STEADMAN PHILIPPON RESEARCH INSTITUTE

SPRI NEWS

Late Summer 2015

INSIDE

Photo top: John Kelly

PATIENTS IN THE NEWS

Wendy Whelan: Focused from the Start, Uncommonly Energetic, Ever-Changing

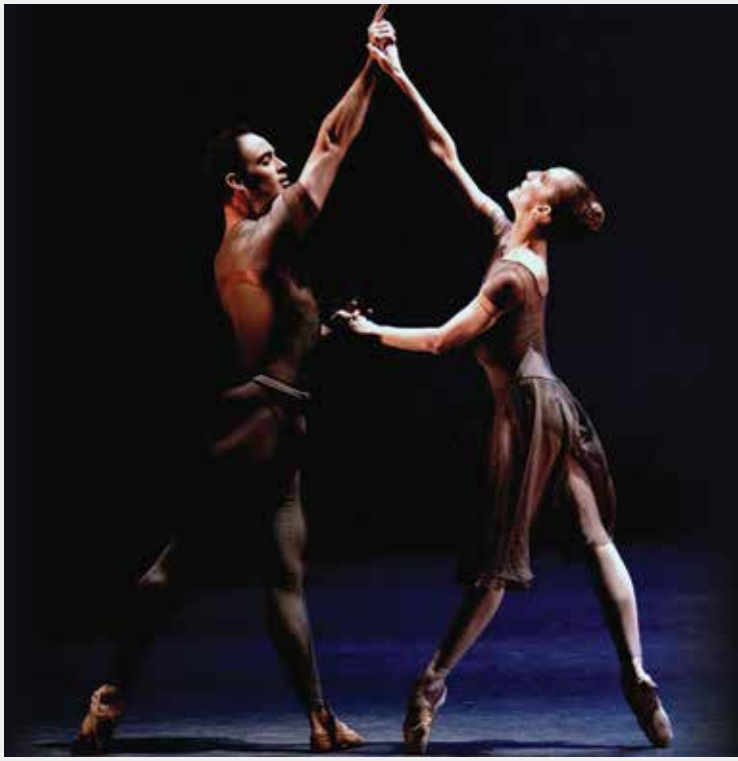
One of the world's great ballerinas reflects on her career, takes on new challenges

By Jim Brown, Executive Editor, Steadman Philippon Research Institute

She started dancing at the age of three and performed with the Louisville Ballet before she was 10. At 14, she won a summer scholarship at the prestigious School of American Ballet in New York. A year later, the teenager moved to New York to live, study, and dance. She never left.

In 1986, she became a member of the New York City Ballet, and in 1991 was named Principal Dancer.

Twenty-three award-winning years later, on Saturday, October 18, 2014, the world-renowned Wendy Whelan gave a farewell performance at the sold-out Lincoln Center in New York City. In the audience was an orthopaedic surgeon from Vail, Colorado. His presence at her performance, as you will soon learn, was not a coincidence.



Wendy Whelan returned to the stage in April of 2014 following surgery by Dr. Marc Philippon.

ENERGY PRODUCES ENERGY

Among the many expressions that have been used to describe Whelan's personality are "the most modest dancer who ever lived," "disarmingly down-to-earth," "generous," "confident," "brilliant," and of course, "exceptional" and "gifted."

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"She is New York's treasure," announces choreographer, dancer, and artistic director Stephen Petronio. "The longevity of her career has been astounding."

"Wendy Whelan is just an extraordinary artist," says British choreographer and director, Wayne MacGregor. "She's like a racehorse—she has this thoroughbred kind of body."

But a recurring theme surfaces when Wendy's personality is discussed. The theme is "energy," and it didn't start with her.

Her father, an accountant, was a runner in college. Wendy's mother, Kay Whelan, is a Louisville legend—Hall of Fame, mother of three, cancer survivor, ex-physical education teacher, and former high school and college basketball coach. A Louisville paper referred to her as "the incomparably energetic Whelan." Apparently, she passed that energy on to Wendy.

