RUSH

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Advancement of Medicine

In 2024 I became the director of basic research in the Department of Orthopedic Surgery. Thanks to the support of the endowed chair and this new role, I have supported my research efforts and the research efforts of others in my department. Endowment support has touched many translational research projects driven directly from clinical problems. The main efforts of the endowment have gone towards expanding a clinical and basic research partnership with **Adam Yanke, MD, PhD**, related to problems of the patellofemoral joint. The patellofemoral joint is the joint between the kneecap and the end of the thigh bone at the front of the knee. Problems of this joint include patellofemoral pain and instability. Patellofemoral pain occurs at the front of the knee joint; it often worsens when descending stairs, rising from a chair or sitting for extended periods of time. Patellofemoral instability occurs when the kneecap dislocates from the knee joint or moves in and out of the groove at the end of the thigh bone.

Some patients with problems of the patellofemoral joint may need a surgical intervention such as tibial tubercle osteotomy, or TTO. TTO is used to move the point of action of the quadriceps, or muscles at the front of the thigh, to reduce force through the kneecap or improve tracking within the groove. We are investigating the optimal position for TTO given complex patient anatomy using computer modeling. Computer modeling is ideal for this problem because a wide range of surgical simulations that would otherwise be impossible to test on the same patient can be tested. This year, a student on this project successfully defended her master's thesis. We submitted a proposal to the National Institutes of Health for funding for this study and to present our findings at international conferences, including the annual meetings of the Orthopaedic Research Society and the International Cartilage Regeneration and Joint Preservation Society.

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Research

This endowment has enabled me to continue research on the patellofemoral joint and made me competitive for NIH funding in this area. It also allowed me to hire a talented student while she worked on her master's degree in biomedical engineering, which she successfully defended in May. The endowment also partially supported five other faculty members and two department staff members.

Select Presentations

- **Lundberg HJ**, Heacock M, Rathjen J, Pourzal R, Levine BR, Gustafson JA. Relationship between Stem Taper Machining Line Height, Spacing, and Assembly Load for Total Hip Head-Neck Modular Junctions. International Society for Technology in Arthroplasty 2024 Annual Meeting, August 28-31, 2024, Nashville, Tennessee.

Publication Highlights

- Asher DP, Wright JL, Hall DJ, **Lundberg HJ**, Van Citters DW, Jacobs, JJ, Levine, BR, Pourzal, R. Is Wear Still a Concern in Total Knee Arthroplasty With Contemporary Conventional and Highly Crosslinked Polyethylene Tibial Inserts in the mid- to Long-Term? Arthroplasty Today, 2024, 30, 101550. https://doi.org/10.1016/j.artd.2024.101550
- Han S, Reddy KI, Lanfermeijer ND, Frangie, R, Ismaily SK, Gold, JE, **Lundberg, HJ**, Rodriguez-Quintana, D. Impact of Prophylactic Cerclage Location on Femoral Fracture Propagation: A Biomechanical Study. Journal of Orthopedic Trauma, 2024, 38(9), 491-496. https://doi.org/10.1097/BOT.0000000000002864
- Sun Y, Cheng K-Y, Kanniyappan H, Ramachandran RA, Neto MQ, McNallan M, Pourzal R, **Lundberg H**, Mathew MT. Fretting-corrosion Apparatus with Low Magnitude Micro-motion (≤5 µm) for Hip Implant Taper Junctions: Development and Preliminary Outcome. Journal of Bio- and Tribo-Corrosion, 2024, 10(2), 24. https://doi.org/10.1007/s40735-024-00826-4

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The Year Ahead: 2025 and Beyond

This coming year, we will resubmit grants for external funding of the patellofemoral joint project. I plan on continuing to support a student in broadening this work. New areas or research this coming year will be to link computer modeling to clinical data to ensure that our work represents what happens clinically.

With Gratitude

Thank you for giving me the opportunity to advance orthopedic science at Rush. It allows me to pursue innovative, exploratory research paths, with the goal of discovering novel therapeutic strategies in the treatment of joint disease.