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Restore

A Multidisciplinary Research Study on the Anterolateral Capsule of the Knee

Ata A. Rahnama-azar, MD, Sebastián Irrarrázaval, MD, Carola F. van Eck, MD, PhD, Volker Musahl, MD, Richard E. Debski, PhD, and Freddie H. Fu, MD

Anterior cruciate ligament (ACL) rupture is the most common ligamentous injury of the knee. Although ACL reconstruction is largely thought of as a successful procedure, up to 30% of patients continue to have some degree of rotatory instability of the knee after reconstructive surgery.

Over the last few years, other soft tissue structures, such as the anterolateral capsule of the knee, have been critically evaluated for their role as a secondary restraint to rotatory instability. The joint capsule of the knee consists of connective tissue that is attached to the distal femur and proximal tibia, forming a sleeve around the joint. The anterolateral structures of the knee were first discussed in 1879. Dr. Segond described the presence of a “pearly, resistant, fibrous band” at the anterolateral aspect of the knee. The so-called “Segond fracture” was defined as a bony avulsion of this band off the tibia and was found to be pathognomonic for an ACL injury.

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Freddie H. Fu, MD,
DSc (Hon), DPs (Hon)
Chairman



Anterolateral Capsule of the Knee *(Continued from Page 1)*

The recent resurgence of research focusing on one specific structure related to the anterolateral capsule of the knee — the anterolateral ligament (ALL) — has sparked debate and intrigue regarding its role in rotatory knee laxity. Despite numerous descriptions of the ALL in the literature, there is a lack of consensus regarding its prevalence, anatomical characteristics, and functional role in the treatment of patients with an ACL injury.

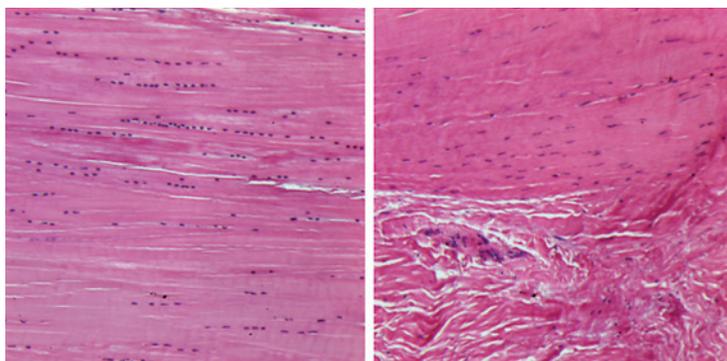


Figure 1. Histological evaluation of the lateral capsular thickening and lateral collateral ligament (LCL). Anterolateral capsule specimens (right) had poorly aligned collagen fibers and less organized cellularity compared to the LCL (left).

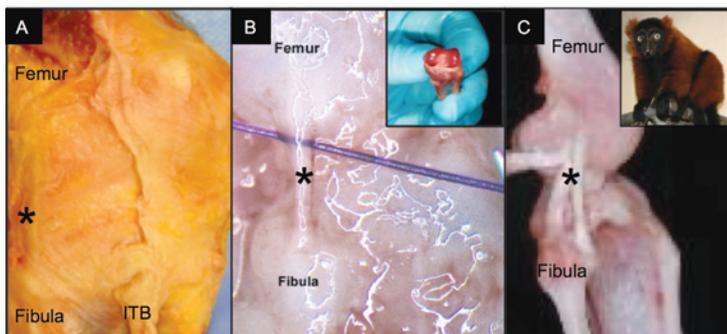


Figure 2. Representative photograph of comparative anatomical dissection of the anterolateral structures of the knee in adult human (A), 18-week-old human fetus (B), and Red Ruffed Lemur (C). No discrete ligamentous structure was observed consistently in either of the specimens. In Red Ruffed Lemur (C), the lateral collateral ligament (LCL) had two separate bundles with attachments to lateral epicondyle and fibula head but no anterolateral ligament was observed. The black star indicates LCL.

In order to improve patient care, the Department of Orthopaedic Surgery and the Orthopaedic Robotics Laboratory at the University of Pittsburgh conducted a multidisciplinary research study on the structure and function of the anterolateral capsule of the knee.

Forty-five human cadaveric knees (including eight fetal knees), 42 patients with an ACL injury, and 58 animal knee specimens (from 24 different species) were studied in a translational research project that was multifaceted and ranged from basic science to clinical care.

During macroscopic evaluation in cadaveric specimens, a capsular thickening of 2-4 mm was present in 30% of the specimens. This is much smaller than the size of the lateral collateral ligament (LCL). On histological examination, this capsular thickening did contain some parallel collagen fibers, but the overall organization of fibers was not homogenous enough to constitute a true ligament (Figure 1).

