Framework

Johns Hopkins Orthopaedic Surgery

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Spring 2018

Surgeon Expands Patellofemoral Research, **Women's Sports Medicine**

Miho Tanaka established a network of medical professionals to spark an international conversation regarding women's sports medicine. Here, Tanaka cares for Amy Lupcho.

Miho Tanaka understands the complexities of multifaceted treatment needed to keep women athletes in the game. A former varsity track and field athlete at Stanford University, she is now an assistant professor of orthopaedic surgery and director of the Women's Sports Medicine Program at The Johns Hopkins Hospital.

Inspired by **Andrew Cosgarea**, her mentor and colleague in orthopaedic surgery who taught her the value of multidisciplinary collaboration, Tanaka has broadened the field of knowledge in patellofemoral research and established a unique network of medical professionals to spark cultural exchange across continents regarding women's sports medicine.

Tanaka's award-winning work has contributed to the advancement of anatomic knowledge of the medial patellofemoral complex (MPFC), which many surgeons refer to as the medial patellofemoral ligament. Tanaka and her co-author, John Fulkerson, a leader in patellofemoral surgery, coined MPFC as a more accurate term reflecting the variability in anatomic attachment points.

> "The traveling fellowship taught me the importance of academic cross-cultural exchange, so I am hoping to generate interest in gender research and expand the model of our program for female athletes to an international level."
> –Miho Tanaka

"Using a digital overlay technique, we identified a reproducible anatomic reference point at the superomedial articular border of the patella," explains Tanaka. This midpoint is more proximal than the commonly used fixation site in surgical reconstruction. Tanaka's goals are to show that re-creating this anatomy may lead to improved patellar kinematics and patient function, and to make surgeons aware of the complications that can occur during patellar stabilization surgery, which range from patellar fractures to increased arthrosis.

"Our goal as surgeons is to re-create the anatomy, and our understanding of the anatomy continues to evolve," says Tanaka. Her work with Cosgarea includes generating new data using a dynamic computed tomography (CT) machine. There are only two such devices in North America, and one is at Johns Hopkins.

"The beauty of this machine," says Tanaka, "is that you can bend the knee and watch the tracking of the patella, because it is when the knee is in motion that dislocation happens." Tanaka and Cosgarea recently described a classification system for dynamic CT tracking to predict the presence of symptoms, thereby laying the groundwork as technology for dynamic CT becomes more widely available.

At Johns Hopkins, Tanaka designed the model for the Women's Sports Medicine Program that includes areas not traditionally associated with women's sports, such as nutrition and pregnancy. "I see a lot of women athletes who are seeking second opinions and who have been told that they should stop being active," Tanaka says.

To bridge the disparities in treatment, Tanaka brought together specialists from nine divisions and departments at Hopkins, including faculty from obstetrics and endocrinology, and specialists in concussions and eating disorders. The program acknowledges the connections between issues such as nutrition, performance and healing.

Recently, Tanaka was invited back to Kobe, Japan, where she toured during her American Orthopaedic Society for Sports Medicine traveling fellowship, to conduct Grand Rounds on women's sports medicine. "Asian countries do not have many female orthopaedic surgeons or women's sports programs," says Tanaka. "The traveling fellowship taught me the importance of academic cross-cultural exchange, so I am hoping to generate interest in gender research and expand the model of our program for female athletes to an international level." ■

THE **WOMEN'S SPORTS MEDICINE** PROGRAM INCLUDES:

- Sports medicine surgery
- Primary care sports medicine
- Hand, shoulder and elbow surgery
- Foot and ankle surgery
- Concussion management
- Eating disorders and nutrition
- Internal medicine
- Obstetrics
- Musculoskeletal radiology
- Physical therapy

After Returning for Orthopaedic Care, Hopkins 'Family Member' **Gives Back to Research**

When Lynne Miller describes Johns Hopkins as "our go-to place for anything other than the common cold," she is only half-joking. Although she no longer lives in Baltimore, she considers Johns Hopkins the best choice for expert care. Perhaps this is unsurprising for the wife of Dr. Edward Miller, former dean of the Johns Hopkins University School of Medicine and CEO of Johns Hopkins Medicine. For years, Lynne supported his work, which advanced the campus and operations of one of the world's premier medical institutions. She and her husband were truly part of the Johns Hopkins "family," and although her loyalty to Johns Hopkins was inspired by this work, it recently became more personal.

In 2016, Lynne discovered a mass in her thigh that seemed to appear overnight. Her local internist diagnosed a lipoma—a benign fat deposit. Several months later, though, while seeing another doctor, she asked for a second opinion. "He did not like the way it felt," Lynne says. He ordered an MRI, and Lynne asked to have results sent to **Carol Morris**, division chief of orthopaedic oncology at Johns Hopkins.