The New York Times reported that, as a child, Wendy had "inexhaustible reserves of energy." When she took to landing jumps on her little sister, Leigh, Kay Whelan "hauled her off" to Ginny Wooton, a Louisville ballet teacher.

"After that," said Ginny, "Wendy was absolutely obsessed."

Sister Leigh survived those early jumps nicely and is now a homicide detective in Louisville.

"I loved playing sports as a kid," says Wendy. "I was a fast runner, did a little diving, and went to basketball camps. I dabbled in other sports, but I was always involved with ballet. I wanted to grow up to be an artist or an athlete. It was only later that I realized dance is both of those things combined."

When asked if she was ever tired after taking ballet classes and rehearsing for three to six hours before an 8:00 pm performance, she laughed at the the notion.

"No, no, my motto is 'energy produces energy.' The more energy I exerted, the more energy I would get. It was always three hours of dancing a day, every day except Monday, no matter what. I felt like the Energizer Bunny."

MAKING OBSTACLES ADVANTAGES

In spite of her athleticism, artistry, and energy, success was not easy. Ballet dancers do well with slightly "turned out" hip joints. Wendy's hips weren't turned out.

At 12, she was diagnosed with idiopathic (adolescent) scoliosis. She wore a brace for four years, spent time in

Saturday, October 18, 2014, Wendy Whelan and Dr. Philippon at her farewell performance at the sold-out Lincoln Center in New York City.

traction, and for six months was in a hip-to-shoulder body cast for her curved spine.

"I got past it," she says, "but there was always a side that was weak and not fully symmetrical. I learned how to make that not a handicap, but an advantage. As I became an older dancer, it started to bother me again and caused some instability issues. But overall, I've had good musculature. I think I got some of the physicality from my grandmother."

In 2003, she tore the plantar fascia tissue in her left foot during the middle of a performance at the Bolshoi Theater in Moscow. "I continued with the piece by staying on my toes because I couldn't put my heel down. I altered things a little bit, but not so much that the audience would notice. We finished it, my partner carried me to dinner, carried me to the airport, and I flew home. Four months in a boot."

More recently, she began having trouble with her right hip. She slipped during a class, then slipped again in rehearsal the same day. She also strained her hamstring twice. "Whatever it was," she says, "my hip was never the same."

THE SURGEON FROM VAIL

Her orthopaedist and physical therapist suspected she might have a torn labrum (the rim around the top of the hip joint). They also said that if she did have a labral tear, the only person she should consider seeing was Dr. Marc Philippon of The Steadman Clinic and Steadman Philippon Research Institute in Vail.

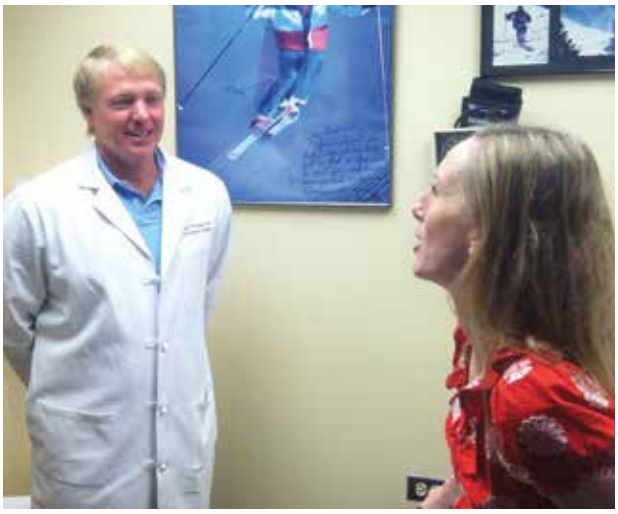
"I didn't want to believe it was as bad as it was, but Dr. Philippon thought he could be helpful if I wanted to pursue surgery. It took a while, but I decided to have reconstruction hip surgery in Vail in August of 2013."