In knee specimens, magnetic resonance imaging (MRI) was performed before dissection and was repeated after placing vitamin E markers over the capsular thickening (if present) or along the path of the proposed ALL during the dissection procedure. The lateral capsule demonstrated great variability among specimens, ranging from a thin structure to a distinct capsular thickening.

To better understand the evolution of anterolateral structures through human development, eight fetal knees (age 18-22 weeks) were dissected utilizing a microscope (Figure 2). In five specimens, an ill-defined capsular thickening was distinguished in the anterolateral capsular region, with variable anatomical origin and insertion. The macroscopic anatomical investigation was complemented with an inter-species comparative study in which dissections on 58 cadaveric knees from 24 different animal species were performed (Figure 2). A discrete ALL was not identified in any of the specimens. However, interestingly, three primate species had an LCL, which contained two separate bundles. This is similar to observations in some humans (anterior oblique band of the LCL).

Anterolateral Capsule of the Knee

Biomechanical testing was performed on human cadaveric specimens to determine the structural properties of the anterolateral capsule. It was demonstrated that the anterolateral capsule had 50% less ultimate load (319.7 ± 212.6 N) and 100% less stiffness (26.0 ± 11.5 N/mm) when compared to the postero-medial capsule (425 ± 151 N, 56 ± 20 N/mm). Compared to the major ligaments of the knee, the anterolateral capsule showed a four times smaller stiffness, five times smaller ultimate load, and twice the final elongation. This suggests that this section does not possess the biomechanical properties of a true ligament.

A custom-made robotic manipulator (Technology Service Ltd., Model FRS2010, Chino, Japan) was then utilized to determine the contribution of the anterolateral capsule to rotatory knee laxity by manipulation of the joint during a simulated pivot shift test (Figure 3). It was demonstrated that the ACL was the main restraint to rotatory knee laxity, especially in low flexion angles where most in vivo activities and subsequent injuries are being observed. The anterolateral capsule and LCL both acted as a secondary stabilizer in the higher flexion angles, however, the contribution of the ALL was negligible.

These findings were supported by observations in clinical studies, as well. One of the unique features of the clinical study was utilization of a novel technology developed in the Department of Orthopaedic Surgery at the University of Pittsburgh to quantify the pivot shift test. This technology allows for an objective and more accurate recording of rotatory knee laxity during pivot shift testing. It was shown that ACL-injured patients with a combined injury to the anterolateral capsule (not ALL) demonstrated higher rotatory knee laxity during quantitative pivot shift testing compared to patients without anterolateral capsule injury (3.7 ± 1.5 mm vs. 2.7 ± 1.5 mm respectively, $p < 0.05$).

In order to avoid rotatory instability of the knee in patients following ACL reconstruction, the clinical question of additional extra-articular (anterolateral capsule) surgical reconstruction was raised. Therefore, the characteristics of additional reconstruction procedures were evaluated in biomechanical experiments. Extra-articular tenodesis using the iliotibial band was shown to be beneficial in restoring rotatory knee laxity, but only when a combined high-grade injury to anterolateral capsule was present in addition to an ACL tear. There was, however, a risk

of over-constraining the normal knee motion (internal rotation of $15.6^\circ \pm 5.4^\circ$ in the native knee vs. $8.6^\circ \pm 2.7^\circ$ after combined ACL reconstruction and extra-articular tenodesis). This further highlights that the decision to perform additional surgeries needs to be carefully made to minimize treatment-related complications and provide the best potential for a successful outcome for our patients.

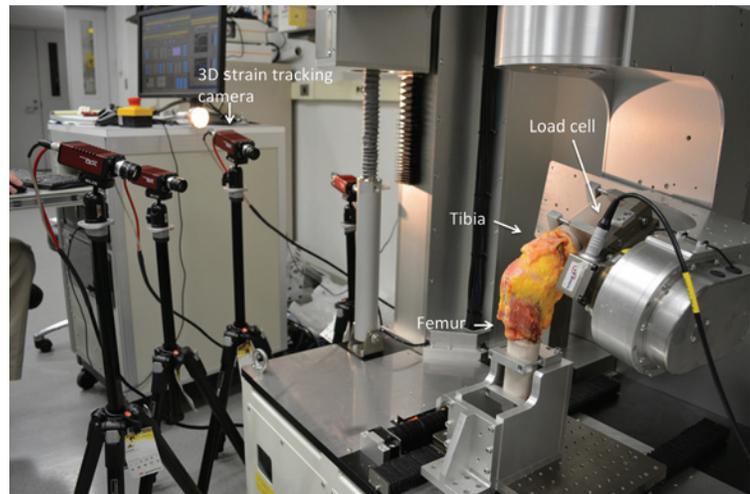


Figure 3. Test set-up for biomechanical evaluation of the joint using the robotic testing system (Technology Service Ltd., Model FRS2010, Chino, Japan). An optical tracking system was used to assess strain in the lateral capsule during different loading conditions.