On Dec. 22, while Lynne was preparing a holiday dinner for her family, she received a call from Morris. "She had reviewed the MRI, and she was concerned," says Lynne. "She thought it might be a sarcoma and said the mass needed to be evaluated right away." There was one obstacle to that, however. In a few days, Lynne and her husband were taking 13 family members on a long-anticipated vacation to the Virgin Islands. Morris felt this was reasonable but urged her to seek care immediately after the trip. Soon, Lynne was in Morris's clinic for an exam. The next day, Morris performed a biopsy, and the results confirmed a sarcoma. The mass was leiomyosarcoma. "Of course, I was terrified," says Lynne.

Fortunately, a CT scan showed that Lynne's lungs were clear. She was quickly scheduled for surgery so Morris could remove the mass. A biopsy of the surrounding tissues showed no remaining cancer, and after several days in the hospital, Lynne returned home. However, Morris had cautioned her that healing can be difficult, and indeed, several weeks later Lynne had to return to Johns Hopkins for an additional surgery to treat the wound.

Eventually, she healed well enough to undergo the recommended course of radiation therapy. "Dr. Morris explained that, without radiation, there was a 23 percent chance the cancer would recur. But with it, there was only a 3 percent chance," Lynne says.

Today, Lynne is cancer-free and has resumed her normal activities. She returns to Baltimore several times a year to participate in a study—continuing to give to Johns Hopkins by contributing data and financially supporting the research of Morris and the Sarcoma Program. Her loyalty, borne of her husband's leadership, is now also rooted in her own experience as a patient. "The service from orthopaedics has been above and beyond," she says. "Dr. Morris and her staff have been wonderful. I can't say it's something I'd choose to go through, but they quelled my fears throughout the process. It's very reassuring to have that kind of care." ■

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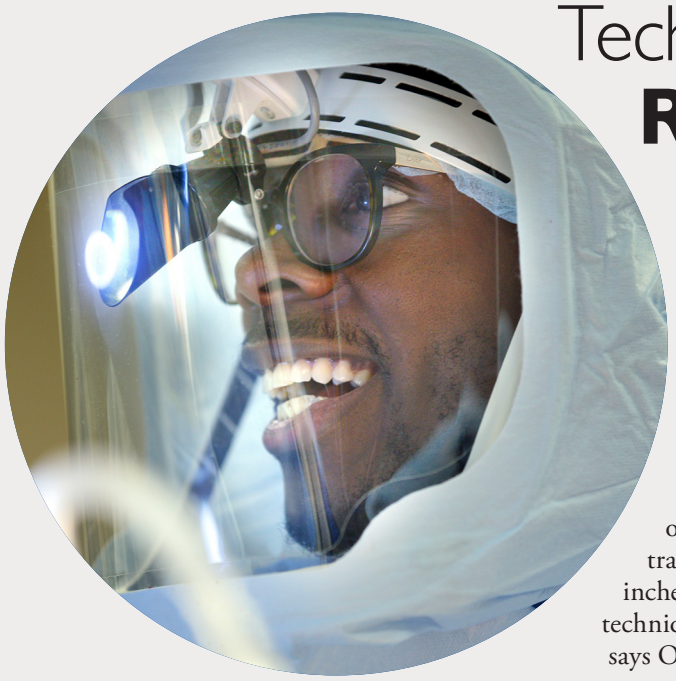