[Dr. Philippon developed the technique and refined it through his research at the Steadman Philippon Research Institute. It is now used as standard procedure throughout the world.]

"My experience at The Steadman Clinic was phenomenal. I got there on Sunday, had surgery on Monday, and flew back to New York on Friday. The day Dr. Philippon performed the procedure, I was up, walking on crutches, and riding a bike at the hospital."

Wendy returned to the stage in April of 2014 and performed regularly until her previously planned retirement from the New York City Ballet in October 2014. Dr. Philippon was there, as he was for a performance in April.

"I can't put into words the level of care I received from Dr. Philippon," says Whelan. "He is one of the warmest physicians and individuals I've ever experienced. He has given back to me my career and my life. He's a force of nature.



Wendy Whelan four days post surgery with Dr. Philippon.

"When I think of The Steadman Clinic and the Steadman Philippon Research Institute," says Wendy, "I think of a group of individuals who are in the forefront and pioneers, developing new surgical procedures and understanding the kinds of injuries that result from sports, dance, and active lifestyles.

"They define new levels of excellence—always thinking about the future and how to make things better. They go non-stop; won't sit still. And they are connected to physicians and researchers all over the world who are forward-thinkers at the highest level."

THREE NEW PROJECTS

Wendy Whelan has a unique ability to continuously reinvent herself. Since her final performance with the New York City Ballet, she has moved forward with three new projects. *Restless Creature*, in which she performs separate duets with four young choreographers, began touring in January. A different performance will debut in London in August, and a third will open in New York in November.

Like Dr. Philippon and his colleagues in Vail, she just can't sit still. Always going. Non-stop.

"I will continue to perform, teach, and explore my craft," she says. "I'm thankful to Dr. Philippon for letting me continue to do that."

THE MASTER SPEAKS

Whether you are part of the ballet world or not, a person with whom you might be familiar offered a concise, profound observation regarding the extraordinary life and ever-changing career of Wendy Whelan.

"She's the best." — Mikhail Baryshnikov

[For more about Wendy Whelan, go to wendywhelan.org]

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Dr. Robert LaPrade Recognized by Patients and Peers as "a Doctor's Doctor," "the Ultimate Surgeon," and a "True Clinician-Scientist"

By Jim Brown

Of the approximate one million physicians in the United States, less than one-half of one percent are actively engaged in research, and even fewer have the opportunity to participate in research-oriented education and mentorship programs.

Dr. Robert LaPrade, M.D., Ph.D., chief medical officer and co-director of the Sports Medicine Fellowship Program at the Steadman Philippon Research Institute, and his colleagues practice medicine, conduct research, teach, and mentor physicians on a daily basis.

"My passion for research started during my residency program," says Dr. LaPrade, who also serves as an orthopaedic complex knee and sports medicine surgeon at The Steadman Clinic. "It became clear as I was doing research that it was helping me answer questions and become better as a practicing physician.

"As I continued to practice, I also began to realize how much I enjoyed being a mentor. Over the past 10 years it has been extremely rewarding for me to help place young doctors into top residencies, fellowships, and orthopaedic practices."

SHARING THE WEALTH

"This 'sharing the wealth' approach to medical practice, research, and mentoring has been beneficial in multiple areas. The Steadman Philippon Research Institute attracts enthusiastic researchers from all over the globe. Together, working with them we are able to produce high-quality research from which we all can learn. It is a symbiotic relationship."

One of Dr. LaPrade's former students and colleagues, Coen Wijdicks, Ph.D., had this to say about Dr. LaPrade's influence on his life. "I can never repay all of the mentorship, support, and friendship that I have received from Dr. LaPrade. He has supported my career from a hungry graduate student to a passionate director. Dr. LaPrade has expanded my understanding within and beyond orthopaedic sports medicine, and I will forever appreciate this."

Dr. Wijdicks is former director of the Department of BioMedical Engineering at SPRI and is now European director of research for Arthrex, a global orthopaedic device company. Dr. Wijdicks is based in Munich, Germany.