In conclusion, based on the findings from our multidisciplinary research, the anterolateral capsule has a role as a secondary restraint to rotatory knee laxity. Our studies show that the anatomical, histological, and biomechanical properties fail to support that there is a discrete ligament in this region of the capsule. In addition, the current available extra-articular reconstruction techniques can improve rotational stability but potentially over-constrain the knee.

When treating patients with knee ligament injuries, *native anatomy is the principle* and should be restored to normal. The overall goal is returning patients back to full pre-injury function and at the same time preventing post-traumatic osteoarthritis. Future studies will be necessary to evaluate the healing potential of injuries to the anterolateral capsule of the knee and better define indications for additional reconstruction surgeries for patients.

Biofilms in Periprosthetic Joint Infections Are Persistent

Kenneth Urish, MD, PhD

Total knee arthroplasty (TKA) is one of the most common surgical procedures in the United States. It is one of the most common surgical procedures in the Medicare population, and it is estimated that almost 5% of the United States population over the age of 50 live with a TKA.¹

These results provide additional evidence for the important role of bacterial persisters in orthopaedic infection.

Infection is the most severe and common complication in TKA and is the leading cause for revision surgery (25%).² The financial impact is enormous, with revision procedures costing

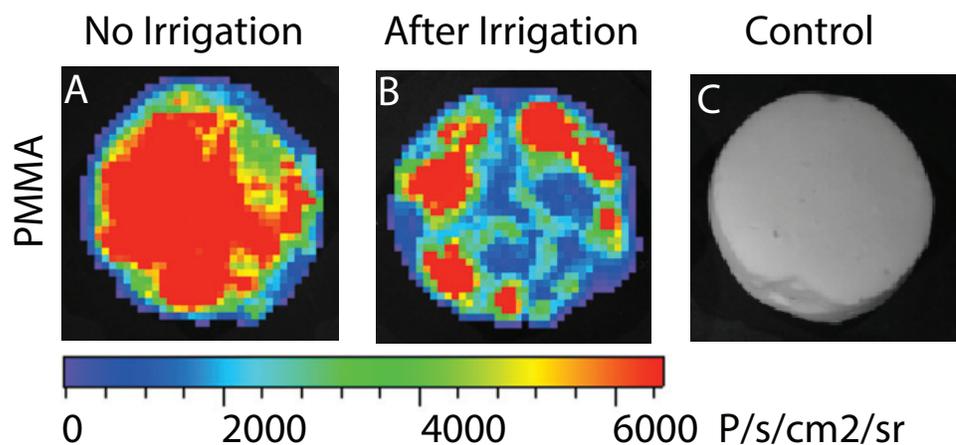
more than \$100k.³ Treatment is debilitating, requiring multiple surgical procedures and months of recovery. In the clinic, these episodes play out over the course of years. The problem is enormous.

Efforts to manage infection include irrigation, debridement, and component retention. Reported failure rates vary widely but are approximately 50%.⁴ These high failure rates are a result of a biofilm established in a short period after infection.

Biofilms are groups of bacteria embedded in a complex extracellular polymeric substance that is comprised of an extracellular polymer of polysaccharides, nucleic acids, and protein. The extracellular polymeric substance of the biofilm enhances bacterial adhesion and shields the bacteria from antibiotics. Additionally, the sessile state of bacteria in biofilm decreases metabolism, further decreasing the efficacy of antibiotics.⁵ Bacteria in a biofilm are not simply the same version of the bacteria growing in suspension adhered to a surface. The differences between the same bacteria in suspension (planktonic) and in a biofilm are enormous; bacteria in a biofilm are enormously more difficult to eradicate.

Irrigation and debridement are the first steps in clearing an infection. Although pulse lavage irrigation of TKA components removes a substantial mass of biofilm, a sufficient volume of biofilm remains to prevent eradication of infection. Our group has used direct visualization and quantification of the remaining biofilm to demonstrate pulse lavage irrigation debrides a large mass of biofilm from the surface of TKA materials, but a substantial mass of biofilm still remains (Figure 1).⁶

Figure 1. Pulse lavage irrigation is unable to remove biofilm from arthroplasty materials. The biofilm mass of *S. aureus* transfected with the luciferase gene can be measured using bioluminescence imaging. A strong biofilm signal remained on polymethyl methacrylate (PMMA) after 3 L of direct pulse lavage irrigation.



