap. When compared to the set 50 Ncm, the maximum insertion torques for 3D printed Tempcaps will fall within that clinical threshold. It is also expected that the fatigue life of the 3D printed Tempcap will be more than that of the conventional Tempcap, representing superior mechanical performance under cyclic loading. The funding requested from this IRG will support the testing and provide the necessary results required to verify and validate the 3D printed Tempcap for translation to clinical use.

Dr. Ali Tassi, Assistant Professor and Clinic Director - Graduate Orthodontics
Co-investigators: Drs. Roman Maev and Bartosz Slak (Windsor)

‘Ultrasonography in the Detection of Tooth Roots and Inter-radicular Spaces to Aid in the Insertion of Temporary Anchorage Devices for Orthodontics’
Abstract: Ultrasonography (US) has long been invaluable in various aspects of the medical field. It has been gaining ground and peaking interest as a diagnostic tool in dentistry as well. Thus far, most of the research has been surrounding soft tissues. There is reason to believe that US may also be beneficial as a diagnostic tool for hard oral tissues. Temporary Anchorage Devices (TADs) are used routinely in orthodontics for “anchorage” requirements and allow the orthodontist to successfully treat some patients that might otherwise require more invasive procedures like extractions and/or surgery. TADs, such as mini-screws and mini-implants, are usually placed between roots of teeth or in proximity to vital structures which is a very technique sensitive procedure requiring clinical judgement, skill and radiographs to assess proper placement locations. Improper placement can lead to injury to vital structures like nerves, periodontal ligaments/roots of teeth, and perforations into the maxillary sinus amongst others. Both clinical judgement and radiographs have some degree of error (abnormal tooth/root anatomy, overlapping roots, elongation/foreshortening etc.) not to mention the added exposure to ionizing radiation for the patient when radiographs are required. Ultrasonography is a safe, non-invasive, convenient diagnostic method that has the potential to detect the presence of dental roots in the maxilla and mandible as well as measure alveolar buccal cortical bone. Our collaborators at The Institute for Diagnostic Imaging Research (IDIR) – University of Windsor have developed a novel handheld US methodology that can be potentially used to do this. Once validated in model jaw bone, followed by biological samples of the jaws, this US device has the potential to improve the accuracy of placement of TADs in orthodontic patients making the procedure less technique sensitive for the clinician and safer for the patient. Determining the thickness of buccal cortical bone in a non-invasive, convenient manner would also be very useful in selecting ideal TAD insertion sites to improve their stability and clinical success.