Techniques to **Improve Knee Replacements**

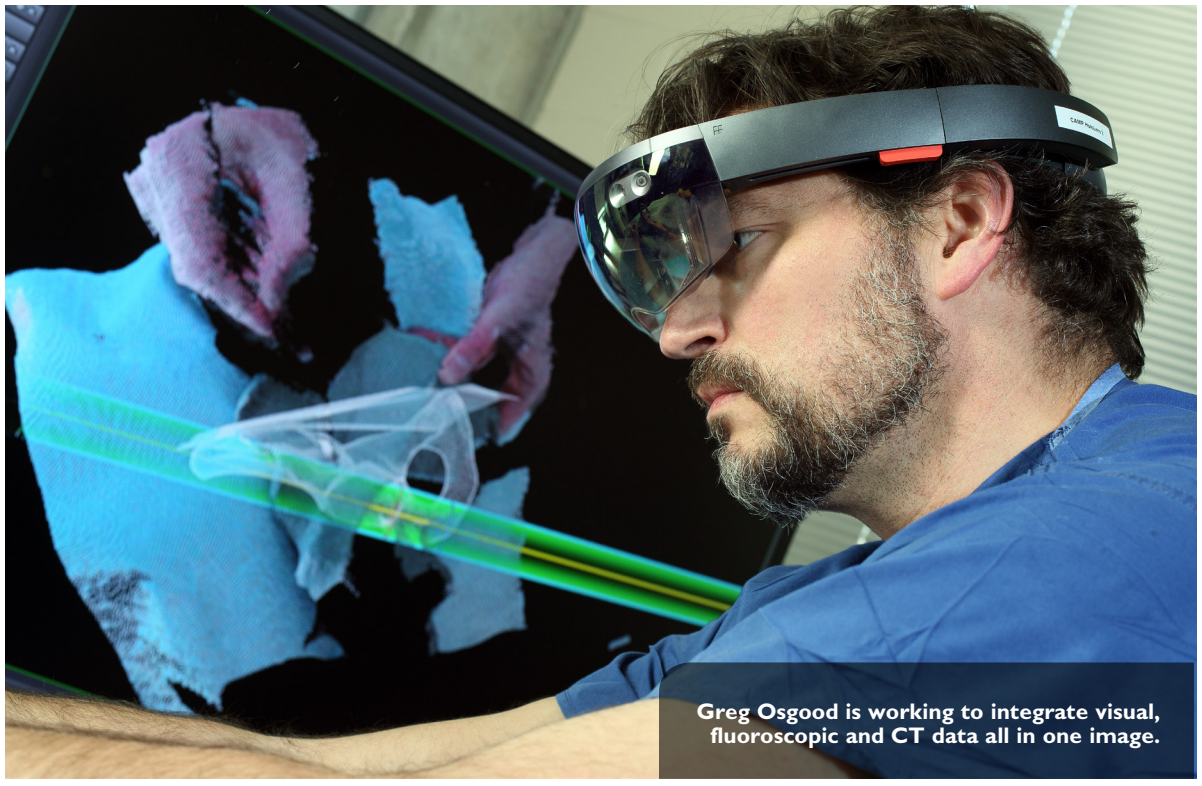
Elevating the success of knee replacements so that the knee becomes the patient's "forgotten joint" is the goal of **Julius Oni**, assistant professor of orthopaedic surgery at Johns Hopkins.

Oni's clinical practice focuses on innovative ways to improve patient outcomes after hip and knee replacement surgeries. For example, Oni performs total knee replacement using incisions that are approximately half the length of the traditional total knee incision. "The classic, traditional total knee replacement incision is 8 to 12 inches long. In contrast, by using the small-incision technique, my incisions are between 4 and 6 inches," says Oni.

Positioning the knee in extension during a significant portion of the surgery allows Oni to use a small incision and keep the soft tissue relaxed. Oni avoids prolonged subluxation of the tibia over the femur and minimizes the amount of subluxation of the patella. Besides the aesthetic advantages for patients who want to avoid the typical long anterior incision, Oni finds that this technique can potentially shorten recovery time, reduce the risk of severe pain from the stretch of the soft tissue, and reduce the risk of severe swelling.

Oni is also an advocate for partial knee replacements, which account for approximately 10 percent of the surgeries he performs. Oni says partial knee replacement is an option that other surgeons often dismiss. "In the past, partial knee replacements had a bad reputation as

Head-mounted Displays
Ease Pelvic Operations



Greg Osgood is working to integrate visual, fluoroscopic and CT data all in one image.

I am passionate about making pelvic surgery easier for the surgeon," says **Greg Osgood**, chief of orthopaedic trauma in the Johns Hopkins Department of Orthopaedic Surgery. Osgood believes that head-mounted displays using three-dimensional imaging data can help surgeons improve imaging and operative techniques, minimize incisions and reduce the complexity of surgery.

"Making the procedure more technology-based helps us provide patients with the same or better outcomes, but in an easier surgical manner," says Osgood. A recent study using this technology in a simulation of percutaneous pelvic surgery showed shorter operative times and less radiation use compared with traditional methods.

Osgood is combining data from advanced imaging techniques, such as ultrasound, computed tomography (CT) and MRI, with traditionally used operative fluoroscopic images, creating virtual three-dimensional imaging and "maps" that can be overlaid onto the patient's body during surgery.

"We have been working on a project for several years to integrate visual, fluoroscopic and CT data all in one image with what we call a Cam-C. It is a C-arm fluoroscopy unit with a camera mounted on it for augmented reality imaging," says Osgood. Augmented reality imaging uses virtual images in the surgical field to give more information than the visual image provides. Using this device, the surgeon can easily process the information and perform the surgery in a safer manner with fewer radiographs.