Biofilms in Periprosthetic Joint Infections

Biofilm behaves similarly to a highly viscous fluid. This allows the biofilm to flow over the surface of arthroplasty materials and remain adhered when high shear irrigation is applied without being removed.⁷

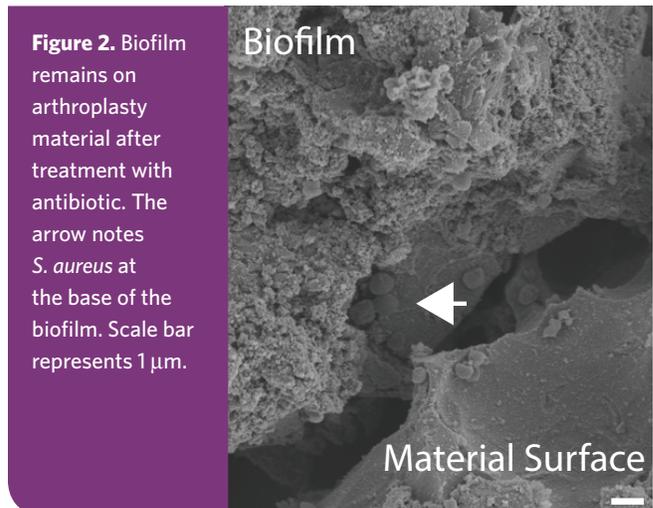
The second critical component of irrigation, debridement, and component retention is treatment with antibiotics. Biofilm has a high tolerance to antibiotics. *Staphylococcus aureus* biofilm cultured on TKA materials remains surprisingly tolerant to antibiotics (Figure 2). After doses above a typical clinical value, no further increase in bacterial death will be observed. Surprisingly, even after 24 hours in supratherapeutic levels, antibiotics were unable to eliminate the biofilm beyond one order of magnitude.

These results provide additional evidence for the important role of bacterial persisters in orthopaedic infection. Bacterial persisters comprise a subpopulation of bacteria that become highly tolerant to antibiotics and reach this state without undergoing genetic change.

Persisters are thought to be less sensitive to antibiotics since the cells are not undergoing cellular activities that antibiotics can corrupt, resulting in tolerance to the antibiotics (i.e., no growth and slow death). In contrast, resistance mechanisms arise from genetic changes that block antibiotic activity. In the presence of antibiotics, resistant bacteria cells grow, whereas persister cells do not grow, they become dormant.⁸

Conclusions

Understanding persister formation is important in order to derive strategies for controlling bacterial infections. Our laboratory is investigating the role of bacterial persisters and biofilm antibiotic tolerance in orthopaedic infection. We have used in vitro and in vivo models to demonstrate biofilm dynamics in arthroplasty infection. Early clinical studies and a biospecimen registry have allowed us to have an increased understanding behind the difficulty in eradicating orthopaedic infection and develop new treatment strategies. Currently, there are two new antibiotic candidates in pre-clinical development that have demonstrated an ability to eliminate persisters, a feat not possible with current clinically available antibiotics. This work is supported by an NIH KL2 grant. New treatment strategies that completely eliminate biofilm will be an important step in improving results in the treatment of orthopaedic infection.



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The Dancer Athlete: The Field of Dance Medicine and Science

Valerie Williams, PT, DPT, OCS

Kathleen Nachazel, ATC

Erica Coffey, PT, MS, SCS

Dance differentiates itself as a performing art in that it requires great artistic ability in addition to difficult physical requirements comparable to sports. There are specific techniques and standard movements, as well as expressive and creative qualities and requirements. The necessity to excel both physically and artistically creates the challenging context in which dancers work. For many dancers, dance is their passion and artistic outlet, and vocation. Because of the highly artistic and physically demanding requirements, dancers are a unique type of athlete and are accurately referred to as performing athletes.¹ In the field of dance there are multiple genres, which generally include ballet, modern, and jazz. Dancers often begin training at a young age and progress through training in dance schools until the end of adolescence. If young dancers are especially talented, they may wish to further pursue their career by auditioning for a professional company or collegiate program.

Injuries are a problem for the dancer beginning at a young age, with 43.1% of dancers aged 10 to 18 becoming injured.² Collegiate dancers have self-reported injury rates ranging from 67% to 77% each semester. Annual injury frequencies in professional ballet and modern dancers have been reported to range from 67% to 95%.³⁻⁸ The most commonly injured locations are similar across studies on many types and levels of dancers. They include the foot and ankle, lower leg, lower back, hip, and thigh, followed by the rest of the spine and upper extremities.⁹ The injury types and severity of injuries are similar in professional dancers, with the most common types of injuries being overuse injuries that do not often involve full cessation of dance activities, including class, rehearsal, and performance.^{3,7,8,10} Traumatic injuries are less common, however, they are very costly.^{4,6} The high rates of musculoskeletal injuries and associated monetary, physical, and psychological costs of injury have led to the emergence of dance medicine and science in the field of sports medicine, with the goal of keeping dancers healthy and injury free.⁹

(left) **Pittsburgh Ballet Theater (PBT) performance of *Petite Mort*.** Artists of the Pittsburgh Ballet Theater.