BEGINNING IN MINNESOTA

Simultaneously practicing, researching, and mentoring began at the University of Minnesota, where Dr. LaPrade was a professor in the departments of orthopaedic surgery and biomedical engineering. It was there that he was recognized for his collaboration with one of Europe's top sports centers, the University of Oslo and the Norwegian Olympic Center, and where he met his future friend and colleague, Dr. Lars Engebretsen.

Dr. Engebretsen, M.D., Ph.D., is now a professor and director of research at Orthopaedic Center, Ullevaal University Hospital and University of Oslo Medical School, and professor and co-chair of the Oslo Sports Trauma Research Center.

"Dr. LaPrade joined me at the University of Minnesota in the mid-nineties when I was working as a professor in orthopaedic and sports medicine there," remembers Dr. Engebretsen. "He came because of his love for research and actually, ice hockey. When I moved back to Norway in 1996, we established a friendship and working relationship that has proved viable over all these years.

"His contribution to orthopaedic science was highlighted by the OREF award, and he is continuing to do clinically relevant research in a very productive environment. He is also helping Norway to educate residents and researchers through our network. He is a true clinician-scientist."

PROLIFIC PRODUCTION

The OREF Clinical Research Award, considered the Nobel Prize of Orthopaedics, was not Dr. LaPrade's first award and is not likely to be his last. He has published more than 200 peer-reviewed scientific manuscripts and 75 book chapters, and has given more than 750 professional presentations, symposia, and instructional course lectures.

Often referred to as a "Doctor's Doctor," he has been selected as "One of the Best Doctors in America" and "One of the Most Compassionate Doctors."

"He has changed and revolutionized the manner in which complex knee injuries are treated," says Clifton Willimon, M.D., an orthopaedic surgeon and sports medicine physician at Children's Orthopaedics of Atlanta who trained as a fellow under Dr. LaPrade's guidance at SPRI. "Dr. LaPrade is the ultimate surgeon. He is blessed with talented hands, an inquisitive mind, a passion for excellence, and compassion for his patients. Every decision he makes in the operating room is backed by research and evidence."

Dr. LaPrade and his team conduct 20-30 research initiatives at any given time. In 2014 alone, he had 52 publications listed on PubMed—an average of one a week for 12 months.

"The team I had was extremely productive," he says. "That is probably more important than the person overseeing things. They are the ones doing the leg work on a daily basis."

THE MOVE TO COLORADO

"The people at SPRI had been talking to me for several years about making a trip to Vail to visit The Steadman Clinic and SPRI, but the timing was not right," says Dr. LaPrade. "When I reached the point where we could make a move that wouldn't be too disruptive to my family, we began to seriously consider the opportunity.

"It's not too often that a place like The Steadman Clinic and the Steadman Philippon Research Institute call asking you to help run their research program, as well as their fellowship program. I looked at it as an opportunity to improve what I do and also have more resources to teach others and conduct higher level research."

MAKING THE BEST BETTER

When he began his work at SPRI in 2010, he was pleasantly surprised. "The fellows were top-of-the-line, by far. I knew we had good fellows, but I didn't realize that we had the best fellows. Our sports fellowship program is one of the most sought after programs in the United States. It is a pleasure for me and my colleagues to play a role in the advanced training of some of the top orthopaedic surgeons in the country.

"The second thing I was really happy with was the ability to do research at a more productive and efficient level. Projects which may have taken five to seven years previously are realized in one or two years here. We have more projects and more resources to engage in our projects."

Dr. LaPrade also comments on the technological advantages available at SPRI. "We have equipment other centers do not have. Our robot is one of only eight in the world. Our bi-plane fluoroscopy system allows us to evaluate patients before and after surgery, and measure with precise accuracy the changes achieved by surgery that can restore patients back to living active lives."

WHERE DO RESEARCH IDEAS ORIGINATE?

