Innovations in Knee Care: Women and knee arthritis; controlling pain; partial replacement

Mayo Clinic’s global leadership in advancing treatment of musculoskeletal disorders spans nearly a century. Teams of physicians at Mayo Clinic Orthopedics are on the forefront of research and innovations to enhance patient care, such as designing the first metal plate used to fix fractures securely and implanting the first artificial hip in the U.S. Through the years, orthopedics at Mayo Clinic has been recognized as a leader in the field, consistently placing among the top institutions by reputable rankings such as the U.S. News and World Report.

Building on this orthopedic legacy, Mayo Clinic knee specialists offer the most advanced, effective and comprehensive knee services available.

Women and Knee Arthritis

Osteoarthritis is a common and painful inflammatory joint condition resulting from degeneration of cartilage. Women older than 50 experience knee arthritis more frequently than men do. They also tend to delay seeking relief from pain, as compared to men.

Is there a biological basis driving this gender difference?

Mayo Clinic orthopedic surgeon Mary O’Connor, M.D., hopes to answer this question. As chair of the Department of Orthopedic Surgery at Mayo Clinic in Florida, Dr. O’Connor leads a new international investigation to discover molecular insights that may lead to new treatments or prevention.

Notes Dr. O’Connor:

“Because I’m different from a man at a chromosomal level, do I have a difference in my nerve fibers, different enervations that make me experience pain differently? Do my different hormone receptors affect pain processing or disease course?” The study will analyze knee tissue and bone specimens for possible molecular differences in pain fibers and hormone and vitamin D receptors between female and male patients.

Controlling Pain

Mark Spangehl, M.D., orthopedic surgeon at Mayo Clinic in Arizona, is committed to answering a key question for knee replacement patients: Which method of post-operative pain control is best for comfort and for recovering mobility?

Typically, patients at Mayo Clinic undergo one of two types of pain control. Dr. Spangehl’s study compares these two methods. One is a peripheral nerve block in which an anesthetic solution is injected around two nerves near the knee. While data show it provides excellent pain control, there is some suggestion it may also slow recovery. There are also rare injuries to the nerve.

The second method of pain control relies on a combination of medications injected into the knee just before the surgery is completed. Explains Dr. Spangehl: “At Mayo Clinic, we pride ourselves on efficiency. But we also want to make sure that we remain focused on doing what is best for the patient’s recovery—and this study will provide the evidence to help us make those decisions.”

The team hopes to publish its analysis sometime this year.

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– Mark Spangehl, M.D.
The Key to the Knee: Comprehensive Care

Knee pain is a common clinical complaint for people of all ages and occupations. It may result when cartilage is torn or a ligament ruptured due to an accident, fall or injury. Medical conditions such as arthritis, infections or gout also may cause knee pain.

Whatever intervention is needed, the key to successful outcomes is the team approach among Mayo Clinic physicians. At the W. Hall Wendel Jr. Musculoskeletal Center, a group of Mayo Clinic’s orthopedic experts works for the patient by accessing state-of-the-art technology to provide diagnosis, outpatient treatment and rehabilitation for all types of musculoskeletal conditions. As a result of the center’s integrated design and comprehensive capabilities, patients quickly and conveniently go from radiographic imaging to clinical consultations to treatment areas.

The Musculoskeletal Center also includes the Department of Physical Medicine and Rehabilitation. This integration assures that patients receive the highest quality, comprehensive care that is individualized to their particular needs.

Partial Replacement

The specific pain of a patellofemoral arthritis is its signature: a stabbing sensation in the front of the knee while going up or down stairs. Anyone can develop this form of arthritic degeneration in only a portion of a kneecap—the back—but athletes often do. Now orthopedic surgeons at the Mayo Clinic Musculoskeletal Center in Minnesota have a new approach that spares the remaining healthy knee. Called a patellofemoral partial arthroplasty, the procedure replaces only one knee compartment. In the past, patients typically were subject to a total replacement of all three knee compartments.

Explains orthopedic surgeon Diane Dahm, M.D.: “The vast majority of cases with this kind of arthritis should be treated without an operation. But if that fails to give relief, we’ve refined a partial approach that is less traumatic for the patient.” Benefits of patellofemoral partial arthroplasty include reduced pain and hospitalization, faster recovery of mobility, less blood loss.