(right) **PBT Studio Rehearsal.** Artists of the Pittsburgh Ballet Theater.

Photos courtesy of Pittsburgh Ballet Theater.



Here in the Pittsburgh area, we experience these same issues while trying to mitigate injuries in dancers. UPMC Sports Medicine has an affiliation, founded by Freddie Fu, MD, with Pittsburgh Ballet Theater (PBT) and School. The medical team is currently lead by Vonda Wright, MD, with MaCalus Hogan, MD, providing foot and ankle expertise. Kathleen Nachazel, ATC, is the certified athletic trainer, and Erica Coffey, PT, MS, SCS, is the head physical therapist. Also part of the team are therapists Catherine Hagan Vargo, PT, DPT, OCS, SCS, and Valerie Williams, PT, DPT, OCS. The team is able to provide onsite care every day and allows dancers key early access to medical, surgical, and rehabilitative evaluation and treatments. The medical team for PBT also coordinates a pre-season and new hire screening program in participation with the Dance/USA Task Force on Dancer Health. During the PBT School summer intensive program screenings, injury prevention lectures and weekly injury clinics also are provided.

Valerie Williams also is conducting dance research at the University of Pittsburgh Department of Sports Medicine and Nutrition as part of completing her PhD. The goal of this research is to investigate the reliability of both clinical and laboratory-based movement assessment tools, and to investigate the physical characteristics of professional and collegiate-level dancers to better understand their potential relationship to injuries.

Pittsburgh has a thriving dance community with multiple dance schools for young aspiring dancers, and collegiate dance programs at Point Park and Slippery Rock Universities and La Roche College. There are other professional dance companies, including Texture Contemporary Ballet, Bodiography Contemporary Ballet, Attack Theatre, and Dance Alloy, to name a few. Pittsburgh's growing cultural scene also has provided more opportunity for independent and freelance dancers to develop and showcase their work throughout the year. UPMC Sports Medicine and UPMC Centers for Rehab Services have affiliations with several dance organizations, and dancers are treated at multiple sites throughout our network. While many sites and dancers are lucky to work with dance specialists, not everyone has this knowledge or access. For those who may find themselves inexperienced in dance medicine but have a patient who is a dancer athlete, a little bit of knowledge in the field goes a long way.



Attendees at the Pittsburgh Dance Symposium, November 1985.

Seated (left to right) Lori Falk, Patricia Wilde, Susan Hunt, MD

Second Row (left to right) John A. Bergfeld, MD, William Hamilton, James Cosgrove, Jack Tomanco

Back Row (left to right) Michael Seel, MD, Steve Sheskie, MD, Freddie H. Fu, MD, Matt Putnam



Valerie Williams, PT, DPT, OCS, and Pittsburgh Ballet Theater Artist.

The Dancer Athlete

To learn more about dance medicine, there are several very helpful organizations that can provide information as well as resources that you can share with your dancer patients:

- International Association for Dance Medicine and Science Resource Papers: <http://www.iadms.org/?page=186>
- Harkness Center for Dance Injuries Hospital for Joint Diseases at the NYU Langone Medical Center page: <http://www.med.nyu.edu/hjd/harkness/education>
- Dance/USA Task Force on Dancer Health: <https://www.danceusa.org/dancerhealth>
- Dance UK, Healthier Dancer Programme: <http://www.danceuk.org/healthier-dancer-programme/>



PBT Pilates Studio. Photo courtesy of Pittsburgh Ballet Theater.

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UPMC VIDEO ROUNDS / GRAND ROUNDS

Video Rounds is a series of informative and educational short videos created for physicians and covering a variety of medical and surgical disciplines, including:

Advances in Hip Arthroscopy

Presented by **Dharmesh Vyas, MD**

Hip injuries are often debilitating for both recreational and professional athletes. Traditionally, these injuries have been under-diagnosed or misdiagnosed largely due to operative complications and the elevated risk of open hip surgery. Hip arthroscopy is a newer and less invasive option, and is the most rapidly growing field within orthopaedic surgery.

Finding the Point of Isometry in Elbow Reconstruction

Presented by **Robert A. Kaufmann, MD**

Elbow trauma often leads to instability, which can have a detrimental effect on joint function and may also lead to

arthritis. However, ligament repair and reconstruction efforts can successfully restore necessary stability. Proper knowledge of the center line of elbow rotation is imperative, and placement of the repaired or reconstructed ligament at the point of isometric motion will ensure a durable surgical outcome.