Dr. LaPrade admits that he literally dreams about new projects, and he gets other research ideas while he's hiking, but most come from pathology that he sees in

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THE STEADMAN LEGACY

"One of the most important ways in which Dr. Steadman's legacy is being carried on is through the Research Institute itself," says Dr. LaPrade. "Dr. Steadman put a great deal of time, resources, and effort into establishing the Institute at a time when not many people in the world were willing to embark on such an endeavor. The Institute went from a very small beginning to one that is now recognized as one of the top two or three orthopaedic sports medicine research centers in the world."

Photo: John Kelly

Dr. LaPrade to Receive Maine 2015 Alumni Career Award

Dr. Robert LaPrade has been named the 2015 recipient of the University of Maine Alumni Career Award. It is the most prestigious recognition given by the University of Maine Alumni Association, and is presented to a Maine graduate whose life's work is marked by outstanding achievement and dedication. Previous recipients include former U.S. Senator Olympia Snowe, renowned cancer researcher Dr. Peter Brooks, Nobel Peace Prize winner Dr. Bernard Lown, and best-selling author Stephen King.

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surgery and topics presented at professional meetings.

When does he have time to write? "One or two hours at night, most weekends, and during a scheduled two-hour academic time each Wednesday morning—Starbucks, 7:00 to 9:00 am. I'm very productive there."

PRACTICAL APPLICATIONS

One area of Dr. LaPrade's research involves the meniscus root tear, a condition that was not recognized until the past five or six years.

"We found out that this injury was occurring in eight to ten percent of patients who have a torn meniscus, and that particular tear seems to result in a very fast onset of arthritis if not treated."

SPRI research found different ways to repair meniscus root tears, which is particularly important among those in the 50-65 age group.

"Now we're finding that we can arrest the arthritis and prevent its development," says Dr. LaPrade.

He thinks that biologics—using stem cells, certain formulations of platelet-rich plasma, and growth factors as diagnostic, preventive, or therapeutic agents—will be the next big breakthrough in orthopaedics and other medical fields.

"It could be almost as significant as when surgery went from open to arthroscopic techniques," says Dr. LaPrade.

THE REWARD

"The most gratifying part of my job is when a patient who first arrived in a wheelchair, discouraged by a debilitating injury, comes back after being treated—smiling and grateful because he or she has returned to an active lifestyle," says Dr. LaPrade. "Every time I see patients like that, I get choked up because we were able to help them.

"It's important for people to realize that we are not just treating athletes. But by treating them, we can help everyone a great deal as well.

"Because of appreciative patients and generous supporters, we are able to continue to improve patients' health, and we are extremely grateful for that. We don't have a scarcity of ideas, and the generosity of our supporters allows us to continue to explore these problems and determine ways to help patients heal faster and return to active lives."

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Photo: John Kelly

Dr. Robert LaPrade with the Biomedical Engineering team.

Dr. Richard Steadman Inducted into the American Orthopaedic Society for Sports Medicine Hall of Fame

Dr. Richard Steadman was inducted into the American Orthopaedic Society for Sports Medicine's (AOSSM) Hall of Fame on Friday, July 10, during the Society's Annual Meeting in Orlando, Florida. AOSSM Hall of Famers are individuals in the sports medicine community who have contributed immensely and set themselves apart from others in the field.

Dr. Steadman was born in Sherman, Texas. He received his undergraduate degree from Texas A&M University, where he played football under Coach Paul "Bear" Bryant. He received his medical degree from the University of Texas Southwestern Medical School in Dallas, Texas. Following internship at Charity Hospital in New Orleans, Dr. Steadman served two years in the U.S. Army in Germany, then returned to Charity Hospital where he completed his orthopaedic residency in 1970.

Richard Steadman began his sports medicine orthopaedics career in South Lake Tahoe, California in 1970. He became active with the U.S. Ski Team soon thereafter, and he donated his services at what became the first ever U.S. Olympic Training Center in Squaw Valley, California.

