STEADMAN◆HAWKINS RESEARCH FOUNDATION

2007 ANNUAL REPORT

An International Center For Research and Education — Keeping People Active

Mission: The Steadman◆Hawkins Research Foundation is dedicated to keeping people of all ages physically active through orthopaedic research and education in the areas of arthritis, healing, rehabilitation, and injury.

History: Founded in 1988 by orthopaedic surgeon Dr. J. Richard Steadman, the Foundation is an independent, tax-exempt (IRS code 501(c)(3)) charitable organization. Known throughout the world for its research into the causes, prevention, and treatment of orthopaedic disorders, the Steadman◆Hawkins Research Foundation is committed to solving orthopaedic problems that limit an individual's ability to maintain an active life.

The Steadman◆Hawkins Research Foundation wishes to express deep appreciation to John P. Kelly, who donated many of the stock photos in this year's Annual Report and contributed his time to photograph the many Foundation and operating room subjects.

Kelly is a renowned sports and stock photographer who approaches every photo shoot like a commando. His sense of motion combines with his obvious love of natural light to produce vibrant graphic images. He shoots extensively for a variety of prominent manufacturers in the sports and recreation industry; and his experience includes numerous assignments at the Olympics, Wimbledon, U.S. Open Golf, and World Cup Skiing. When Robert Redford needed a poster that reflected the spirit of his movie "A River Runs Through It," he called Kelly. More recently, Redford employed Kelly's photographic talents during the making of "The Horse Whisperer." Whether covering the Olympics or trekking in the Himalayas, Kelly is always ready for his next photographic adventure.

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Founded in 1988 by orthopaedic surgeon Dr. J. Richard Steadman, the Steadman◆Hawkins Research Foundation is an independent, tax-exempt (IRS code 501(c)(3)) charitable organization. Known throughout the world for its research into the causes, prevention, and treatment of orthopaedic disorders, the Foundation is dedicated to solving orthopaedic problems that limit an individual's ability to maintain an active life.

The Foundation has influenced the practice of orthopaedics — from diagnosis to rehabilitation. Recognizing that the body's innate healing powers can be harnessed and manipulated to improve the natural healing process has led to exciting advances in surgical techniques that are used today by orthopaedists in many practices. The microfracture technique, for example, is now accepted as a treatment to enhance articular cartilage healing that may make it possible to postpone or even eliminate the need for joint replacement surgery. It has been independently estimated that more than one million patients have now been treated with microfracture to repair chondral defects. Today, the Foundation is recognized worldwide for pioneering research of new arthroscopic procedures to treat femoral impingement in the hip and rotator cuff injuries in the shoulder.

The Foundation collects data and publishes clinical research results on knees, hips, shoulders and spine and has become the most published and one of the most innovative organizations in sports medicine research and education. The Foundation publishes its findings in relevant scientific and medical journals and presents its research results at medical meetings worldwide. Philanthropic gifts are used to advance scientific research and to support scholarly academic programs that train physicians for the future. As a result of its Fellowship Program, the Foundation now has a global network of more than 160 Fellows and associates who have put the advanced concepts they learned in their fellowships to good use in their orthopaedic practices.

The focus is on improvement of function and quality of life. Future research will target predictors of disability caused by arthritis, predictors of successful surgery, predictors of patient satisfaction, patient expectation of treatment, and patient outcomes following surgery.

THE FOUNDATION'S PRIMARY AREAS OF RESEARCH AND EDUCATION ARE:

- **Basic Science Research** – undertakes biological studies to investigate the causes and effects of degenerative arthritis, techniques of cartilage regeneration, and basic biological healing processes.
- **Clinical Research** – conducts evidence-based medicine "outcomes" research based on actual clinical data that aids both physicians and patients in making better-informed treatment decisions.
- **Biomechanics Research Laboratory** – studies dynamic joint function using motion analysis, computer modeling and dual-plane fluoroscopy imaging in an effort to understand injury mechanisms and to enhance rehabilitation techniques and outcomes.
- **Imaging Research** – develops and evaluates noninvasive imaging techniques of the joints for the purpose of directing and monitoring clinical treatment and outcomes and to enhance the clinical relevance of Biomechanics Research.
- **Education and Fellowship Program** – administers and coordinates the physicians-in-residence fellowship training program, hosts conferences and international medical meetings, and produces and distributes publications and teaching visual media.

SINCE ITS INCEPTION, THE FOUNDATION HAS HELPED PEOPLE OF ALL AGES REMAIN PHYSICALLY ACTIVE THROUGH ORTHOPAEDIC RESEARCH AND EDUCATION. THE FOUNDATION CONTINUES TO PURSUE ITS GOALS OF:

- Understanding, enlisting, and enhancing the body's innate ability to heal.
- Designing and validating surgical and rehabilitation techniques, as well as nonoperative management for arthritis.
- Producing and publishing scientifically validated research in leading medical and scientific journals.

DEAR FRIENDS,

On behalf of our dedicated board members, scientists, staff, and physicians, it gives us great pleasure to present to you our 2007 Annual Report. We wish to express our heartfelt appreciation for your support through our first 19 years as you have seen our vision became reality.

Our achievements during these years would not be possible without the generosity of loyal friends and patients. In presenting this Annual Report, we are mindful that we are not stopping here. We are committed to building the best orthopaedic sports medicine institute in the world. Being the best and most innovative will require state-of-the-art facilities, the most advanced equipment, and the skills to help people based on the complexity and severity of their injuries. As we reflect on this year, we also look forward to celebrating our 20th anniversary in 2008.

While the Foundation's contributions to the world of medicine are acknowledged here, it is important to recognize the achievements made by our senior research directors and their teams.

William G. Rodkey, D.V.M., recognized worldwide for his research, heads Basic Science (page 23). The focus of his research has been on regeneration of cartilage tissue for resurfacing of articular cartilage defects that typically lead to osteoarthritis. A significant finding of this research is the importance of removing the calcified cartilage layer in the subchondral bone plate to enhance the growth of repair tissue following microfracture. This information was published in the prestigious *American Journal of Sports Medicine* in 2006, and has helped surgeons improve outcomes of microfractures worldwide. Gene therapy to enhance healing has been a promising area of research and remains on the horizon in 2008 and beyond.

The Biomechanics Research Laboratory (page 39), under the direction of Mike Torry, Ph.D., has become a world leader in the development of dual-plane fluoroscopy and computer-based joint modeling. In recognition of this work, Dr. Torry was one of only 100 scientists in the world to be invited to participate in the National Academies Keck *Futures Initiatives* that convened in Irvine, California.

Dual-plane fluoroscopy will provide scientists with new information about loads placed on joints and ligaments during motion. This research will offer new information on the mechanism of injuries, prevention, and treatments. Dr. Peter Millett, for example, is gaining a deeper understanding of normal shoulder motion, shoulder motion among those with osteoarthritis, and implant motions following total shoulder replacement. From these studies we hope to discover better ways of preventing arthritis and better ways of treating it once it develops. We also hope to develop improved surgical methods for implanting prostheses, perhaps in less invasive ways, and to develop better designs for the implants so they will be more functional and last longer.

Karen Briggs, M.B.A., M.P.H., heads the Clinical Research Department (page27) and oversees the most widely published clinical research organization of its kind in the world. Karen reports that this has been a record year for disseminating research results. Her department produced more than 20 articles for publication in peer-review journals, 20 book chapters, and more than 40 papers to be presented at national and international medical conferences and symposia. The highlight of the year was publishing the Foundation's first three articles on femoroacetabular impingement (FAI). Two articles were published in *Knee Surgery, Sports Traumatology,* and *Arthroscopy*, and one article was published in the *American Journal of Sports Medicine*.

Dr. Marc Philippon joined the Steadman-Hawkins team three years ago, guiding the Foundation to world leadership in the field of hip research. He has pioneered an arthroscopic technique to repair the damaged labrum, which is a leading cause of hip pain and disability and is thought to lead to a more rapid onset of arthritis. At the annual meeting of the American Academy of Orthopaedic Surgeons, seven studies on hip arthroscopy were accepted for presentations. The Foundation produced five of those studies.

In 2008, Imaging Research will become our newest area of research at the Steadman◆Hawkins Research Foundation, taking its place beside Basic Science, Clinical Research, and the Biomechanics Research Laboratory. Dr. Charles Ho, a radiologist recognized for his musculoskeletal expertise and a member of our Scientific Advisory Committee, has accepted the new position, Director of Imaging, for the Foundation. Dr. Ho has extensive training in physics, engineering and radiology. His background is uniquely suited to lead us in imaging research. All four research areas will support the Foundation's Education and Fellowship Program.

In this regard, we are pleased to announce that we have partnered with Siemens Medical Solutions (SMS) USA, Inc. This new partnership will enable us to become a world leader in sports medicine imaging research.

Imaging has become a vital part of sports medicine for diagnosis, treatment, and postoperative evaluation. Patients from all over the world are treated at the Steadman-Hawkins Clinic, and many of them return for an assessment of their progress. Imaging is a noninvasive way to evaluate that progress, and the technique is becoming more and more precise for bones, soft tissue, and cartilage.

Siemens is an ideal partner for our Foundation. The company has been recognized for developing innovative diagnostic products related to orthopaedics and conducting research at prestigious universities. But until now, in sports medicine, it has not clinically validated its newest imaging technology, called the 3.0 Tesla MRI (Magnetic Resonance Imaging) Scanner. The 3.0 Tesla (3-T) has an advanced imaging system with twice the field strength of conventional MRI scanners, and it can increase the imaging resolution by 16 times.

J. Richard Steadman, M.D.

J. Michael Egan

The 3-T technology has been available for several years, but its clinical utility has not yet been validated or exploited in sports medicine. Our Foundation will be testing and validating new software that is being developed specifically for the type of research being conducted here in Vail.

At the beginning of 2009, the system will be in place, and the Foundation will begin collecting imaging data on patients. Essentially, we will then analyze the data and determine whether we can match what we are seeing on images with actual surgical observations. This validation process will allow us to improve imaging capabilities and give our scientists access to innovative imaging technology that will benefit our research initiatives. For example, we will be able to evaluate physiology of cartilage tissue before and after treatment and determine the health and regeneration of that tissue in a totally noninvasive way. Until now, our only option was to look inside a joint and perhaps take a biopsy (invasively) just to evaluate the results of a procedure or to measure progress.

Once we have clinically validated aspects of the 3-T imaging capabilities, it is likely that other orthopaedic centers will seek the same high level of detail the 3-T provides. The research conducted here will be a valuable contribution to orthopaedic sports imaging worldwide.

Meanwhile, our Foundation continues to set the standard for Evidence-Based Medicine (EBM), by collecting, organizing, analyzing, and publishing data on the short- and long-term outcomes of every Steadman-Hawkins Clinic patient. EBM is becoming more and more the gold standard in health care, improving it because of the way health insurance is monitored and tracked. EBM is the conscientious use of extensive and current evidence to make decisions about the best course of treatment for each patient.

We collect information on every patient we see and enter it into our Foundation's comprehensive database. Data can vary from the size of cartilage tears seen on MRIs to patients' ratings of their satisfaction and comfort on a scale. The database helps us develop evidence on whether a procedure is ultimately better or worse for a patient.

In this annual report, you will meet Brian Simmons (page 25) and learn how the "healing response" got him back on his skis again. Healing response, a minimally invasive procedure to repair a partially torn ACL, reduced his recovery time and medical costs.

When artist and philanthropist Lee Schmidt (page 7) tore her shoulder's rotator cuff and tendon eight years ago, she lost the function of her right arm and hand. She couldn't even hold a glass of water, much less skillfully apply a paintbrush to her canvas. But thanks to gifts to the Steadman◆Hawkins Research Foundation, Lee is not only painting, she's helping make history in the world of orthopaedic medicine.