UPMC Orthopaedic Surgery Grand Rounds Fall 2015

Anatomy Preservation in the Active Elderly After Upper Extremity Fragility Fracture

To view this issue of *Ortho Grand Rounds*, and the slide presentations, please visit UPMCPhysicianResources.com/Ortho.





UPMC Lemieux Sports Complex Opens in Cranberry

UPMC and the Pittsburgh Penguins® celebrated the opening of the UPMC Lemieux Sports Complex in Cranberry Township in August 2015. An elite, first-of-its-kind facility, the Complex is dedicated to hockey-related training, rehabilitation, and injury prevention, and unites world-class sports medicine and hockey under one roof.

Built on a 12-acre site, the 185,000-square-foot facility is the new practice facility for the Pittsburgh Penguins and is also a comprehensive outpatient facility for UPMC Sports Medicine, with 54,000 square feet dedicated to orthopaedic, physical therapy, concussion, imaging, and sports performance services. The space houses 24 orthopaedic exam rooms, 12 physical therapy exam rooms adjoining a UPMC Centers for Rehab Services gym overlooking the practice rink, 50-plus sports medicine experts, two x-rays, an MRI, and a concussion clinic. The Department of Orthopaedic Surgery plays a major role in providing the coordination of clinical services by sports medicine experts, including **Vonda Wright, MD**, medical director of the UPMC Lemieux Sports Complex, **Dharmesh Vyas, MD, PhD**, head team physician for the Pittsburgh Penguins, **Melissa McLane, DO**, assistant team physician for the Pittsburgh Penguins, **Michael Collins, PhD**, director, UPMC Sports Medicine Concussion Program, **Kelley Anderson, DO**, primary care sports medicine, and other sports medicine experts. The Complex continues the model started with the UPMC Center for Sports Medicine, treating, rehabilitating, and training athletes of all ages and skill levels, as well as nonathletes.

Traveling Fellows Hosted in Pittsburgh

The Department of Orthopaedic Surgery hosted the visit of the **2015 JOA-AOA Traveling Fellows**. The 2015 JOA-AOA Fellows are Jun Nishio, MD (Fukuoka University Faculty of Medicine), Kanji Mori, MD (Shiga University of Medical Science), Takayuki Furumatsu, MD (Okayama University), Tomoki Nakamura, MD (Mie University Faculty of Medicine), Koichi Ogura, MD (National Cancer Center Hospital, Tokyo), and Sumihisa Orita, MD (Chiba University Hospital). During their visit to Pittsburgh, the Fellows observed surgeries and received tours of research laboratories and other facilities within the department. The JOA Traveling Fellowship is sponsored in collaboration with the AOA.

The department hosted the visit of the combined **ESSKA and SLARD Traveling Fellows**. The 2015 ESSKA Traveling Fellows were João Espregueira-Mendes, MD, PhD (Portugal) [Godfather], Sebastian Kofp, MD (Germany), Nicolas Pujol, MD (France), and Christiaan van Bergen, MD, PhD (the Netherlands). The 2015 SLARD Traveling Fellows were David Figueroa, MD (Chile) [Godfather], Gustavo Goncalves Arliani, MD (Brazil), Paula Sarmiento Riveros, MD (Columbia), and Federico Spikermann, MD (Argentina). During their visit, our guests observed surgical cases with Dr. Freddie Fu, received tours of research laboratories and other facilities within the department, and participated in a special presentation.

Promotions

Vonda Wright, MD, was promoted to associate professor of orthopaedic surgery. Dr. Wright is medical director of the UPMC Mario Lemieux Sports Complex.

New Faculty

Bryson Lesniak, MD, joined the Division of Sports Medicine as an associate professor. Born in Pittsburgh, Dr. Lesniak received his medical degree in 2003 from the University of Cincinnati College of Medicine and received his residency training at the University of Michigan, graduating in 2008. He completed his sports fellowship at UPMC.

Ozgur Dede, MD, joined the Division of Pediatric Orthopaedic Surgery as an assistant professor. Dr. Dede received his medical degree in 2001 and completed his residency training in 2010, both at Hacettepe University in Ankara, Turkey. He was also a research fellow in our department from 2005-07. He completed clinical fellowships at the University of California, San Francisco, in spine surgery; Nemours/Alfred I. duPont Hospital for Children in Delaware in pediatric orthopaedic surgery; UPMC Presbyterian in pediatric orthopaedic surgery; and Cincinnati Children's Hospital Medical Center in adult and pediatric orthopaedic surgery.