Dr. Dahm notes that comprehensive aftercare with physical and occupational therapy is vital to positive outcomes. “After-surgery recovery is well supported at our Musculoskeletal Center so patients regain strength, agility and stability and a return to pain-free mobility.”
For Panagiotis “Panos” Kokkinos, an outgoing 16-year-old from Limassol, Cyprus, an ordinary tennis injury turned into a harrowing ordeal. Hitting balls one afternoon four years ago, he felt a twinge in his back. When the pain persisted, his parents, Petros and Nikki, took him to a doctor in town. No injury was visible on an X-ray, and the doctor manipulated Panos’s back to realign it, advising Panos to rest.

But after a month of bed rest, Panos was suffering severe pain. He also had developed an array of new symptoms. His posture was changing, and he had begun to limp. His pelvis tucked under, and he couldn’t lift his legs from the hip. His parents took him to doctors in Athens, London and Bern, Switzerland, but nobody could pinpoint a diagnosis. Though Panos’s pain eased over the next two years, the stiffness in his hips failed to improve.

Then Petros went online to make an appointment at Mayo Clinic. When he arrived in Rochester, Minn., in August 2010, Panos’s pain had mostly subsided, but his hip joints were so stiff he could barely lift himself out of a chair. “He had a very unusual constellation of symptoms,” says Sherilyn Driscoll, M.D., director of pediatric rehabilitation in the Department of Physical Medicine and Rehabilitation. “It wasn’t clear whether the problem was a neurologic disease process or a mechanical problem.”

What changed the course of Panos’s experience was a sophisticated test and collaboration among Mayo Clinic specialists. When Panos’s MRI, X-ray and lab work showed no sign of disease, Dr. Driscoll ordered a specialized exam to analyze the mechanics of his stride. With sensors attached to his limbs and his joints, Panos walked on a runway. “We could see his muscles responding properly, which showed the problem was likely mechanical,” Dr. Driscoll says. Orthopedic surgeons Mark Dekutoski, M.D., and Amy McIntosh, M.D., joined Driscoll to review Panos’s MRIs. There the surgeons identified the problem: a limbus fracture. Ripped cartilage attached to the end of his vertebra was pressing on a nerve root in the spinal canal. “Because the problem was cartilage,” explains Dr. Dekutoski, “it doesn’t show up on X-ray. On an MRI, it looks a little unusual, but unless you’re familiar with the pathophysiology of that problem, it can be overlooked.” A CT scan confirmed their finding.

Fortunately, Mayo Clinic orthopedic surgeons recently developed a new surgical technique to address the injury and help athletes recover quickly. They believe Panos’s original back twinge was exacerbated during the physical realignment. With a limited incision, they removed the cartilage fragment and realigned his spine.

With the nerve compression released, Panos underwent physical therapy and regained motion over the next six months. He continues to recover flexibility in his hip joints and a more normal gait. An irrepresible spirit, he’s set his goal for this year: to get back on skis.

His parents are grateful. “The doctors here speak to each other and work as a team,” Petros says. “Because of their team approach, we had peace of mind.”

Panagiotis “Panos” Kokkinos, and his dad Petros
When Jorge Rivera learned that endoscopic surgery could save his life, he also learned there was a risk of damage to his throat and vocal cords from removing a cancerous tumor through his mouth. Fortunately, his treatment at Mayo Clinic and his positive outlook allowed him not only to beat cancer, but to continue playing the guitar and singing.

Rivera, a commercial auto loan manager and father of three in San Juan, Puerto Rico, underwent a combination of endoscopic and laparoscopic surgery at Mayo Clinic in Jacksonville, Florida, to remove his cancerous esophagus and restore his digestive system. To some, surviving cancer would be reason enough to celebrate, but Rivera also wanted to recover the life he enjoyed before his cancer diagnosis at age 47. Just about a year later he is cancer-free, and back to work, family and his passion—music.

Rivera recalls “the usual” heartburn from “a typical Puerto Rican diet,” but no other symptoms. An endoscopy showed otherwise. Oncologist Benigno Varela, M.D., found cancer cells in the valve between Rivera’s esophagus and stomach and in the upper part of his stomach. Dr. Varela described treatment options, including a new, minimally invasive surgery performed at Mayo Clinic.