Lee and her children decided to help by lending their family foundation's support to partially fund our research project on dual-plane fluoroscopy. "We have confidence in the way our donation will be used," she says. "We know the Foundation's overhead costs are less than half that of university research programs, so a dollar sent here will go twice as far."

Our achievements in 2007 would not be possible without the contributions of more than 900 individuals, foundations, and corporations whose combined support has amounted to more than $3.2 million. Our donors will be pleased to know that, in large part, their gifts are going directly to research and education.

Breakthrough research is expensive. However, we believe that with continued support, we will further strengthen the Foundation as an international leader in evidence-based orthopaedic sports medicine and research. As in the past, our success depends on the help from generous donors like you.

On behalf of our dedicated board members, physicians, researchers, and staff, we wish to thank you. We look forward to your continued support and to updating you on exciting advances from the Steadman◆Hawkins Research Foundation.

Respectfully yours,

J. Richard Steadman, M.D.
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J. Michael Egan
President and Chief Executive Officer

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Imaging Research Set to Become Newest Area of Science at Steadman-Hawkins

by Mike Egan, Chief Executive Officer, Steadman◆Hawkins Research Foundation

We are pleased to announce that the Foundation has reached an agreement with Siemens Medical Solutions (SMS) USA, Inc., that will enable us to become a world leader in sports medicine imaging research. SMS is one of the largest medical imaging suppliers in the U.S. and is a subsidiary of Siemens AG, a multinational conglomerate based in Germany that has business segments in healthcare, industrial automation, power generation, and other industries.

Imaging Research will become our newest area of research at the Steadman◆Hawkins Research Foundation, taking its place beside Basic Science Research, Clinical Research, and the Biomechanics Research Laboratory. All four departments will be integrated into the Foundation's Education and Fellowship Program.

Imaging has become a vital part of sports medicine for diagnosis, treatment, and postoperative evaluation. Patients from all over the world are treated at Steadman-Hawkins, and they return for an assessment of their progress. Imaging is a noninvasive way to evaluate that progress, and the technique is becoming more and more precise for bones, soft tissue, and cartilage.

A Perfect Fit

The Foundation is recognized for its depth, detail, and sophistication of clinical research. We collect data points on every patient before, during, and after surgery on hips, knees, shoulders, and the spine. The data points are what our orthopaedic surgeons record in patient visits, actually see on a surgical video monitor, and match with what they observe during surgery. The cumulative result is a massive database that includes hundreds of pieces of information on each patient treated. The database system ensures that the evidence-based medicine practiced here will continue to grow and that it will be shared with physicians around the world through presentations, consultations, and publications.

Siemens is a perfect partner for Steadman-Hawkins. The company has been recognized for developing innovative diagnostic products, focusing on orthopaedics, and conducting research in prestigious universities. But until now, it has not developed a way in sports medicine to clinically evaluate its newest imaging technology, called the 3.0 Tesla MRI (Magnetic Resonance Imaging) Scanner. The 3.0 Tesla (3-T) has an advanced imaging system with twice the field strength of conventional MRI scanners, and it can increase the imaging resolution and speed multiple-fold.

The 3-T technology has been available for several years, but its clinical utility has not been validated or exploited in sports medicine. The machine also has a very large bore (opening) through which patients are scanned, a technical advancement other scanners do not have. This design won't make patients feel as confined, and it will allow for studies that require movement of joints. The Foundation will have another advantage because we will test and validate new software that is being developed specifically for the type of research being conducted here in Vail.

The Foundation will design imaging data collection forms and once the system is in place, it will begin collecting imaging data on our patients. Essentially, we will then analyze the imaging data and determine whether we can match what we are seeing on images with actual surgical operations. This validation process will allow us to advance imaging capabilities.

At the same time, it will give our physicians and scientists access to innovative imaging technology that will benefit our patients and our research initiatives. We will be able, for instance, to evaluate physiology of cartilage tissue and determine the health and regeneration of that tissue based on color in a totally noninvasive way, before and after treatment. Until now, we would look inside a joint and perhaps take a biopsy (invasively) just to evaluate the results of an operation or to measure progress.

If the patient happens to be an athlete, in many instances we think we will be able to determine the status of an injury without surgery and without keeping the player off the field until he or she recovers from the diagnostic procedure. Once we have clinically validated aspects of the 3-T imaging capabilities, it is likely that other centers dedicated to sports medicine will demand this high level of detail. The research conducted here will be a valuable contribution to orthopaedic sports imaging worldwide.

The Foundation's Commitment

Our Board of Directors has approved this new initiative, and Charles Ho, Ph.D., M.D., one of the world's leaders in musculoskeletal radiology, has agreed to become the Director of Imaging Research at the Foundation. Siemens will also appoint him to its advisory board for orthopaedic imaging. Dr. Ho currently serves on our Scientific Advisory Committee and practices in California. He has served as Regional Medical Advisor to the USA Decathlon Team, consultant to a number of professional sports teams and several medical device companies, and he reads many of the MRI images of our patients in Vail.

The Siemens 3.0 Tesla imaging system has been purchased, is being built in Germany, and should be in place by the end of 2008. Construction is being completed to house the system at Vail Valley Medical Center (VVMC). The Steadman-Hawkins Clinic will take MRIs of all clinic patients who require them.

We will establish a new fellowship for sports medicine radiology, in addition to the half-dozen fellowships in orthopaedics we already offer, and we believe the Foundation will then have the only dedicated radiology sports medicine fellowship in the country. We will add interns for imaging data collection, and we'll develop specific clinical research programs for the hip, shoulder, and knee — all initially done in conjunction with Siemens.

Your Support Is Needed

Even with the support of Siemens, this breakthrough research capability will be expensive. However, we believe that it is clearly within our mission and that it will further strengthen the Foundation as an international leader in evidence-based orthopaedic sports medicine and research. As in the past, our success will rely on the support of generous donors like you. We encourage you to ask questions, become more familiar with how this technology will benefit you and the world, and learn how you can support Imaging Research at the Foundation.

Lee Schmidt: A Lesson in the Art of Giving

By Jim Brown, Ph.D., Executive Editor, *Steadman◆Hawkins Research Foundation News*

Lee Schmidt is a Santa Fe artist and photographer. She is also a wife, mother, grandmother, businesswoman, horsewoman, teacher, and civic volunteer— all worthy titles, but to an outside observer, the thing Lee Schmidt does best is give.

She is a third-generation philanthropist with a family history — perhaps even a family mandate — of donating time, resources, and energy to causes that make differences in the lives of people around the world. Her grandfather established the Wheless Foundation, which has given substantial amounts of money to medical research (including the Steadman◆Hawkins Research Foundation), educational institutions, religious organizations, and charities, and that's just the short list.

Lee's father, a leader in the oil and gas business, has a well-documented record of generosity and involvement with the Shreveport community. "At 91," says Lee, "he is still the driving force behind the Wheless Foundation. He made me a member of the Foundation's board and taught me a lot about the process of making grants."

Lee and her three adult children, Tracey, Emily, and Hobson, established the Gumbo Foundation in 2002. The title reflects Lee's Louisiana roots and a wide variety of causes supported by the Foundation. She is president, her children are board members, and her husband Paul, a prominent Santa Fe attorney who specializes in estate planning, serves as secretary-treasurer and counsel, and he executes the decisions of the board.

"Our grants," explains Lee, "have been made to food banks, environmental organizations, medical centers, animal shelters, hurricane Katrina rebuilding efforts, art education, international aid agencies, and institutions of higher learning, including Centenary College (where Lee graduated and later served as a trustee), MIT (her father's alma mater), Tulane, Georgia Tech, Emory, and the University of North Carolina."

Getting to Vail

Lee had experienced a series of orthopaedic problems, including a torn rotator cuff and detached tendon. "I had lost function of my right arm and hand to the point of not even being able to hold a glass of water," she recalls. A Santa Fe friend suggested that she call the Steadman-Hawkins Clinic and try to schedule an appointment. Within two weeks she was in Vail to repair her rotator cuff and reshape her shoulder socket.

Over the past eight years, she has been treated by Dr. Peter Millett, Dr. Randy Viola, and Dr. David Karli for other orthopaedic problems. "Every time I put on a coat, reach up to do anything, or paint on my easel, I think of Dr. Millett," she says. "The outcomes were 100 percent what he promised me. I would go back to Dr. Millett without hesitation, and I would recommend him to anyone who has a shoulder or knee problem. I consider myself a walking ad for the Steadman-Hawkins Clinic.

"When Dr. Viola gave me his cell phone number to call if I had any questions or problems related to my medical condition," says Schmidt, "I realized that this was a different kind of place. It turned out to be just one way that Steadman-Hawkins Clinic and Foundation staff members go out of their way to make you a part of their team."

Waiting Room Reading Material

During a visit to the Clinic, she picked up a copy of the *Steadman◆Hawkins Research Foundation News*. At first, the programs described in the newsletter seemed to be interesting reading, but the more she read, the more she started to consider a possible relationship between the Wheless Foundation and the Steadman◆Hawkins Research Foundation. That interest led to a series of annual grants.

In 2002, the support expanded to include grants from the newly formed Gumbo Foundation. Again, the *Steadman◆Hawkins Research Foundation News* played a useful role in the process. The newsletter insert included an envelope to send a donation or to get more information. Lee did neither. Instead, she called the Foundation for details and spoke with Vice President for Program Development John McMurtry.

John sent her two proposals. One involved the Foundation's Fellowship Program, which enables young physicians to come to Vail and continue their orthopaedic training with some of the world's elite scientists and surgeons. The second was an opportunity to partially fund the development of dual-plane fluoroscopy. This technology will allow surgeons to look inside a person's knee, hip, or shoulder joint during real-time movement with comprehensive accuracy.

"I asked John to let me talk with my children about which option to choose," she says. "All three of them wanted to support the research project. My experience on the other side of fundraising efforts influenced my decision. Some grant money comes more easily than others, and I sensed that research projects like this one might have more difficulty in getting outside funding. Also, with Steadman-Hawkins, we have confidence in the way our donation will be used."

Photo: Tracey Hogan

Lee Schmidt with Fagin

The Gumbo Foundation's five-year commitment to dual-plane fluoroscopy technology will make it a pioneer in supporting research that will change the face of orthopaedic surgery.