Hang Lin, PhD, was appointed research instructor in the Department of Orthopaedic Surgery. Dr. Lin previously served as a postdoctoral fellow in the Center for Cellular and Molecular Engineering (CCME) under the directorship of Rocky S. Tuan, PhD.

Hongshuai Li, MD, PhD, was appointed research associate in the Division of Musculoskeletal Research. Dr. Li was a postdoctoral associate in the Stem Cell Research Laboratory and was mentored by Dr. Johnny Huard. Upon Dr. Huard's departure, Dr. Li was promoted to assistant professor of Orthopaedic Surgery in the Division of Musculoskeletal Research.

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In Memoriam

Dr. Tanya Hagen, assistant professor of orthopaedic surgery, passed away unexpectedly on June 11, 2015. A graduate of our primary care sports medicine fellowship, Dr. Hagen paved the way as our first female primary care sports medicine physician, joining the faculty of UPMC Sports

Medicine in 2002. She was an integral part of an exceptional and diverse group of women who were unique in the sports medicine discipline in North America.

As a physician, Tanya was dedicated, hard working, and talented. She was loved by her patients, not only for her ability to diagnose and manage their conditions, but also because of her compassion. Tanya served as the head team physician for the Pittsburgh

Passion Professional Women's Football Team. She also was head team physician for all of Robert Morris University Athletics, team physician for Mt. Lebanon High School, and had provided care for professional, collegiate, and high school teams and athletic groups in Pittsburgh. She also was involved in Olympic sports, the Special Olympics, and professional tennis. Just as she was adored and respected by her clinic patients, the same was true with the athletes, coaches, and athletic trainers with whom she worked.

Dr. Hagen was an incredible mentor and educator to students, residents, and fellows. In addition to teaching others, she was a dedicated student herself. She was always determined to keep up to date about current research in orthopaedics and sports medicine.

Tanya was friendly, fun, and had an infectious personality. Her sunny disposition brought warmth to everyone around her. She was an exceptional employee, colleague, physician, and friend. We will miss her dearly.

Thomas Lozito, PhD, was appointed research associate. Previously, Dr. Lozito worked as a postdoctoral associate in the Center for Cellular and Molecular Engineering and is being mentored by Rocky Tuan, PhD.

Mark Sakr, DO, joined the Division of Sports Medicine as an assistant professor. Dr. Sakr received his doctor of osteopathic medicine degree from the Arizona College of Osteopathic Medicine in 2008. He completed his family practice residency at Duke University Medical Center in 2011, followed by a primary care sports medicine fellowship at the University of North Carolina Hospitals in 2011.

Haruyo Yagi, PhD, was appointed research associate in the Center for Cellular and Molecular Engineering (CCME). Previously, Dr. Yagi worked as a postdoctoral associate in the CCME under the directorship of Rocky S. Tuan, PhD.

Faculty Notes

Freddie H. Fu, MD, presented the 2015 Sir Robert Jones Lecture at the 2015 Scientific Program of the Alumni Association at NYU School of Medicine in May 2015. Dr. Fu presented "30 Years of ACL Surgery:

What I Have Learned." The annual Sir Robert Jones Lecture, first delivered at the Hospital for Joint Diseases Orthopaedic Institute in 1930, continues the tradition of excellence in orthopaedics through the work of distinguished contemporary scholars and also honors the achievements of Sir Robert Jones. The papers presented were a combination of clinical experiences and results, as well as basic science research that involves anatomical, biomechanical, and animal research. This year's lectures are devoted to transitions and transformations in ACL reconstruction surgery and current strategies to lower risk for infection, contamination, and surgical complications.

Freddie Fu, MD, was invited to join the Pennsylvania Department of Health Advisory Health Board. The invitation was extended on behalf of Governor Tom Wolf, Secretary Ted Dallas from the Department of Human Services, and Secretary Karen Murphy from the Department of Health. The Advisory Board meets with the governor quarterly to discuss health-care related issues.

MaCalus Hogan, MD, was selected by the AAOS to serve on the Mastery Model for Education Initiative. The Academy is seeking representation from all anatomical and domain areas to gain a clear vision

of the knowledge, skills, and behaviors throughout the profession. Participants will create a Mastery Model of the critical duties and tasks of an orthopaedic surgeon. This model will help meet the educational needs of Academy membership throughout an orthopaedic surgeon's career.

Awards

The UPMC Sports Medicine Concussion Program (**Michael Collins, PhD**, research director, and **Anthony Kontos, PhD**, assistant research director) was selected as a Phase II site for the GE/NFL Head Health Initiative Clinical Studies. The goal of GE/NFL Head Health Initiative Clinical Studies is to improve the clinical understanding and knowledge of traumatic brain injuries and to develop tools that improve the assessment, treatment, and therapy management of traumatic brain injury patients.