He was the Head U.S. Alpine Ski Team Physician from 1976 to 2012 and developed the U.S. Ski Team Sports Medicine Committee. He continues today as the chairman of the medical group of the U.S. Ski Team. He has been inducted into the U.S. and the Colorado Ski Halls of Fame. He was also awarded the AT&T Skiing Award, which is given to someone whose excellence and dedication to skiing has profoundly enriched the sport.

An award-winning innovator and mentor in the field of orthopaedic sports medicine, Dr. Steadman founded the non-profit Steadman Sports Medicine Research Foundation in 1988 at South Lake Tahoe, California, where he began his orthopaedic practice in 1970. Its purpose was to collect and analyze patient data and outcomes over time. That organization exists today as Steadman Philippon Research Institute, which is known worldwide for its unprecedented clinical database and research into orthopaedic injuries of the knee, hip, shoulder, ankle, and spine.

Early in his career at South Lake Tahoe, Dr. Steadman developed significant improvements in the

Photo: John Kelly

field of post-surgical rehabilitation. These techniques are important in shortening and strengthening the healing process after surgery.

Steadman is internationally known for the development of many advanced surgical procedures for the knee, including "microfracture," a procedure that repairs the damaged joint, and encourages the re-growth of articular cartilage. Today, microfracture is the most common treatment for chondral defects of the knee. He also developed the "healing response," and most recently (in 2011), the "package," a technique that can restore normal, comfortable movement to the stiff and painful arthritic knee, thereby avoiding joint replacement surgery.

Dr. Steadman was a proponent of early motion and physiologic loadbearing after ACL reconstruction. He has had more than 225 articles published and has made nearly 700 presentations.

In 1990, he moved his practice to Vail, Colorado, and became the founding and managing partner of The Steadman Clinic. Prior to his retirement from clinical practice in 2014, Dr. Steadman served as a consultant to several professional sport teams in the U.S. and Europe.

The American Orthopaedic Society for Sports Medicine (AOSSM) is a world leader in sports medicine education, research, communication and fellowship, and includes national and international orthopaedic sports medicine leaders. The Society works closely with many other sports medicine specialists, including athletic trainers, physical therapists, family physicians, and others to improve the identification, prevention, treatment, and rehabilitation of sports injuries. AOSSM is also a founding partner of the STOP Sports Injuries campaign to prevent overuse and traumatic injuries in kids.

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RESEARCH UPDATE

Dr. Peter Millett's Study Shows that Arthroscopic Rotator Cuff Repair Is Effective in Older Athletes

A study led by SPRI's Peter Millett, M.D., M.Sc., is the first to provide direct evidence that arthroscopic shoulder surgery for the repair of rotator cuff injuries is effective for recreational athletes in their 70s and 80s.

"Rotator cuff repair surgery decreased pain and improved function," says Dr. Millett. "The procedure was effective in helping patients function not only in daily activities, but also in sports and activities that make life meaningful."

Photo: John Kelly

Peter Millett, M.D., M.Sc.

Dr. Millett is an internationally recognized orthopaedic surgeon and partner at The Steadman Clinic who specializes in disorders of the shoulder and other sports-related injuries. He has been consistently selected as one of the "Best Doctors in America."

The results of the study were featured in a presentation at the recent meeting of the Arthroscopy Association of North America in Los Angeles, and the findings were published in the *The American Journal of Sports Medicine*.

Titled "Two-Year Outcomes After Arthroscopic Rotator Cuff Repair in Recreational Athletes Older Than 70," the study was co-authored by Sanjeev Bhatis, M.D., Joshua Greenspoon, B.Sc., Marilee Horan, M.P.H., and Ryan Warth, M.D., coordinator of upper extremity research at SPRI's Center for Outcomes-Based Orthopaedic Research.

EFFECT ON OLDER ATHLETES

"Many older patients who have rotator cuff tears have significant pain, limitations in function, difficulty with sleep, and cannot play the sports they enjoy," explains Dr. Millett. "When they go to the doctor, they are often told that surgery is not an option, that they are 'too old,' that surgery is ineffective, or that they won't be able to return to sports after surgery. That is not what they want to hear."