Spreading the Word

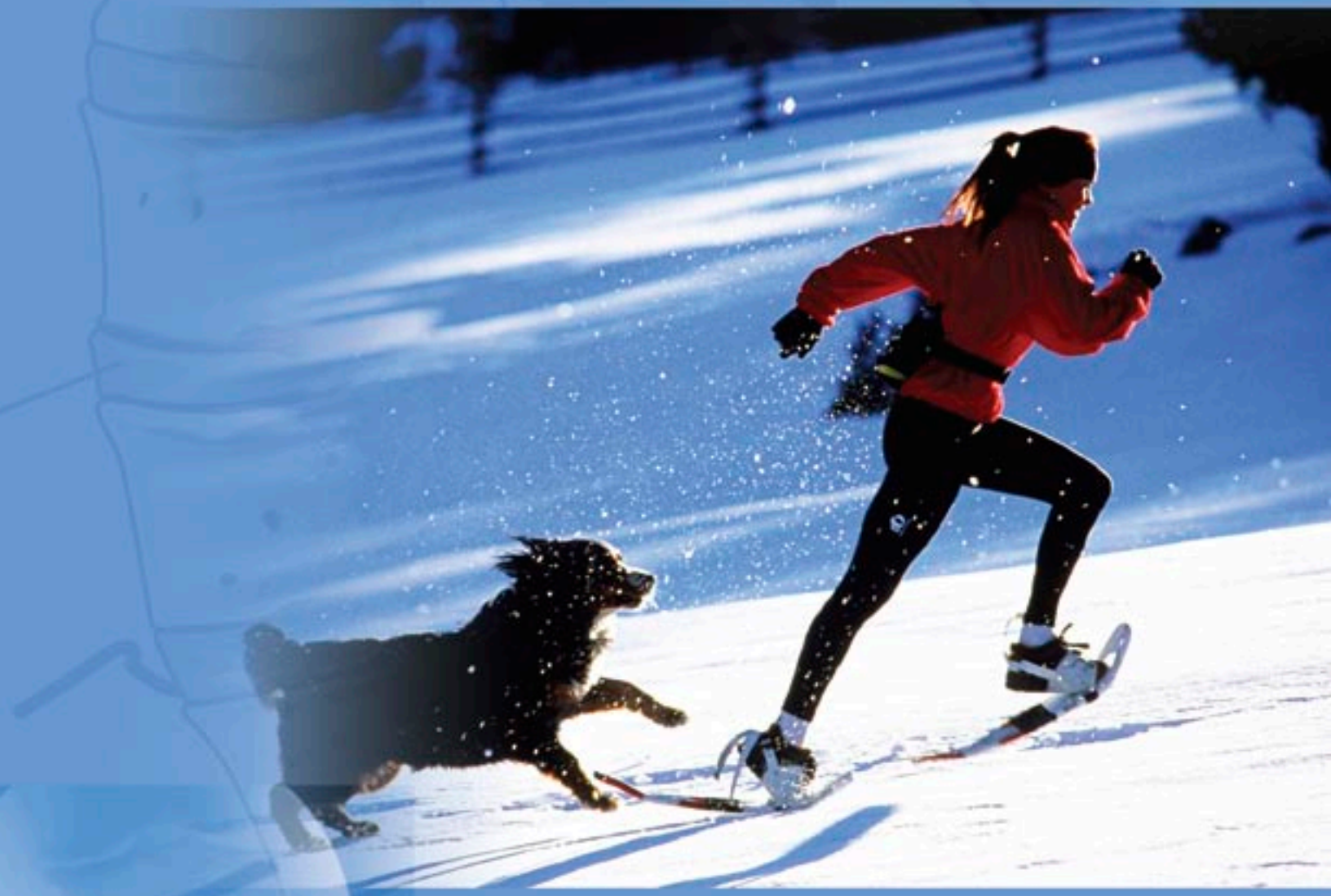
"I want to tell people who might consider supporting the Steadman◆Hawkins Research Foundation that they can be part of an effort that helps in exponential ways," she volunteers. "The Foundation shares its data and research findings with other physicians. The Fellows spread the expertise they acquired at Steadman-Hawkins with their patients and colleagues from now on. Supporting the Foundation is a way to support healing everywhere in the country."

Lee also has some kind words for the *Newsletter* and some advice for those who read it. "I had no personal contact with the Foundation before reading the *Newsletter*, but the invitation to become a supporter was inviting; it presented a giving alternative that our group could handle, and it told me whom to call and how to get more information. I called them. They didn't have to call me.

"I can't tell you how many times I've given a *Newsletter* or a copy of one of its articles to someone else. I encourage those of you who read it to share it with friends and relatives," she concludes.

Lee Schmidt first came to Steadman-Hawkins to receive something as a patient, not to give. That quickly changed. She started giving back to the Foundation and continues to do so. She can't help herself. It's in her DNA. It's who she is. Now she's an unofficial, unabashed, unpaid advocate for the life-changing work being done by the Steadman◆Hawkins Research Foundation. She thinks you ought to be one, too.

Friends of the Foundation



In 2007, we received contributions and grants from 878 individuals, foundations and corporations. This combined support, including special events, amounted to more than $3,268,397.

The Steadman◆Hawkins Research Foundation is grateful for this support and to those who have entrusted us with their charitable giving.

We are especially pleased to honor the following individuals, foundations, and corporations who have provided this support. Their gifts and partnership demonstrate a commitment to keep people active through innovative programs in medical research and education. Without this support, our work could not take place.

1988 Society

Lifetime Giving

On November 9, 1988, the Steadman◆Hawkins Research Foundation was incorporated as a not-for-profit educational and research organization dedicated to advancing modern medical science and the education of young physicians. The Foundation is deeply grateful to the following members of the distinguished 1988 Society whose cumulative giving totals $1 million or more.

Mr. Herbert Allen

Mr. and Mrs. George N. Gillett, Jr.

Mr. Kenneth C. Griffin

Vail Valley Medical Center

Dr. and Mrs. J. Richard Steadman

Education and Research Grants

Sharing our research findings throughout the world is a vital part of our educational and research mission. We wish to thank the following sponsors for their support:

European Visiting Scholar, sponsored by Arthrex, Inc

Brazilian Visiting Scholar, sponsored by Jorge Paulo Lemann

Sports Medicine Imaging Research Fellowship, sponsored by Siemens

Bioskills Research and Education Grant, sponsored by Smith & Nephew

HALL OF FAME

The Steadman◆Hawkins Research Foundation is grateful to the following individuals, corporations, and foundations for their support of the Foundation in 2007 at a level of $50,000 or more. Their vision ensures the advancement of evidenced-based medical research, science, and care, as well as the education of physicians for the future. We extend our gratitude to these individuals for their generous support:

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We are grateful to the following individuals, foundations, and corporations who contributed $20,000-$49,999 to the Foundation in 2007. Their continued generosity and commitment helps fund research such as enhancing cartilage healing. This potentially innovative treatment will help preserve the body's own joints and tissues by leading to improved quality and quantity of "repair" cartilage produced by the microfracture technique, a procedure impacting multitudes worldwide.

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SILVER MEDAL CONTRIBUTORS

Silver Medal donors contribute $5,000-$19,999 annually to the Foundation. Their support makes it possible to fund research to determine the effectiveness of training programs to prevent arthritis, identify those who are most at risk for arthritis, and provide a basic foundation to improve post-surgical rehabilitation programs, thus improving the long-term success of surgical procedures. We extend our deep appreciation to these following individuals for their generous support in 2007:

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The Founders' Legacy Society

Over the years, the Steadman◆Hawkins Research Foundation has been privileged to receive generous and thoughtful gifts from friends and supporters who remembered the Foundation in their estate plans. In fact, many of our friends—strong believers and supporters of our work today—want to continue their support after their lifetimes.

Through the creation of bequests, charitable trusts, and other creative gifts that benefit both our donors and the Foundation, our supporters have become visible partners with us in our mission to keep people physically active through orthopaedic research and education in arthritis, healing, rehabilitation, and injury prevention.

To honor and thank these friends, the Founders' Legacy Society was created to recognize those individuals who have invested not only in our tomorrow, but also in the health and vitality of tomorrow's generations.

Our future in accomplishing great strides—from understanding degenerative joint disease, joint biomechanics, and osteoarthritis, to providing education and training programs—is ensured by the vision and forethought of friends and supporters who include us in their estate plans. The Foundation's planned giving program was established to help donors explore a variety of ways to remember the Foundation. We are most grateful to these individuals for their support in becoming founding members of the Founders' Legacy Society:

Mr. and Mrs. Robert M. Fisher

Ms. Margo Garms

Mr. Albert Hartnagle

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Chairs Support Foundation Work

The education of orthopaedic surgeons is a critically important mission of the Steadman◆Hawkins Research Foundation. Academic Chairs provide the continuity of funding necessary to train physicians for the future, thus ensuring the continued advancement of medical research. Currently, more than 160 Steadman-Hawkins Fellows practice around the world. We wish to express our gratitude and appreciation to the following individuals and foundations that have made a five-year $125,000 commitment to the Fellowship Program to support medical research and education. In 2007, eight chairs provided important funding for the Foundation's research and educational mission. We are most grateful for the support from the following:

Mr. and Mrs. Harold Anderson

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Medical research and education programs are supported by gifts to the Steadman◆Hawkins Research Foundation's annual fund. The Bronze Medal level was created to recognize those patients and their families, trustees, staff, and foundations who contribute $10-$4,999 annually to the Foundation. Donors at this level support many programs, including the Foundation's research to validate the success of new treatments for degenerative arthritis and identify factors that influence success. We thank the following for their support in 2007:

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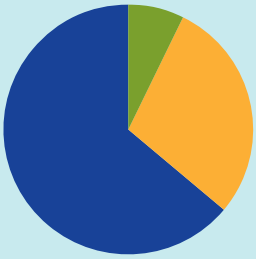
The Face of Philanthropy Highlights in 2007

2007 New Gifts

Steadman◆Hawkins Research Foundation supporters—individuals, corporations and foundations—increased their philanthropy in 2007.

Total: $3,268,397

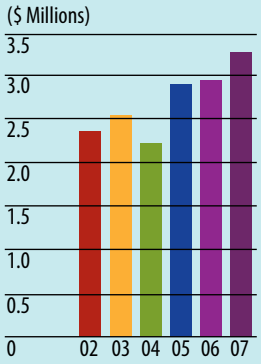


Foundations and Grants $242,215
Corporations $926,000
Family and Friends $2,100,182

Increasing Generosity

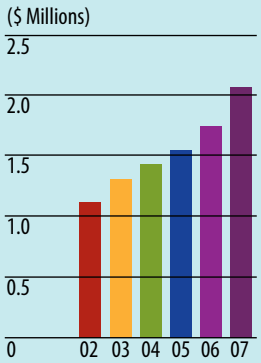
Individuals, corporations and foundations contributed $3,268,397 in 2007, breaking the record for total giving.

Six years of support.



Annual Giving

The generosity of our friends making annual gifts to the Foundation between 2003 and 2007 has shown a positive trend. In 2007, contributions including special events totaled $2,100,182.



Fellowship Benefactors

Fellowship Benefactors fund the research of one Fellow for one year at a level of $10,000. This is a fully tax-deductible contribution that provides an opportunity for the benefactor to participate in a philanthropic endeavor by not only making a financial contribution to the educational and research year but also to get to know the designated Fellow. Each benefactor is assigned a Fellow, who provides written reports and updates of his or her work. We extend our gratitude to the following individuals for their generous support:

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Pepsi 2007 Steadman-Hawkins Golf Classic Presented by RE/MAX International, August 16

The Steadman◆Hawkins Research Foundation was selected by RE/MAX International, a global real estate firm, to hold the fourth Steadman-Hawkins Golf Classic at the Sanctuary, a premier golf resort located south of Denver. Proceeds from the tournament support the development of new procedures and methodology to battle degenerative arthritis. The tournament was open to the public and included grateful patients and corporate supporters.

The Foundation is grateful to Dave and Gail Liniger, owners and co-founders of RE/MAX International, who created this unique opportunity for the Foundation to develop and enhance relationships with those who support our mission. In addition, we wish to express our sincere appreciation to the following sponsors and participants:

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US Bank Presents the 2007 Steadman-Hawkins Winter Winemaker Festival Featuring Château Smith Haut-Lafitte Vineyards

The fourth annual Steadman-Hawkins Winter Wine Festival, Sunday, January 13, brought together two of the world's finest vintners, Daniel and Florence Cathiard, and one of the world's great chefs, Thomas Salamunovich at Vail's Larkspur Restaurant.

During this elegant evening, Daniel and Florence Cathiard of Bordeaux-Martillac, France, owners of Château Smith Haut-Lafitte, presented their award-winning wines while guests mingled with the Cathiards. Renowned Larkspur chef Salamunovich created a specially designed menu to complement the featured wines.

In its first three years, this high-end event has been oversubscribed and has attracted some of the world's finest wines and winemakers from Bordeaux, Napa, and Sonoma. The festival has featured principals and winemakers from Château Angélus, Caymus, Château Cos d'Estournel, Château Latour, and Château Pichon.