Soon a team of Mayo Clinic doctors that included Michael Wallace, M.D., a specialist in detection of gastrointestinal and lung cancer endoscopic imaging, was caring for Rivera. An endoscopic biopsy showed cancer cells spreading to the borders of the area previously identified as a problem.

Surgeons removed Rivera’s entire esophagus and part of his stomach, then shaped stomach tissue into a tube to form a new esophagus. Rivera left the hospital in one week and began eating solid foods three to four weeks after the surgery. His Mayo Clinic doctors, including oncologist Dr. Gerardo Colon-Otero, and his oncologist in Puerto Rico coordinated a chemotherapy and radiation plan administered in Puerto Rico. A year later, Rivera is cancer-free, eating well, playing music and doing kick-boxing.

“The traditional treatment for early-stage cancer of the esophagus—removal of the esophagus—is a high-risk surgery that typically involves long-term side effects, such as difficulty swallowing, frequent nausea and heartburn,” Dr. Wallace says. By combining endoscopy and laparoscopy techniques, he explains, doctors now can offer a minimally invasive option with fewer side effects.

Today Rivera feels good and is thankful that his tests show no cancer. He says, “I received first-rate treatment that contributed to the new chance at life I have today.”

“I received first-rate treatment that contributed to the new chance at life I have today.”  – Jorge Rivera

Mayo Clinic’s leadership in Gastroenterology and Hepatology practice is indisputable. Researchers at Mayo are at the forefront of innovation, producing more original research to advance patient care than any other institution in the world. Gastroenterology and Hepatology at Mayo Clinic has been recognized as #1 in the U.S. News and World Report for as long as the rankings have been published.
Groundbreaking Discovery on Aging

Rochester, Minnesota — A Mayo Clinic study on aging has been declared by *Science* magazine to be one of the top 10 scientific achievements of 2011. The research shows that the onset of age-related disorders and disabilities could be delayed or prevented by eliminating cells that biologists call senescent—more casually known as “deadbeat” cells—that help drive the aging process.

The study was originally published in the journal *Nature* in November 2011, and was the first to eliminate senescent cells from mice. To do this, the Mayo team inserted a gene into laboratory mice bred to develop early onset of age-related complications such as cataracts, feeble muscles, and stiff arteries. This gene only gets switched on when cells become senescent and dysfunctional with aging. Researchers then gave the mice a drug that acts with the gene to eliminate the senescent cells. Their results showed that eliminating senescent cells delayed onset of age-related cataracts, muscle weakness and impaired exercise capacity.

“Therapeutic interventions to get rid of senescent cells or block their effects may represent an avenue to make us feel more vital, healthier, and allow us to stay independent for a much longer time,” says Jan van Deursen, Ph.D., professor of cellular senescence at Mayo Clinic and the study’s senior author.

James Kirkland, M.D., Ph.D., director of Mayo’s Kogod Center on Aging and also an author of the study, says the work “could pave the way to delaying or preventing age-related chronic diseases—such as cancers, dementias, heart disease, and diabetes—as a group, instead of one at a time.”

The *Science* editors noted that treated mice “didn’t live longer than their untreated cage-mates—but they did seem to live better, which provided researchers with some hope that banishing senescent cells might also prolong our golden years.”

Simple Intestinal Probe May Detect Pancreatic Cancer

Jacksonville, Florida — By shining a tiny light within the small intestine, close to its junction with the pancreas, physicians at Mayo Clinic’s Florida campus detected pancreatic cancer 100% of the time. The promising results from this small study suggest it may one day be possible to screen patients much earlier in the development of pancreatic cancer, and by doing so improve outcomes.

This is important because pancreatic cancer is notoriously hard to reach and see. Most often it is detected by an imaging scan, followed by an invasive biopsy. However, tumors found in this way are usually at an advanced stage and are curable in only 5% of cases. The minimally invasive technique, called Polarization Gating Spectroscopy, is now being tested in a large international clinical trial led by the Mayo Clinic researchers.

Researchers led by Michael Wallace, M.D., chairman of the Division of Gastroenterology at Mayo Clinic in Florida, used a light probe attached to an endoscope to measure the amount of oxygenated blood and the size of blood vessels in an area of the small intestine 6 to 10 inches from the pancreas itself. Because a growing tumor requires a heightened supply of blood, normal tissue nearby reveals evidence of enlarged blood vessels and changes in the blood’s oxygenation.