Michael Collins, PhD, and **Anthony Kontos, PhD**, were awarded a Department of Defense grant under the United States Army Medical Research and Materiel Command (USAMRMC) Psychological Health/Traumatic Brain Injury (PH-TBI) Joint Program Committee 6 (JPC-6) for the project titled "Targeted Evaluation,

Action, and Monitoring of TBI (TEAM-TBI).” The total award for this project is \$275,000 over two years.

Andrew Evans, MD, assistant professor, has received two sub-agreements to Johns Hopkins University for a project entitled “The Major Extremity Trauma Research Consortium,” funded by United States Army Medical Research Acquisition Activity for \$264,209 through September 2016.

The Ferguson Laboratory for Orthopaedic and Spine Research was selected as a winner of the Pitt Innovation Challenge and received a \$100,000 award. The interACTION portable rehabilitation system was developed out of the Ferguson Laboratory by a team of clinicians and scientists from the Department of Bioengineering, Department of Orthopaedic Surgery, and the UPMC Centers for Rehab Services.

MaCalus Hogan, MD, was selected as an honoree for the 2015 Inaugural Edition of *Who's Who in Black Pittsburgh* and will be featured in the Medical Professionals section.

James Irrgang, PhD, was presented with the Paris Distinguished Service Award at the American Physical Therapy Association Combined Sections Meeting in Indianapolis, Indiana. The award honors an Orthopaedic Section Member whose contributions are of

exceptional and enduring value, and it provides an opportunity for the recipient to share achievements and ideas with the membership through a lecture presented at the meeting. Dr. Irrgang presented “Innovations and Implementation Strategies for Assessing and Improving the Value of Care Provided by the Physical Therapists.”

Stephen A. Mendelson, MD, received the Golden Apple Award during Resident/Fellow Graduation for the most outstanding contribution to resident education. Dr. Mendelson is an assistant professor in the Division of Pediatric Orthopaedics.

Volker Musahl, MD, was selected to receive funding by the UPP Foundation Committee for his proposal “Enhancement of Rotator Cuff Repair.” The Foundation will provide one year of funding at \$50,000 in support of this project. The UPP Foundation received 90 highly competitive proposals for consideration.

Ivan Tarkin, MD, was named a winner of the 2015 UPMC Award for Commitment and Excellence in Service (ACES) award. The ACES award honors the most outstanding employees whose commitment to service exceeds the UPMC standard. ACES winners are nominated by their peers and are awarded to less than 1 percent of UPMC staff across the health system.

Scott Tashman, PhD, received notice of award funding from the NIH Small Business Innovation Research Program (SBIR) to conduct Phase II of a research study with C-Motion, Inc. The project, Software for Improved Accuracy and Rapid Tracking from Dynamic X-Ray, has been awarded a two-year, \$955,000 grant, with a \$280,000 subcontract to the University of Pittsburgh.

Rocky Tuan, PhD, received a National Institutes of Health R01 grant award for “Cholesterol Sensitivity and Mechanisms of MSC Responses to 3D Substrate Rigidity” for \$1,339,139 over four years.

Rocky Tuan, PhD, received two Department of Defense grant awards for “Cell-Based Meniscal Repair Using an Aligned Bioactive Nanofibrous Sheath” for \$308,000 over one-and-a-half years; and “Adult Stem Cell-Based Enhancement of Nerve Conduit for Peripheral Nerve Repair” for \$1,557,090 over three years.

Ken Urish, MD, PhD, was selected for appointment to the University of Pittsburgh Clinical and Translational Science Institute (CTSI) KL2 career development award, the Multidisciplinary Clinical Research Scholars program (CRSP).

Concussion Experts Gather to Discuss Best Treatment and Practices

On October 15 and 16, 2015, UPMC hosted a conference of the leading concussion clinicians and researchers from across the country. The goal of the meeting was to propose standard guidelines on the best practices, protocols, and active therapies for treating concussions today, resulting in a white paper to be published in a medical journal and shared nationwide. The white paper is intended to make scientific, clinical, and therapy recommendations for other health care providers to replicate and researchers to study further.

For the first time, U.S. experts came together to discuss what UPMC organizers call Targeted Evaluation and Active

Management (TEAM) Approaches to Treating Concussion. Representatives from the National Institutes of Health and the U.S. Department of Defense, among others, participated.

UPMC received support to host this meeting because it is aligned with Pittsburgh’s long-standing place at the center of the field: the first sports-medicine concussion program to open its doors (2000), a leading institution in concussion research and innovation, and a model clinic with successful assessment, treatment, and outcomes of nearly 18,000 concussion-patient visits yearly.

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