We wish to extend our thanks to the following for their help in making this a special evening:

Dr. and Mrs. J. Richard Steadman

Mr. Jay Bauer

Mr. Bill Burns and US Bank

Daniel and Florence Cathiard and Château Smith Haut-Lafitte

Mr. Kevin Furtado

Mr. and Mrs. George Gillett

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Inverness Hotel and Golf Course

Mr. and Mrs. David Liniger and Sanctuary Golf Course

Mr. and Mrs. Steven Read

Mr. Larry Ruvo and Southern Wines and Spirits of Nevada

Mr. Thomas Salamunovich and Larkspur Restaurant

Mr. William Schneiderman and the Ritz-Carlton Club

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John Kelly: An Elite Photographer Takes His Shoulder, His Hip, and His Talent Into a Steadman-Hawkins Operating Room

By Jim Brown, P.h.D, Executive Editor, Steadman◆Hawkins Research Foundation News

You've seen a John Kelly photograph. It might have been a movie star (Robert Redford, Brad Pitt), a famous athlete (Palmer, Nicklaus, Watson, McEnroe, Borg), British royalty (Princess Diana), or a rock star (Mick Jagger). A different kind of John Kelly image might be locked in your mind forever. It could be the Golden Gate Bridge, scenes from the American West, the Winter Olympics, a child's face, or even an old cat sitting on a fence post at Kelly's End of the Road Ranch in western Colorado.

But the John Kelly photos you have not seen are the X-rays of his dislocated hip and the pictures of his torn rotator cuff that took him from friend and supporter of the Steadman◆Hawkins Research Foundation to a patient who needed treatment. "I had been doing photographs for the Foundation for a long time, but the high point was putting on the scrubs and watching the Steadman-Hawkins doctors perform surgery," says Kelly. "It was like watching a world-class event. I was amazed at how good and how calm they were. When you observe a tennis champion like Borg or McEnroe, it seems like every serve is perfect. It's that way with these doctors, but they can't have a double fault."

A Bad Ski Wreck

Kelly, a self-taught photographer who began taking pictures while serving as a first lieutenant in Vietnam, was shooting a national advertising campaign in Breckenridge, Colorado, when he suffered a 100 percent dislocation of his right hip in a "bad ski wreck," as he describes it. He got immediate medical care at Steadman-Hawkins but was warned that the injury would come back to haunt him. It did. His hip degenerated over an eight-year period, making it difficult to do things he liked to do personally and professionally — trekking across mountain ranges, cycling, riding horses, working on his ranch.

But it was a recurring shoulder injury that resulted in Kelly's first visit to a Steadman-Hawkins operating room. Over the years, his adventure-heavy lifestyle resulted in a torn rotator cuff. It was repaired in February 2005 by another young Steadman-Hawkins surgeon named Dr. Tom Hackett, a specialist in the arthroscopic treatment of sports injuries who trained under Dr. Frank Jobe, the famed physician who developed the "Tommy John" procedure. Dr. Hackett's skills and reassuring manner dispelled many of the doubts Kelly would have toward a more complicated surgery he would face in the future.

In the meantime, another world-class professional, Dr. Marc Philippon, had left Pittsburgh, joined the staff at Steadman-Hawkins, and was one of the pioneers of a procedure to address a condition known as femoroacetabular impingement (FAI). FAI causes damage to the hip socket's labrum, as well as to the articular cartilage in the hip. Kelly underwent hip surgery in December 2005 to repair the labrum, but the procedure also involved cleaning out a "debris field" around the hip joint and performing microfracture on the top of the femur.

Through all of this, one of the lessons learned was the importance of rehabilitation. You can have a great surgical repair, but it is the rehab that will give you a great result. "Rehab is crucial," says Kelly, "you've got to do the rehab. Having a stationary bike and Sport Cord at home is essential."

For 30 years, he has known Dr. Steadman's innovative therapists, John Atkins and Topper Hagerman, when they were directing the conditioning and rehabilitation programs for the U.S. Ski Team. They teamed up with Steve Stalzer of Howard Head Sports Medicine Center to supervise his rehab regimen while he was on the mend. "You blow any advantage you gain from the world-class surgeons upstairs if you don't take advantage of the boys downstairs," advises Kelly.

Multi-Layered Relationship

So John Kelly's relationship with Steadman-Hawkins involves several layers. He has known Steadman-Hawkins Founder and Chairman Dr. Richard Steadman, John Atkins, Topper Hagerman, and Vice President for Program Advancement John McMurtry from the old days when he was doing "shoots" with the U.S. Ski Team. He has been treated for two major injuries at the Steadman-Hawkins Clinic, and he has provided photos to the Foundation for newsletters, annual reports, and other publications.

"I can't give them $100,000," explains Kelly, "but I can give them $100,000 in free photographs. I wanted the Steadman◆Hawkins Research Foundation to succeed long before I needed its help; then all of a sudden, I needed the kind of treatment the Foundation's research had made possible.

"Every year when I do the annual report, I get to meet the Steadman-Hawkins staff," adds Kelly. "You realize that this group of professionals, including some of the brightest interns in orthopaedic research, comes from all over the world. When they want to know if something new is happening, they don't have to read about it. They can go downstairs and watch cutting-edge science in real time.

"Now I get to photograph the work of highly skilled physicians performing procedures in the operating room that have either been developed or refined at Steadman-Hawkins. I can take photos of athletes moving on a $60,000 specially constructed treadmill that could result in injury prevention and treatment for years to come. I saw Dr. Sterett taking time in the middle of the day to film the movement of a knee so he could better understand the forces placed on it during athletic performance."

John Kelly has lived an exciting life and there is a lot more adventure in his future. But he seems to get just as excited about photographing the work inside the Steadman◆Hawkins Research Foundation as he does in shooting images of celebrities or taking pictures of breathtaking landscapes around the world.

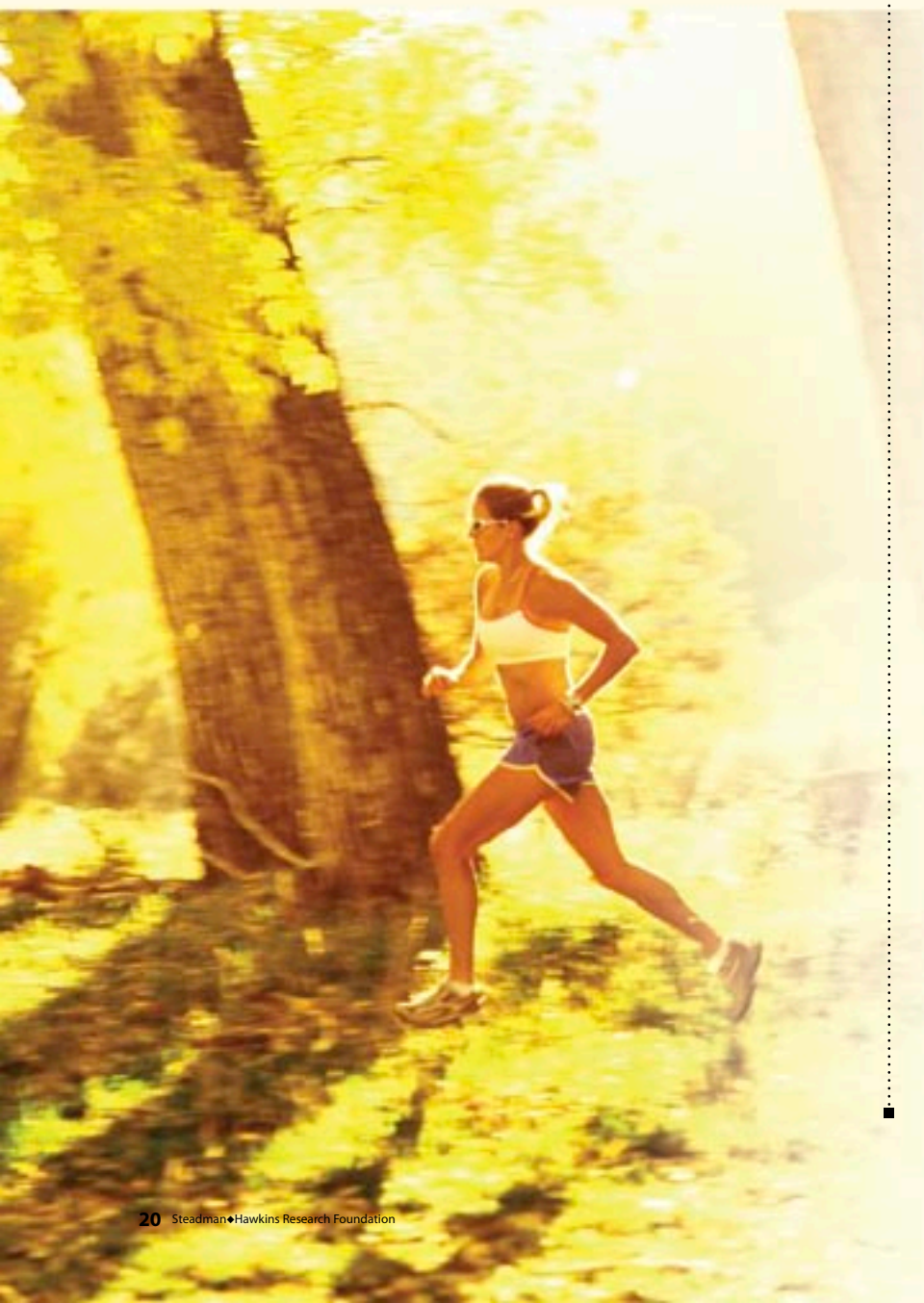
He has a world-class reputation as a photographer, he has experience as a patient who has benefited from the research conducted by the Foundation, and he contributes valuable works of photographic art so that the rest of the world can get a glimpse into the world of orthopaedic research being conducted at Steadman-Hawkins. This triple-threat combination gives Kelly a unique perspective and a powerful platform as an advocate for the Steadman◆Hawkins Research Foundation.

John Kelly on his ....

- **Most challenging shoot** - "The Winter Olympics because of the cold weather and because I have to work my way around 100,000 people to get the shots I want."
- **Most rewarding shoot** - "There is a reward for every job. My reward is making clients happy."
- **Most interesting celebrity shoot** - "Robert Redford. It has been an absolute thrill to be associated with him. He is a gentleman, an award-winning actor and filmmaker, and a person who can talk sports, history, and politics just as easily as he can talk about show business."
- **Most recognized photograph** - "It would have to be either Tom Watson's chip to win at Pebble Beach, Jack Nicklaus's birdie putt to win the 1980 U.S. Open, John McEnroe's first win at Wimbledon, or Bjorn Borg on his knees after a five-set victory to win his fifth Wimbledon in a row."
- **Best advice for amateur photographers** - "You have to go out and shoot. All cameras are about the same, but everyone has a different eye. Practice. There is an opportunity for every amateur photographer to take a dramatic photo. I took a picture of a cat sitting on top of a fence post that sold in Europe for $25,000."

Corporate and Institutional Friends

Corporate support helps fund the Steadman◆Hawkins Research Foundation's Research and Education Programs in Vail, Colorado, and at six university sites. The Foundation is grateful for the generous support of our corporate donors. In 2007, we received $926,000 in corporate support. This work will benefit patients and physicians for generations to come.