The study included 10 patients who were found to have pancreatic cancer, and 9 participants who did not. Testing both measures detected all 10 pancreatic cancers, but was only 63% accurate in determining which volunteers did not have pancreatic cancer. Dr. Wallace says researchers are working to improve that.

If study results are confirmed, he says, it would be “a real advance in the treatment of pancreatic cancer.”
Mayo Clinic Celebrates 25 Years in Arizona

Scottsdale, Arizona — In June 1987, a team of just 47 physicians and 225 allied health employees formally launched Mayo Clinic in Arizona. Even before the doors opened, 1,800 patient appointments had been booked. Now, 25 years later, the organization includes more than 470 physicians and scientists and nearly 5,000 allied health employees.

“While we are celebrating our notable successes at our 25-year mark in the Valley, importantly, we’re honoring our dedicated staff, our generous benefactors, our key collaborative partners, and the pioneering spirit of our original crew—our true trail blazers,” says Wyatt Decker, M.D., CEO, Mayo Clinic in Arizona.

Mayo Clinic in Arizona now spans two campuses on 400-plus acres. It has added two research buildings on the Scottsdale campus and, on the Phoenix campus, a 244-bed hospital, a specialty clinic, housing for transplant and cancer patients, and leased space for a child care center, a hospice, and a hotel. Off-site family medicine practices were also added in Scottsdale and Glendale, Arizona.

On the Phoenix campus, construction is under way for the Proton Beam Therapy Program, a precise form of cancer treatment that uses pencil-beam scanning for greater control over radiation doses. When the facility opens in 2016, it will be the first of its kind in the Southwest. In addition, a branch of Mayo Medical School is expected to open in 2015. The school will offer both a medical degree granted by Mayo and a master’s degree in the science of health care delivery through Arizona State University.

Mayo Clinic remains committed to innovations, research, and new technology related to its core clinical areas—cancer, cardiology, neurosciences and transplant. The Mayo Clinic Comprehensive Cancer Center is the only National Cancer Institute-designated center in the Valley. Patients in need of a life-saving heart, kidney, pancreas, liver or bone marrow transplant have access to the largest transplant entity in the U.S.—Mayo’s campuses in Arizona, Florida, and Minnesota.

At the same time, Mayo Clinic is developing ways to bring more targeted care to patients through individualized medicine, regenerative medicine, and the science of health care delivery.

To Your Health!

Sleep and weight gain: What’s the connection?

Recent studies have suggested an association between sleep duration and weight gain. Sleeping fewer than 5 hours—or more than 9 hours—a night appears to increase the likelihood of weight gain.

In one study of the sleep-weight gain link, recurrent sleep deprivation in men increased their preferences for high-calorie foods and their overall calorie intake. In another study, women who slept fewer than 6 hours a night or more than 9 hours were more likely to gain 11 pounds (5 kilograms) compared with women who slept 7 hours a night. Other studies have found similar patterns in children and adolescents.

One explanation for this may be that sleep duration affects two key hormones that regulate hunger, ghrelin and leptin, and through them stimulates the appetite. Another contributing factor may be that lack of sleep leads to fatigue and results in less physical activity.
In the spring of 2012, Mayo Clinic sent five scientists to monitor a team of climbers attempting to scale Mount Everest. The goal is to learn more about how the various biological systems of humans adapt and perform at high altitude in order to help patients with heart conditions and other ailments. Mayo Clinic’s team was headed by Bruce Johnson, Ph.D., a veteran researcher who has conducted similar studies at the South Pole and at Mount Aconcagua in South America.

The highest mountain in the world is a natural laboratory for studying heart disease, lung problems, muscle loss, sleeping disorders and new medical technologies. That’s because Mount Everest’s extreme altitude puts climbers under conditions similar to those experienced by patients suffering from heart disease, obesity or advanced age. To take advantage of this natural “stress lab,” Mayo Clinic researchers joined an expedition to Everest with National Geographic, The North Face and Montana State University. Explains Dr. Johnson: “Our effort contributes to the rich history of altitude research that reveals mechanisms of lung physiology and fluid regulation in health and disease. Teaming up with this group highlights the growing need for health researchers with depth, breadth and a sense of adventure as they explore the field of integrative human physiology.”

Studying Human Stress Response to High Altitude

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