The SPRI investigation involved 49 shoulders in 44 patients of Dr. Millett who described themselves as recreational athletes and had undergone a primary or revision arthroscopic repair of a full-thickness supraspinatus rotator cuff tear.

[The supraspinatus is one of the four rotator cuff muscles. The muscle is located on the top of the shoulder and its tendon attaches to the humerus so that one can elevate and rotate the arm.]

Many factors affect patient outcomes after arthroscopic rotator cuff repair, including age, gender, occupation, a chronic or traumatic tear, and length of time patients are followed. The SPRI study evaluated the effectiveness of rotator cuff repair specifically among patients in their 70s and 80s.

1,300 ROTATOR CUFF REPAIRS

Dr. Millett has performed more than 1,300 arthroscopic rotator cuff repairs since 2005, and results in his overall cohort have had a very low revision rate. Many of these patients fall into the 70+ category and most

Rotator Cuff Injuries: How Do You Know?

Patients with rotator cuff issues often notice pain when reaching and with overhead activities. Rotator cuff tears are often very painful at night and it is often painful to sleep on the injured shoulder. There may also be weakness when reaching overhead, clasping hands behind the neck, or elevating the arm to the side.

A visit to the orthopaedic surgeon starts with a careful history and then a shoulder physical examination, which may provoke pain and weakness. The physician will order x-rays that may show a bone spur that can impinge on the underlying rotator cuff tendons. An MRI is the best test to visualize the actual tendons of the rotator cuff. In active patients, arthroscopic surgery is generally preferred to decrease pain and restore function, as tendons will not heal on their own.

of them are extremely active. Older individuals have shown an increasing desire to remain physically active as they age, and many patients over the age of 70 still have expectations of high levels of function and activity.

Concerns have existed about repairing rotator cuff tears in this age category. Older patients tend to have larger tears with more degenerative changes in their tendons, which can increase the complexity of repair. Bone quality decreases with age and can complicate suture anchor fixation. Vascularity and healing can also be compromised in older patients. These and other factors make rotator cuff repair more challenging and clinical outcomes less predictable in this age category. This study, however, shows that carefully selected patients over 70 can and do achieve excellent outcomes with arthroscopic surgery when it is combined with appropriate postoperative rehab.

FOUR BENEFITS

All postoperative outcome measures demonstrated significant improvement when compared with baseline scores prior to surgery. Pain was decreased and function was increased. None of the patients needed further surgery. Patients were highly satisfied with their outcome. Moreover, 77 percent of the patients who responded were able to return to their desired sports at a pre-injury level of intensity or greater.

"Our study showed that 1) older patients can and do benefit from arthroscopic rotator repair surgery, that 2) arthroscopic rotator repair reliably eliminates pain, that 3) the procedure effectively restores function, and that 4) older patients can and do return to sports after rotator cuff repair," says Dr. Millett.

Dr. Millett emphasizes that the expertise of the entire team caring for patients, from the surgeon to those who supervise rehabilitation, plays a big role in the outcome.

"We offer patients who have suffered rotator cuff injuries an effective option—arthroscopic surgery—one that meets the patients' expectations," concludes Dr. Millett. "The procedure and the results of this study fit perfectly with our mission of keeping people active."

The Steadman Philippon Research Institute is grateful to Paul and Lee Schmidt, who partially funded this study with a grant.

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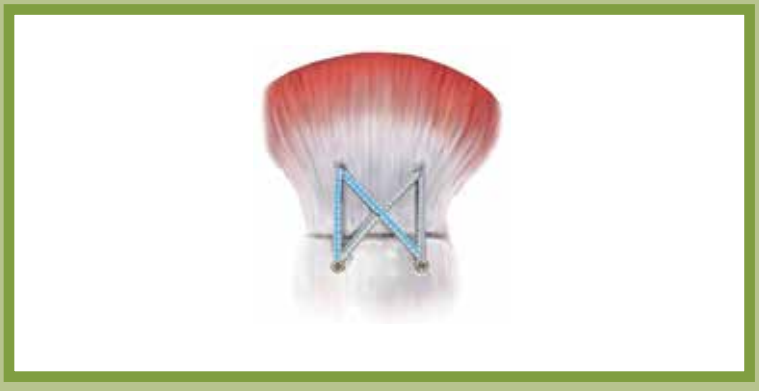
Illustration showing a completed extended linked double-row rotator cuff construct.