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The Year in Research and Education

Basic Science Research

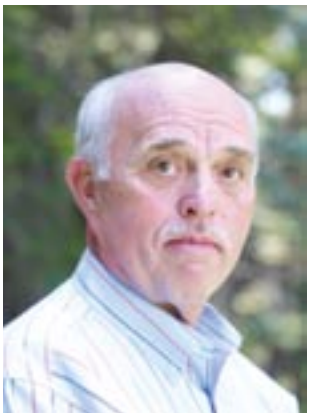
William G. Rodkey, D.V.M., Director

The purpose of our Basic Science Research is to gain a better understanding of factors which lead to: (1) degenerative joint disease; (2) osteoarthritis; (3) improved healing of soft tissues such as ligaments, tendons, articular cartilage, and meniscus cartilage; and (4) new and untried treatment approaches. Our focus is to develop new surgical techniques, innovative adjunct therapies, rehabilitative treatments, and related programs that will help delay, minimize, or prevent the development of degenerative joint disease. In 2006, we collaborated with various educational institutions, predominantly Colorado State University and Michigan State University. We believe that our combined efforts will lead directly to slowing the degenerative processes, as well as finding new ways to enhance healing and regeneration of injured tissues.

The relatively new area of regenerative medicine is an exciting one that has gained global attention. There are many new and innovative techniques under investigation by scientists around the world. One of the broad goals of this work can be stated simply as joint preservation. In 2007, we focused our efforts almost exclusively on regeneration of an improved tissue for resurfacing of articular cartilage (chondral) defects that typically lead to degenerative osteoarthritis. We have been working in the promising area of gene therapy in collaboration with Drs. Wayne McIlwraith and David Frisbie at Colorado State University. We have now completed our initial studies, and we have enough important data to take this project to the next level. As previously reported, in 2006 we also published an extremely important manuscript that examined the effects of leaving or removing a certain layer of tissue during lesion preparation for microfracture. This manuscript will help guide surgeons and should improve outcomes of microfracture performed by surgeons worldwide.

The following provides some background information and a summary of our most recent findings. This work is ongoing, and the encouraging results presented here will allow us to continue to focus on this endeavor in the coming years.

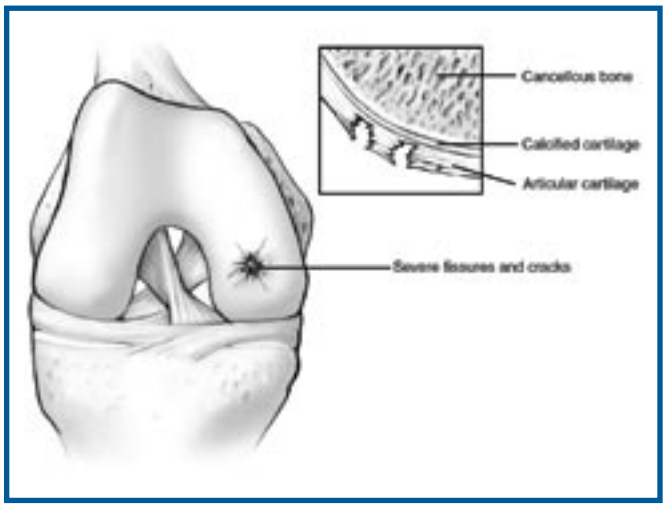
Osteoarthritis (OA) is a debilitating, progressive disease characterized by the deterioration of cartilage accompanied by changes in the bone and soft tissues of the joint. Traumatic injury to joints is also often associated with acute damage to the articular cartilage. Unfortunately, hyaline articular (joint) cartilage is a tissue with very poor healing or regenerative potential. Once damaged, articular cartilage typically does not heal, or it may heal with functionless fibrous scar tissue. Such tissue does not possess the biomechanical and biochemical properties of the original hyaline cartilage; hence, the integrity of the articular surface and normal joint functions are compromised. The result is often OA.



William G. Rodkey, D.V.M.

The importance and the global impact of OA must not be underestimated. The U.S. Centers for Disease Control estimates that in the next 25 years at least 71 million Americans (15 percent to 20 percent of the population) will have arthritis, including degenerative arthritis secondary to injury to the articular cartilage surfaces of the joints. Osteoarthritis is the most significant cause of disability in the United States and Canada, moving ahead of low back pain and heart disease. By the year 2020, more than 60 million Americans and six million Canadians will be affected by some degree of osteoarthritis of just the knee. OA of other joints will raise this number significantly. The economic impact is enormous. Osteoarthritis alone will consume more than $85 billion of direct and indirect costs to the American public in 2008. The intangibles of this terrible disease include the chronic pain, disability, and psychological distress on the individual as well as the family unit. We believe that our research can have far-reaching effects by greatly enhancing the resurfacing of damaged or arthritic joints before the disease process reaches an advanced and debilitating state.

Several of our earlier studies have shown that a technique, arthroscopic subchondral bone plate microfracture, is a successful method to promote adequate cartilage healing. "Microfracture" consists of making small perforations in the subchondral bone plate using a bone awl to access the cell population and the growth factors that exist in the underlying bone marrow. The technique relies on the body's own cell population and healing proteins present in the marrow to promote healing, thus avoiding concerns of immune reactions to transplanted tissues or the need for a second surgical site or second surgery to collect grafts or cells. When we evaluated the healing of full-thickness chondral defects in exercised horses, we were able to show that the use of microfracture increases the amount of repair tissue present in the defect and improved the quality of cartilage repair by increasing the amount of Type II collagen (found in normal joint cartilage) present in that repair tissue. Although microfracture was able to increase the major building block of articular cartilage tissue, it did not enhance the production of the other major components of cartilage thought to be necessary for long-term joint health. Additionally, as we have previously reported, we have found the mechanical aspect



Removal of the calcified cartilage layer will enhance the attachment of the repaired tissue.

of removing a deep layer of the cartilage, called the calcified cartilage layer, is critical for optimal formation of repair tissue and healing to the subchondral bone. Our work in horses also helped us confirm and refine the rehabilitation program for patients undergoing microfracture.

With respect to our work on the calcified cartilage layer, we had observed that leaving calcified cartilage inhibits the tissue healing and repair response after microfracture. Therefore, we hypothesized that removal of the calcified cartilage with retention of the underlying (subchondral) bone would enhance the amount of attachment of the repair tissue compared to retention of the calcified cartilage layer. We confirmed our hypothesis, and these findings were published in the prestigious *American Journal of Sports Medicine* in 2006.

The repair and healing of cartilage defects involve specific hormones and growth factors entering the wound in a given order while minimizing the negative effects of various inflammatory cytokines that can slow or even prevent healing. In conjunction with work we supported at Colorado State University, investigators explored an animal model of gene therapy treatment to supply adenoviral vectors carrying the genes of interleukin-1 receptor antagonist protein (IL-1ra) and insulin-like growth factor-1 (IGF-1). We hoped to minimize the negative effects of inflammation while enhancing repair of full-thickness equine chondral defects treated with microfracture. Questions asked were whether such treatment could (1) increase proteoglycan and Type II collagen (the "building blocks") content in the repair tissue; (2) improve the macroscopic and histomorphometric aspect of the repair tissue; and (3) induce prolonged and increased IL-1ra (to decrease inflammation) and IGF-1 (to enhance healing) production in treated joints. Twelve horses had full-thickness chondral defects made in their joints followed by microfracture. Joints were injected with either the equine IL-1ra/IGF-1 adenoviral preparation (the experimental treatment) or a special salt solution (the placebo control). Sixteen weeks later, defect healing was evaluated visually, histologically, histochemically, and biochemically. Production of IL-1ra and IGF-1 was measured by sophisticated laboratory techniques, including enzyme-linked immunosorbent assay (ELISA) and radioimmunoassay. These tests confirmed increased proteoglycan content in treated defects along with augmented Type II collagen associated with substantial transgene expression of IL-1ra during the first three weeks. These findings strongly suggest that gene therapy can improve the biologic processes associated with chondral defect repair. The next step in this research is to examine use of an adeno-associated viral vector because other studies indicate that this vector is completely safe to humans. Our original adenoviral vector could potentially cause disease in humans.

Our basic laboratory model work on the ACL "healing response" is now complete. This information will help other orthopaedic surgeons gain confidence with the healing response procedure, making them more likely to perform it. In so doing, fewer patients will require the expense, time, inconvenience, and discomfort of a formal ACL reconstruction. Additionally, other patients unwilling to have ACL reconstruction can be offered an alternative with much less morbidity. Interestingly, this study has raised some additional questions that we believe can be answered, at least in part, with additional laboratory studies. We will collaborate with other investigators and use an animal model to determine whether making puncture holes in a ligament graft at the time of implantation can lead to more rapid and complete formation of new blood vessels in the graft. If so, and if the number of punctures can be optimized, then faster and more complete healing enhancement of the ACL graft might be possible.

And finally, we are in the early stages of exploring the feasibility of two other areas of research. One area involves the new and exciting use of shock wave therapy to stimulate tissues to heal more rapidly. This shock wave therapy is similar to that used to pulverize kidney stones so that they may be passed without invasive surgery. The second area being considered involves the use of mesenchymal stem cells, that come from the patients themselves, as an adjunct to microfracture. That is, there is no use of embryonic stem cells, nor is there a necessity to find donors. Each patient is his/her own source of the stem cells. We believe that there is a simple and inexpensive way to produce these stem cells, and when added to the microfracture site, these stem cells will significantly enhance the speed and intensity of the healing process. If we can prove this method successful, it is likely that the rehabilitation protocol can be greatly accelerated, thus minimizing discomfort, lost time away from work or sports, and overall financial costs.

These are exciting times, and we feel that some very exciting research results lie just ahead for the Basic Science Research group and the Steadman◆Hawkins Research Foundation.

Brian Simmons: Getting Back on Feet Not Enough

By Jim Brown, Ph.D, Executive Editor, Steadman◆Hawkins Research Foundation News

"I can do more now than before I got hurt," says Brian Simmons, the 48-year-old, Chicago-based founder and partner of Code, Hennessy & Simmons, an investment firm that manages more than $2.5 billion in private equity capital. "I'm probably a better skier and my left knee (the one that was injured) is more stable than my right one."

Brian is talking about an injury that happened in December of 2006. "I was skiing with my son and a friend in Aspen. About halfway down one of the pitches, I had a feeling that was like tearing a piece of Velcro in my left leg. I knew something bad had happened, but when I sat down, took my ski off, and stretched my leg out, it stopped hurting."

He skied — slowly and carefully — to the bottom of the mountain and then drove himself to the emergency room of a hospital in Aspen, where an MRI was taken. "I was told that I had probably torn my ACL (anterior cruciate ligament), and I knew that was about the worst thing that can happen to a knee."

Two days later, he was in Vail to see Dr. Richard Steadman at the Steadman-Hawkins Clinic. Some of his friends in Chicago had suffered similar injuries and knew Dr. Steadman "all too well."

"He looked at my MRI, confirmed the diagnosis, and said there were two ways to fix my ACL," recalls Simmons. "One option was to replace it with a graft from my own body or someone else's. In other words, a total reconstruction of the knee. The other was the 'healing response,' a relatively noninvasive procedure Dr. Steadman and his colleagues have developed at the Foundation."

The Healing Response

The healing response is an alternative to ACL reconstruction that uses microfracture holes punched into the bone to induce the formation of a "super clot." This clot stimulates an environment for tissue healing. The ligament then gradually reunites to the bone without having to be mechanically attached. By avoiding a more invasive procedure, this method greatly reduces recovery time and healthcare costs.

"Even though Dr. Steadman kept giving me treatment options," says Simmons, "I told him I was not shopping around. I wanted him to use his best judgment about how to treat my injury and to proceed. I also liked the idea of having surgery in a sports medicine clinic rather than in a traditional hospital, and I wanted this done where the doctors were not just interested in getting me back on my feet, but back on to my skis." Two weeks later, Dr. Steadman performed the microfracture/healing response procedure on Brian's left knee.