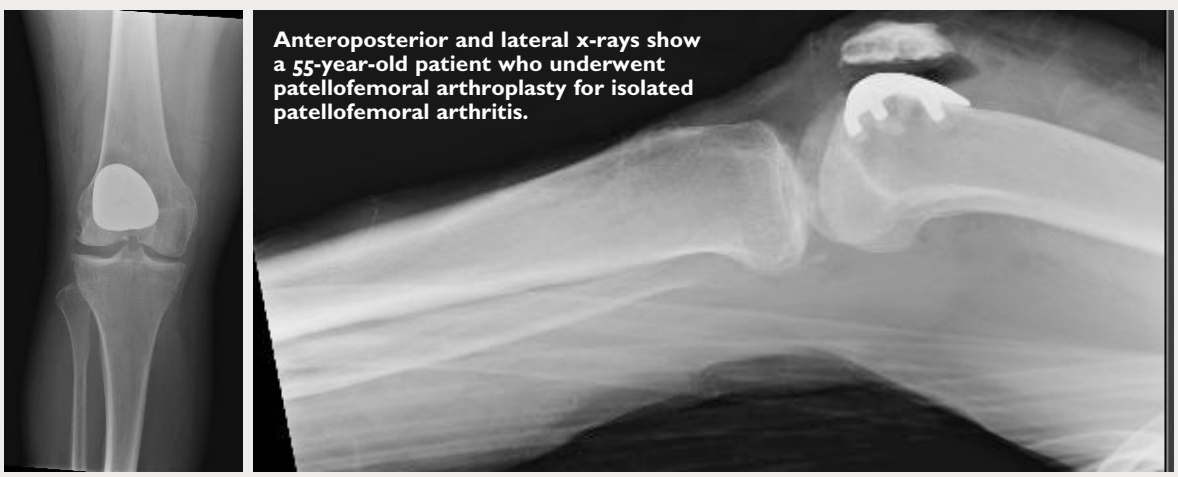
Osgood is collaborating with two Johns Hopkins researchers at the Malone Center for Engineering in Healthcare: **Jeff Siewerdsen**, professor of biomedical engineering and director of the Carnegie Center for Surgical Innovation, and **Nassir Navab,** professor of computing and director of the Computer Aided Medical Procedures Lab. Siewerdsen is working to improve C-arm CT and image registration methods to make image quality better and reduce radiation dose during surgery. Navab is working closely with clinical and industrial partners to enhance three-dimensional imaging and augmented-reality technology. His team has introduced camera-augmented mobile C-arm technology and is now focusing on the integration of head-mounted display technology into the clinical workflow.

Osgood believes the greatest potential of these new technologies lies in their teaching capabilities. During surgical simulations, residents who have never been trained in pelvic surgery were able to perform complex techniques with accuracy, using very few radiographs.

Osgood credits a T32 grant sponsored by the National Institutes of Health for bringing together the team of experts. "We involved people at all different levels, international laboratory collaborations, postdoctoral students and very engaged residents," he says. "We have people engaged in developing projects and exploring ideas—really making medical care better by deep investment in science." ■

a stopgap measure, something to hold you over until you need a total knee replacement," Oni says. "That is not necessarily true anymore."

By retaining all the ligaments and healthy compartments, Oni finds that a partial knee replacement can feel much more like a normal knee than a total knee replacement. "Patients recover a lot faster, and the complication profile is a lot better. There is less risk of infection, deep venous thrombosis, cardiopulmonary complication and blood loss," says Oni.



Anteroposterior and lateral x-rays show a 55-year-old patient who underwent patellofemoral arthroplasty for isolated patellofemoral arthritis.

Although patients report high satisfaction after knee replacement, some are not entirely pain-free. "There is still a lot of opportunity to improve the execution of knee replacement," says Oni.

Oni is addressing that issue through his research on "pain mapping." By studying the location, timing and characteristics of knee pain postoperatively, Oni hopes to identify pain patterns that will become the focus of an anatomical study. Oni plans to examine the areas of interest from the skin down to the intra-articular structures of the knee joint to determine the cause of the pain. The ultimate goal, he says, "is to educate patients better and develop interventions that can alleviate the pain, especially in the acute and subacute postoperative periods."

Oni's passion for improving joint replacement surgery stems from his knowledge of the effect it can have on his patients' lives. One of his patients

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Innovations to Improve Knee Replacements

(continued from page 3)

was wheelchair-dependent for three years because of a knee deformity secondary to neglected arthritis. Oni replaced both knees, and the patient is now able to walk. "The fact that we can take people from significant debilitation to a place where they have their lives back," says Oni, "makes what we do worth it." ■

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Framework

This newsletter is one of the many ways we seek to enhance our partnership with our thousands of friends and patients. Comments, questions and topics you would like to see covered in upcoming issues are always welcome.

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