Left, a typical crescent-shaped tear. Right, standard four-anchor double-row construct to repair a crescent-shaped tear.



New arthroscopic interconnected suture double-row repair technique (transosseous equivalent technique TOE) that may help chronic tendons heal better given the larger surface area and compression of the tendon with a double row of sutures that are interconnected with suture anchors.

EDUCATION

Rachel Surowiec and Jocelyn Todd Awarded National Science Foundation Research Fellowships

Two former Steadman Philippon Research Institute staff members, Rachel Surowiec and Jocelyn Todd, have been awarded prestigious National Science Foundation (NSF) Graduate Research Fellowships to pursue Ph.D. degrees.

SUROWIEC TO OAKLAND UNIVERSITY

Ms. Surowiec, who earned bachelor's and master's degrees from Ball State University, was a senior research scientist at SPRI in the Imaging Research Department. While at SPRI, she co-authored more than a dozen manuscripts published in peer-reviewed journals, including the *British Journal of Sports Medicine* and; *Knee Surgery, Sports Traumatology, Arthroscopy*; and the *Journal of Magnetic Resonance Imaging.*

Ms. Surowiec is pursuing her Ph.D. at Oakland University in Rochester Hills, Michigan, and is the first NSF Fellowship in Physics recipient in the school's history. She will be conducting her dissertation research with Dr. Yang Xia, whose lab uses a variety of imaging methods to study the degradation of articular cartilage during osteoarthritis.

"SPRI has been pivotal to my growth as a researcher," says Surowiec. "It is where I developed a deep interest in non-invasive techniques to image articular cartilage. Without the experience I gained from Dr. Charles Ho, I could not have imagined realizing my dream of becoming a National Science Foundation Fellowship recipient.

"I left SPRI with unparalleled experience in research and had amazing opportunities to work with leaders in the field of imaging and orthopaedics," she adds. "I am so thankful for all of the experiences that SPRI provided."

TODD TO THE UNIVERSITY OF UTAH

Jocelyn Todd served as a summer undergraduate research fellow at SPRI in 2013 while working toward a B.S.E degree in biomedical engineering at the University of Iowa. She will graduate this semester. At SPRI, she worked with a team on two projects related to surgical techniques on the shoulder.

The findings of both studies were published in leading orthopaedic journals—*The American Journal of Sports Medicine* and the *Journal for Shoulder and Elbow Surgery.*

"Because of my experience at SPRI, I decided to pursue further orthopaedic research through an honors thesis at the University of Iowa Biomechanics Laboratory," says Ms. Todd. "In August, I will begin working toward my Ph.D. in bioengineering at the University of Utah, where I will focus on finite element modeling of cartilage defects in the hip."

Rachel Surowiec, M.Sc., (top) and Jocelyn Todd

"My internship at SPRI really developed my excitement for conducting research, and reinforced my interest in orthopaedics and biomechanics."

SPRI HONORED BY AWARDS

The NSF received more than 16,000 applications for the 2015 fellowship awards, and only 2,000 NSF awards were made. The fellowships provide three years of tuition and a stipend for graduate studies and open doors for further research collaboration, NSF internships, and international research experiences.

"We are honored to share this exciting news, and we congratulate Rachel and Jocelyn on their well-deserved and significant achievements," says Travis Turnbull, Ph.D., deputy director and senior engineer/scientist in the Department of BioMedical Engineering at SPRI.

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STEADMAN PHILIPPON RESEARCH INSTITUTE℠

181 West Meadow Drive
Suite 1000
Vail, Colorado 81657
970-479-9797
970-479-9753 FAX
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