Recovery: Demanding, But Fast

Simmons' recovery was demanding, but relatively fast. The toughest part, he recalls, was doing exercises five times a day for five weeks and otherwise keeping his leg immobilized. Each exercise session lasted 10-20 minutes, followed by 20 minutes of ice applications. After five weeks of isometric exercises for strength and flexibility exercises to improve joint mobility, he began more aggressive workouts to strengthen the knee and the muscles around it.

"By May of 2007 I was able to run and in December I was skiing again," says Brian. "The injury was a wake-up call. I realized that I was either going to have to give up some of the things I like to do, or I was going to have be in better physical condition. I was in great aerobic shape, but too one-dimensional. I needed to improve my overall strength and build muscle to support my knee."

The Cindy Nelson Connection

"I was generally aware of the Steadman◆Hawkins Research Foundation, but I think I probably first heard more about it from Cindy Nelson, the former Olympic skier and Foundation Board of Directors member who runs an organization called Here to Help Vail," says Brian. "Her group provides assistance to orthopaedic surgery patients, and they were very helpful to us.

"After visiting with some of the doctors and technicians at the Foundation, and after some conversations with John McMurtry, my wife, Julie, and I decided to make a five-year commitment to the Steadman◆Hawkins Research Foundation. We did it for two reasons. One was to pay a debt of gratitude for giving my knee back to me. The other was because the healing response is something that came directly out of research conducted at the Foundation.

"Julie and I were particularly interested in supporting the Foundation's effort to train more physicians in procedures like microfracture and the healing response, which is why we dedicated our support to the Foundation's Fellowship Program."

Brian concludes, "We understand that philanthropy is an individual decision. But it seems to me that the money the Foundation raises is going directly into meaningful advances in orthopaedic surgery, specifically for athletes and people who want to remain active throughout their lives."

Clinical Research

Karen K. Briggs, M.P.H., M.B.A., Director. Marilee Horan, B.S.; Lauren Matheny B.A.; Sarah Kelley-Spearing, B.S.; Research Associates. David Kuppersmith B.S., Senior Research Intern; Katie Maland, B.S.; Tiffany Tello, B.S.; Conner Hay, B.S.; Greg Lichtman B.S., Research Interns.

The goal of Clinical Research at the Steadman◆Hawkins Research Foundation is to conduct outcomes-based research in the area of orthopaedic medicine that will aid both physicians and patients in making better-informed decisions regarding treatment. To achieve that goal, Clinical Research gathers data from patients before and after surgery for knee, shoulder, hip, and spine disorders. Information that is stored in a database provides a tool to understand the patient's perspective and is the key to our research. The focus is improvement of function and quality of life. Future research will target predictors of disability caused by arthritis, predictors of successful surgery, predictors of patient satisfaction, patient expectation of treatment, and patient outcomes following surgery.

KNEE RESEARCH

Alternative Osteoarthritis Treatment: Non-Surgical Unloader Brace for Treatment of Knee Malalignment and Osteoarthritis

Osteoarthritis commonly affects the older, active patient. Malalignment of the knee may increase the severity of osteoarthritis. A good option for patients who have osteoarthritis and knee malalignment problems, and who would like to try a non-surgical treatment option, is an unloader brace. An unloader brace is a specific type of brace used to shift knee loading from the degenerative compartment to the opposite compartment (i.e., from the left side of the knee to the right side of the knee). Unloader braces are designed to decrease the load on the degenerative compartment of the knee in order to improve function and decrease symptoms related to malalignment and osteoarthritis. The purpose of this study was to document outcomes following six months of use of an unloader brace. Outcomes and response to the brace were measured by symptoms, such as pain and stiffness, function, use of pain medication, and quality of life.

Left to right: Sarah Kelley-Spearing, Lauren Matheny, Karen Briggs, M.B.A., M.P.H., Marilee Horan

We conducted a study following patient function and symptoms after unloader brace treatment. These patients wore the unloader brace and reported their knee function and symptoms at three weeks, 12 weeks and six months. At three weeks, 24 percent of patients reported a decrease in over-the-counter anti-inflammatories, and 16 percent reported a decrease in prescription anti-inflammatories. At six months, 23 percent reported a decrease in over-the-counter anti-inflammatories and 16 percent reported a decrease in prescription anti-inflammatories. Overall, we found that the unloader brace decreased patients' symptoms and improved function, as well as reduced medications and improved patients' physical health. This study will be presented as a poster at the 2008 Osteoarthritis World Congress.

Treatment with Hylan G-F 20 and Corticosteroid: Expectations of Treatment and Outcomes Six Months Following Treatment

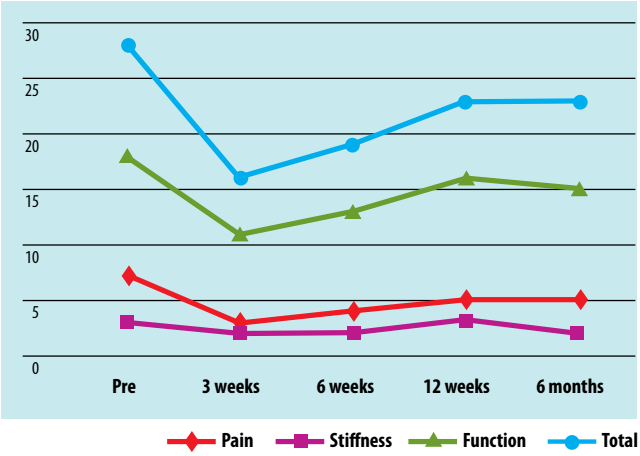
The prevalence of osteoarthritis (OA) is constantly increasing, currently affecting 4.3 million adults in the United States alone, and making this chronic joint disorder the most

Evidenced-based medicine and how it is being developed at the Foundation

Since 1993, the Foundation has entered the records of every patient seen at Steadman-Hawkins into a massive database. Approximately 450 pieces of information, objective and subjective, exist on every patient. Patient outcomes are tracked 5-10 years after surgery. The goal is to monitor progress over a number of years to determine how long patients experienced continued improvement and whether they required additional surgery. The evidence-based information related to patient outcomes is made available to physicians around the world through presentations, consultations, and publications, contributing to their continuing medical education.

WOMAC Score before and after a Hylan G-F 20 and corticosteroid injection

The WOMAC score is divided into 3 categories: pain, stiffness, and function. It is validated to measure outcomes following treatment for osteoarthritis.



prevalent worldwide. Although pain-relieving medications and surgical interventions are available, these are not always appropriate treatment options. Traditional non-steroidal anti-inflammatory drugs (NSAIDs) alone are not always effective at relieving osteoarthritis pain, and surgery, such as arthroplasty, may not be indicated or be an appropriate treatment for patients who want to remain at a high level of activity and function. As more and more people are afflicted with this disease, physicians are turning to alternative conservative treatment options in the face of OA.

In order to address this disease, medical companies are creating conservative (non-surgical) treatment options that physicians are increasingly choosing to implement in their practices. One example of these conservative treatments for osteoarthritis is a viscosupplementation. This treatment consists of Hylan G-F 20 (Synvisc) and a corticosteroid, which are injected into the knee joint in order to increase joint lubrication. Considered a conservative treatment, hyaluronic acid injections could delay further operative treatments by temporarily relieving symptoms such as pain. This joint lubrication is meant to decrease pain caused by the lack of articular cartilage on the femur and tibia when they rub together.

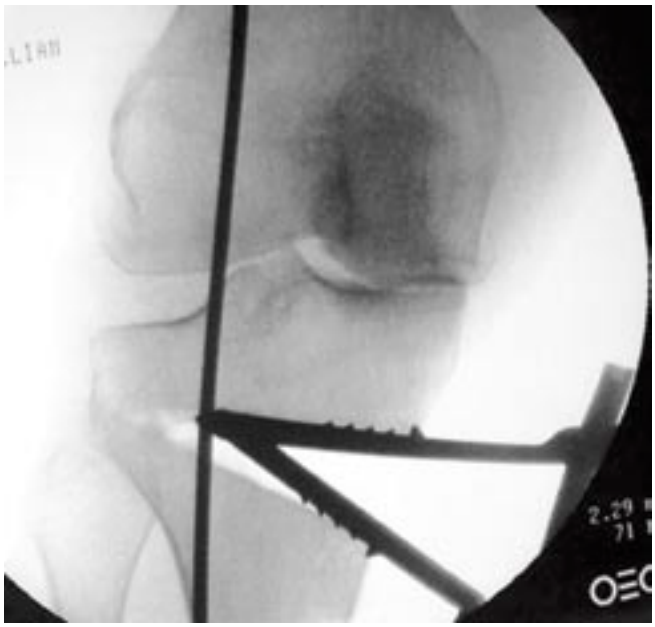
An important aspect to consider, when treating patients with osteoarthritis, is patients' expectation of treatment. This topic is an increasingly important issue in the medical field. Lack of knowledge of expectations can lead to inappropriate treatment, decreased patient satisfaction and failure to return for subsequent treatment or elective surgery. By identification of patients' expectations, better clinical care and more suitable treatment options may be offered, and communication between physicians and patients may improve. Patient expectations can be used as a clinical instrument in order to assess the most appropriate and realistic treatment for each individual, which aids physicians in determining treatment options and affording the patient more satisfactory results. By improving patient selection, improvements in patients' satisfaction and outcomes may be seen.

We conducted a study to document outcomes and patient expectations following a treatment protocol in which corticosteroid was used in addition to the initial Hylan G-F 20 injection in a series of three injections. Results have shown that overall knee function increased at six months, and overall pain decreased at six months. All patients reported pain as a reason for seeking medical treatment. Pain relief was very important to only 66 percent of patients and somewhat important to 12 percent. If patients did expect pain relief, 43 percent expected most of the pain to be relieved and 36 percent expected all pain to be relieved. Thirty-seven percent also reported stiffness as a primary reason for seeking medical treatment. Only 54 percent of the patients expected knee stiffness or swelling to stop. Improving their ability to walk was considered very important in 89 percent. Of those who considered walking important, they expected to walk more than one mile. Patients considered return to recreational sports an important expectation. It was considered very important in 80 percent and somewhat important in 13 percent. The most important expectations in this group were to have confidence in their knee, avoid future degeneration of their knee, and improve ability to maintain general health. All patients rated these important. Getting their knee back to where it was before the problem started was only important in 66 percent of patients. Sixty-five percent of patients reported previous knee surgery.
This study has shown good outcomes for our patients and has shown to be a good alternative treatment for patients who do not wish to undergo surgery. This study was presented at the World Congress of Osteoarthritis in 2007. The authors of this study are Dr. Steadman, Karen Briggs, and Lauren Matheny.

Knee Malalignment

Correlation of Second-Look Arthroscopic Findings and Clinical Outcomes in the Treatment of Degenerative Chondral Lesions with Microfracture and Valgus High Tibial Osteotomy

Medial high tibial osteotomy (HTO) is a surgical procedure active patients with osteoarthritis and knee malalignment (bow-legged) may choose to undergo. This procedure shifts the load from the degenerative medial compartment of the knee to the less damaged lateral compartment of the knee. Microfracture is done in conjunction with this procedure in order to try to regenerate replacement cartilage and decrease pain. Months after patients underwent this combined procedure they also underwent a "second-look" arthroscopy, which allowed the physician to determine how much cartilage was actually regenerated at a later point in time. The purpose of this study was to collect outcomes from patients who had this procedure done, and to report on our results.



X-ray of opening wedge high tibial osteotomy.

Average time to second-look arthroscopy was 13.1 months (range: 1.9–57.2 years). Mean Lysholm score was 63.1(range: 5–100), mean Tegner was 3 (range: 0–7) and mean patient satisfaction was 7.6 (1–10) (scale 1–10, 10=highest satisfaction). The average fill of new cartilage tissue in the medial femoral condyle lesions was 84 percent (range: 15 to 100 percent). The average fill of medial tibial plateau lesions was 74 percent (range: 0 to 100 percent). When comparing patients who had greater than 80 percent fill with those with less than 80 percent fill, the average patient satisfaction score was 8.4, compared to 5.4. The average Lysholm score was 72 compared to 55 and average Tegner was 3.4 versus 2.1.

The results of this study support the use of combined HTO and microfracture for the degenerative varus knee. The addition of microfracture reliably increases the amount of coverage of degenerative lesions on the medial femoral condyle and the medial tibial plateau. This study is useful for physicians and patients alike. With this information, physicians can better inform patients about the results of HTO in conjunction with microfracture, as well as expected functional and satisfaction levels. This study was also presented at the American Academy for Orthopaedic Surgeons (AAOS) in 2007. The authors of this study are Dr. Steadman, Dr. Sterett, Dr. King, Dr. Chen, Karen Briggs and Lauren Matheny.

Microfracture is a successful method to promote adequate cartilage healing. The procedure consists of making small perforations in the subchondral bone plate using a bone awl to access the cell population and the growth factors present in the underlying bone marrow. The technique relies on the body's own cell population and healing proteins present in the marrow to promote healing, thus avoiding concerns of immune reactions to transplanted tissues or the need for a second surgical site or second surgery to collect grafts or cells.

Lysholm and Tegner Scores

The Lysholm score (0-100, 100=highest) and Tegner activity level (0-10, 10=highest satisfaction) are common scoring systems utilized to evaluate outcomes of arthroscopic knee surgery. The Lysholm score measures symptoms and function. The Tegner categorizes individuals based on the activities in which they participate. Outcomes following arthroscopic knee surgery have recently shifted focus to the patient's perspective. Patient perspective is often driven by various factors, including previous experiences. The Lysholm score and Tegner activity level measure the patient's perspective of function and activity. The pre-surgical score is often compared to the follow-up score to rate improvement. Improvement in function and activity, along with patient satisfaction, are primary goals for most knee surgeries. However, these results do not say how the knee compares to someone with normal knee function.

Correlation Between Position of Final Weight-Bearing Line and Validated Outcomes Scores after High Tibial Osteotomy

An alternative treatment for patients who want to delay knee arthroplasty is high tibial osteotomy, in which the weight-bearing load of the degenerative compartment is shifted to neutral or the lateral compartment, relieving the diseased compartment of excessive load. For this study, all patients underwent a high tibial osteotomy for degenerative varus malalignment. Radiographic assessment was used to determine the weight-bearing line (WBL) before and after HTO. The purpose of this study was to determine whether outcome scores would be affected by the final position of the weight-bearing line after high tibial osteotomy (HTO).

The study looked at the degree to which the malalignment, or bow-legged deformity, was corrected. Some people may have had a large bow-legged deformity, which means they underwent a larger correction, shifting the load further on the opposite compartment. Others may have had a mild bow-legged deformity, meaning they only needed a small correction, shifting the load only slightly. We wanted to see if a large or a small correction would make a difference in patient knee function and activity levels, as well as patient satisfaction.

This study demonstrated that there was no significant difference between patients who underwent a high tibial osteotomy with overcorrection versus patients who underwent a high tibial osteotomy corrected to the neutral midline of the knee. Since no significant difference was found, we believe that the use of a less valgus correction may consequently reduce the risk of drift and nonunion which are generally associated with larger correction or overcorrection. This study may aid physicians in determining the necessary size of correction for a high tibial osteotomy. The authors of this study are Dr. Sterett and Dr. Zehms.

Ligament Instability Treatment
Early Anterior Cruciate Ligament (ACL) Reconstruction in Combined Medial Collateral Ligament (MCL)/ACL Injuries

Previously, clinical research conducted a study determining patient outcomes for patients who underwent an ACL reconstruction within three weeks of injury and had conservative (non-surgical) treatment of the MCL. This study was published in 2000 and showed patient outcomes for this procedure. We wanted to look at the same patients at a longer follow-up date. The purpose of this study was to present long-term clinical results with early reconstruction of the ACL and nonoperative treatment of the MCL after combined injuries of the ACL/MCL. Our hypothesis was that patients undergoing treatment for combined injuries within three weeks of injury would still have good outcomes and high activity levels.

Our results showed excellent postoperative Tegner scores with good to excellent in 72 percent of patients. Good to excellent Lysholm scores were obtained in 61 percent of patients. The average patient satisfaction score was 8.5 on a scale of 1-10, 10 being most satisfied. Of the 74 patients, 91 percent of patients rated their results as excellent or good.

This study showed that patients who underwent conservative treatment of the medial collateral ligament (MCL) and early reconstruction of the anterior cruciate ligament (ACL) had good knee function, high activity levels and high patient satisfaction at an average follow-up of five years. This study was presented at the American Academy of Orthopaedic Surgeons (AAOS) in 2007. The authors of the study were Dr. Steadman, Dr. Sterett, Dr. Millett, Dr. Looney, Lauren Matheny, and Karen Briggs.

SHOULDER RESEARCH

Improved Understanding of Shoulder Complications
Clinical Presentation of* Propionibacterium acnes *Infection Following Shoulder Surgery

Infection after shoulder surgery can be a potentially devastating complication that can lead to septic arthritis and cartilage destruction. Historically, bacterial infection after shoulder replacement can be as high as 15 percent. Infections after rotator cuff repair have a much lower rate of about 2 percent. While staph bacteria are generally the most common infections after surgery, *Propionibacterium acnes* (*P. acnes*) is a much harder bacterial infection to detect. The *P. acnes* bacteria are commonly found in moist areas of the body such as hair-covered areas, for example, the armpit, and other hair follicles. This bacteria has an increasing frequency in shoulder infections after surgery. It is a very slow-growing organism that requires reduced concentrations of oxygen to grow. A single bacterium introduced into the shoulder joint during surgery can grow for many years undetected, while causing unexplained pain and loss of motion without the typical infection signs such as swelling around the incision sites, redness, or postoperative wound drainage. Once detected, most infections are treated successfully with oral antibiotics. Physicians routinely use blood tests to detect infections, but with *P. acnes*, these tests typically show a normal test result. The purpose of this study was to evaluate *P. acnes* and appropriate measures of identification and treatment in patients with unidentified postoperative shoulder pain.

Twenty patients came to our clinic with possible *P. acnes* deep shoulder infection at an average age of 48 (range 18 - 81

years). There were 11 women and 9 men. Physical examination and blood tests showed inconsistent results. Shoulder joint fluid and tissue biopsies were obtained, and infection with *P. acnes* was confirmed by microbiologic cultures. Fifty percent of patients' biopsies grew *P. acnes* in culture. Of these 10 patients with positive *P. acnes* cultures, three developed infections after surgery at our facility, and seven sought treatment at our institution for ongoing shoulder problems after having shoulder surgery elsewhere. At the time of *P. acnes* confirmation, fever, swelling and drainage were not observed. For these 10 patients average time from shoulder surgery to diagnosis of *P. acnes* infection was 1.8 years (range 26 days to 8 years), despite prolonged symptoms of pain.

Results from this study showed that typical signs associated with infections, such as fever, swelling, and drainage, may be absent in the presence of *P. acnes*. We believe that the treating surgeon should be aware of this infection and take appropriate measures to test and correctly identify the presence of this type of bacteria. Microbial cultures of many aspirates and/or biopsies are required of patients that present with unexplained pain. *P. acnes* should be grown for at least two weeks. Given the incidence, better awareness of the problem and possibly a change in preventative therapy might be considered in the future.

This study was presented at the American Academy of Orthopaedic Surgeons (AAOS) and the American Shoulder and Elbow Surgeons Society in 2007. The authors of this study are Dr. Millett, Dr. Yen, and Marilee Horan.

Rotator Cuff Repair

Survivorship of Full-Thickness Rotator Cuff Repairs

The tendons of the rotator cuff help elevate and rotate the arm and stabilize the ball of the shoulder within the joint. These muscles and tendons provide stability by forming a cup over the top of the arm, which is known as the rotator cuff. Rotator cuff tears are a common cause of shoulder pain and disability. The supraspinatus tendon is the most common tendon torn, but other parts of the rotator cuff, such as the infraspinatus or the subscapularis, may be involved. The rotator cuff can be injured in a single traumatic event or become damaged over time from repetitive use of the arm, such as in overhead activities. Patients often describe ongoing shoulder pain for months and can recall a specific injury that triggered the onset of pain. A cuff tear may also happen at the same time as another injury to the shoulder, such as a fracture or dislocation. Rotator cuff injuries are some of the most commonly diagnosed orthopaedic conditions. Currently, technological advances allow for most rotator cuff tears to be fixed arthroscopically (or less invasively). However, open or mini-open cuff repairs were done quite well with predictable results. The purpose of this study was to determine how long the average open rotator cuff repair lasted, also referred to as the survivorship of open rotator cuff repairs. Survivorship was defined as patients not requiring additional surgery. Two hundred and sixty-nine shoulders with torn rotator cuffs underwent open rotator cuff repair. All patients in this study had a complete tear of the supraspinatus, in addition to possible tears of the infraspinatus and/or subscapularis. At the time of repair, the size of the tear, the location of the tear, type of repair, quality of repair, and biceps treatments were also documented.

The average follow-up time was 6.3 years. Patients' pain and functional outcomes were measured using the American Shoulder and Elbow score (ASES=0-100 points) and patient satisfaction level (1=unsatisfied, 10=very satisfied). The average ASES score was 87 out of 100. The average patient satisfaction score was 8 on a 10-point scale. Overall survivorship at five years following open rotator cuff surgery was 90 percent for patients that did not require subsequent surgery. Survivorship for 10 years after surgery was 82

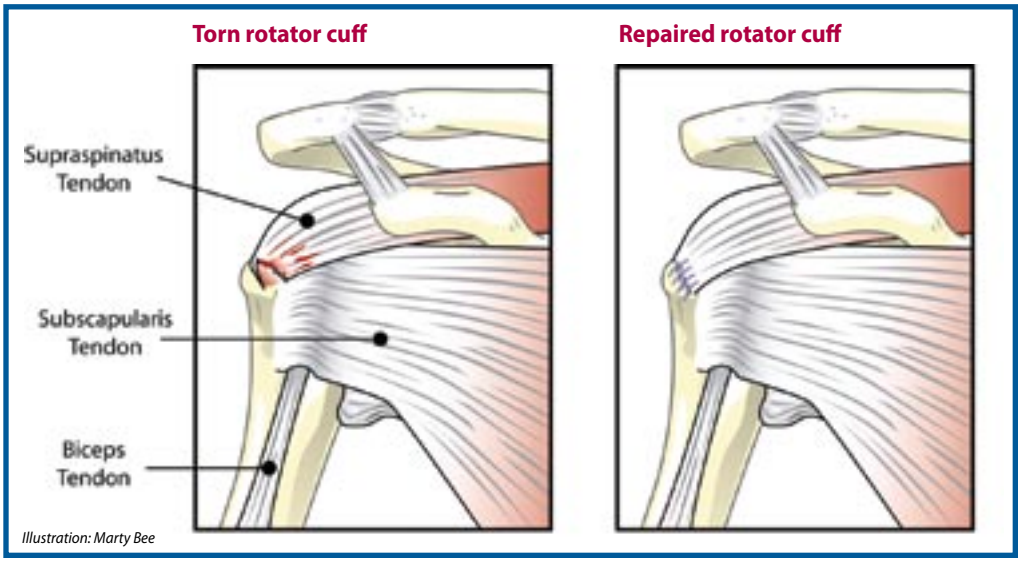


Illustration: Marty Bee

Research Moving Forward on Femoroacetabular Impingement

By: Karen Briggs, M.B.A., M.P.H., Director of Clinical Research

Patients with hip pain may suffer from femoroacetabular impingement, or FAI, in which bony abnormalities of both the femur and acetabulum irregularly and repetitively contact each other, creating damage to articular cartilage and labrum. This may lead to a more rapid onset of osteoarthritis, which is the leading cause of disability in the United States. In the past, the treatment for FAI was an open surgical dislocation procedure to repair this pathology. It has shown good mid-term results, but it is a highly invasive procedure. The recovery from this open surgical dislocation procedure may limit activities for nine months. This length of postoperative inactivity is not feasible for the recreational or professional athlete. Dr. Marc J. Philippon has developed an arthroscopic technique to repair this hip joint disease that allows individuals to return to activities, including athletics, as early as three months.

Dr. Philippon recently published his first peer-reviewed research article in the *Journal of Knee Surgery, Sports Traumatology, and Knee Arthroscopy.* This landmark paper comes just two years after his joining the Steadman-Hawkins team and is truly a milestone accomplishment. The article, titled "Femoroacetabular Impingement in 45 Professional Athletes: Associated Pathologies and Return to Sport Following Arthroscopic Decompression," focused on professional athletes who underwent minimally invasive arthroscopic hip surgery due to persistent hip pain and an inability to participate in their sport. All patients had treatment for FAI. After undergoing surgery, 42 (93 percent) returned to their professional sport, and 35 (78 percent) remained active at average 1.6-year follow-up.

Following the publication of this article, another article was accepted for publication in the *Journal of Knee Surgery, Sports Traumatology, and Knee Arthroscopy*. The paper, titled "Clinical Presentation of Femoroacetabular Impingement," was written to describe patients' symptoms and how they respond to specific tests in the office. The study looked at 301 patients of Dr. Philippon's with hip pain. The most frequent complaint was pain, with 85 percent of patients reporting moderate or marked pain. The most common location of pain was the groin (81 percent). Patients showed decreased ability to perform activities of daily living and sports. When examined by the physical therapist, patients had reduced hip flexion, hip abduction, hip adduction, and hip rotation (see figures). Patients with osteoarthritis of the hip had even greater reduction in motion of their hip. The anterior impingement test and the FABER test are specific measurements used to determine impingement in the hip. In this study, these tests were positive for 98 percent of the patients when the physician evaluated them. This study concluded that patients with FAI most commonly had pain and functional limitations.

Significant limitations in sports and activities of daily living were usually present in patients with FAI. Limitations of hip range of motion were common, and a positive anterior impingement test was seen almost universally, as was a positive FABER test. This study will provide physicians, physical therapists, and patients new information in the diagnosis of this common hip problem.

Marc J. Philippon, M.D.

Dr. Philippon joined the Steadman-Hawkins Clinic in March of 2005. Through the Steadman◆Hawkins Research Foundation, he has made it a priority to validate the procedures he performs in the operating room, determine factors that are associated with patient satisfaction, and continue to improve patient outcomes following hip arthroscopy.

Dr. Philippon assessing internal rotation of the hip on a patient in the clinic.

Dr. Philippon assessing hip extension.

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A Fellow assessing hip abduction.

A Fellow assessing hip adduction.

percent. Age was the only factor that showed increased risk of subsequent surgery. People with chronic tears and tears that involved the subscapularis had lower functional scores. Overall, survivorship of rotator cuff tears was high and outcomes were excellent to good.

The authors of this study are Dr. Millett, Marilee Horan, Karen Briggs, Kaire Maland, and Dr. Hawkins.

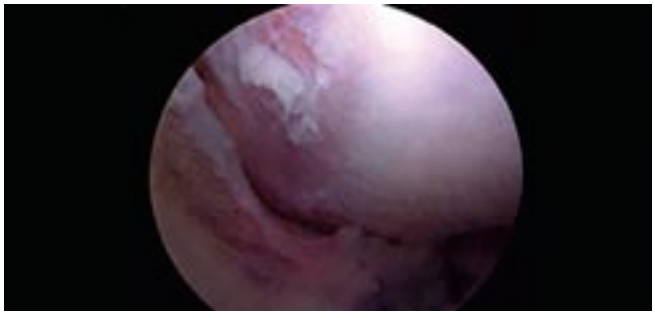
HIP RESEARCH

Femoroacetabular Impingement and Outcomes

Early Outcomes Following Hip Arthroscopy for Femoroacetabular Impingement in the Athletic Adolescent Patient: A Preliminary Report

Femoroacetabular impingement (FAI) has become an important new issue in adult orthopaedics. FAI is a result of excessive anterolateral coverage of the femoral head or an abnormal femoral head-neck junction. This results in abutment of the femoral head-neck junction (CAM) against the acetabulum during flexion. The current belief is that FAI leads to labral tears and the evolution of early-onset degenerative arthritis. Some of the causes of FAI arise as a result of childhood diseases such as developmental dysplasia of the hip, Legg-Calve-Perthes, and slipped capital femoral epiphysis, although a majority are likely idiopathic anatomic variants. Symptoms of impingement may not arise until adulthood, but increasingly we are recognizing these symptoms in the pediatric population.

Treatment of FAI is becoming more popular with the goal of restoring normal hip morphology. Treatment methods that are applicable to adults have been applied to late juvenile and adolescent patients. However, the anatomy of the pediatric population differs from that in adults and great care must be taken when applying surgical procedures. Traditionally, in the pediatric population, correction of the femoral head-neck offset has been with proximal femoral osteotomies including the Southwick, Imhauser, and Dunn osteotomies. These osteotomies redirect the femoral head and direct the CAM lesion away from the acetabulum. Correction of the retroversion of the acetabulum can be performed with acetabular osteotomies. However, each of these osteotomies has significant morbidity and do not allow intra-operative intra-articular range-of-motion testing. Current treatment for FAI in adults includes open surgical dislocation with a greater trochanteric osteotomy or



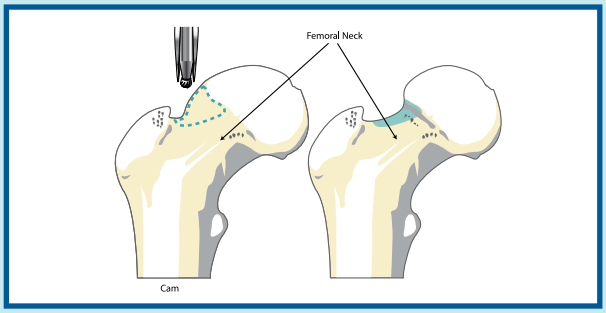
Femoroacetabular impingement before treatment.

What Is FAI?

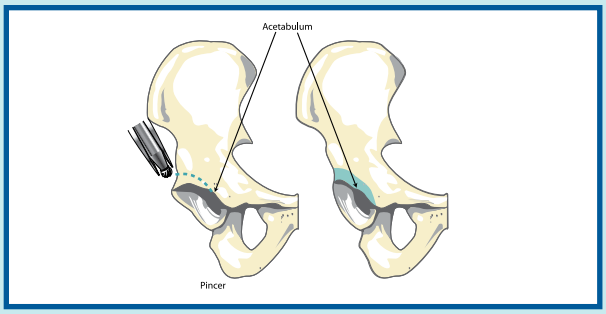
Femoroacetabular impingement occurs when abnormally shaped bones of the hip repetitively hit into each other during movement. As a result, soft tissue structures of the hip, including the acetabular labrum and the articular cartilage, are often entrapped and injured. Impingement is particularly common in hip flexion and internal rotation, a position frequently encountered during activities of daily living. Difficulty with putting on shoes and socks and getting into and out of a car are common complaints in patients with extensive impingement.

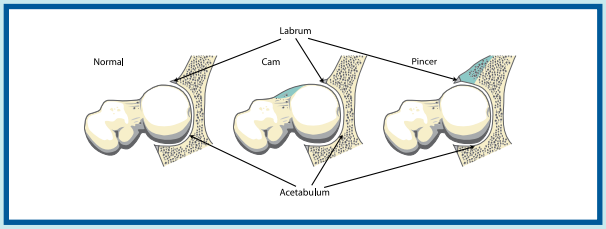
There are two distinct types of femoroacetabular impingement, cam and pincer. Most commonly, patients have a combination of the two types of impingement. Cam impingement results from excess bone located on the femoral neck. Pincer impingement results from excess bone located on the acetabulum. The precise cause of the impingement is unknown; however, it likely has both developmental and activity-related (such as in contact in sports) components.

In both types of impingement, the abnormal contact between the femoral head and acetabulum during movement causes injury to the labrum and articular cartilage. Injuries to the acetabular labrum lead to increased movement of the femoral head within the acetabulum, resulting in an unstable joint. Also, tears of the acetabular labrum result in increased contact forces between the femoral head and the acetabulum. With these increased forces, damage to the articular cartilage may result. Injuries to the articular cartilage over time may increase in size and depth, and ultimately result in bone-on-bone contact. At this point, the only current solution is a total hip replacement.



With cam impingement, the burr, a small cutting instrument, is used to remove excess bone from femoral neck.





With pincer impingement, the burr, a small cutting instrument, is used to remove excess bone from acetabulum.

Illustrations: Marty Bee

hip arthroscopy. Hip arthroscopy has been emerging as a new treatment for FAI and we present our experience with the pediatric population. The purpose of this study was to report early outcomes in the pediatric athletic population following arthroscopic decompression of femoroacetabular impingement and associated pathologies.

There were 16 patients identified as adolescent (16 years old or less) who underwent hip arthroscopy. Five patients had isolated pincer lesions, two had isolated cam lesions, and nine had mixed-type femoroacetabular impingement. Seven patients had labral repair and nine underwent partial labral debridement for labral pathology. Subjective data (modified Harris Hip Score and patient satisfaction) were collected pre- and postoperatively to document patient outcomes.

The average age was 15 years. The average preoperative modified Harris Hip Score was 55. The average time to follow-up was 1.36 years. The average postoperative modified Harris Hip Score improved 35 points to 90. The average patient satisfaction was 9. The results of this study show that hip arthroscopy for femoroacetabular impingement and associated pathologies in the adolescent population produces excellent improvement in both pain and function and results in a high level of patient satisfaction.

This study was presented at the 2008 annual meeting of the American Academy of Orthopaedic Surgeons (AAOS) in San Francisco, and is in press for publication in the *Journal of Pediatric Orthopaedics*. The authors are Dr. Philippon, Dr. Yen, Karen Briggs, David Kuppersmith, and Brian Maxwell.

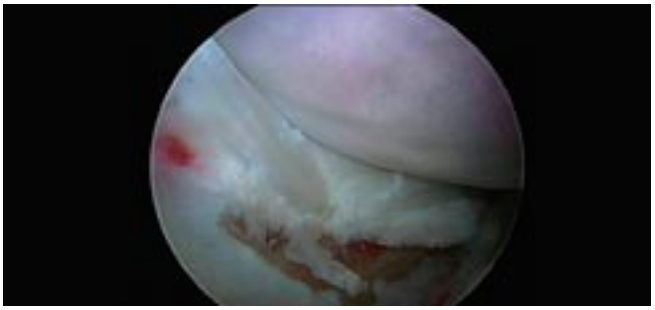
Outcomes of Arthroscopic Acetabular Labral Reconstruction in the Hip in Professional Athletes

The acetabular labrum is a fibrocartilage and dense connective tissue ring attached to the bony rim of the acetabulum. It deepens the acetabulum and extends the coverage of the femoral head. Although the function of the acetabular labrum is not completely understood, its significance has been documented as a sensitive shock absorber, joint lubricator, and pressure distributor in the normal hip. Labral degeneration has been found early in the arthritic process and suggested as one of the factors contributing to osteoarthritis of the hip.

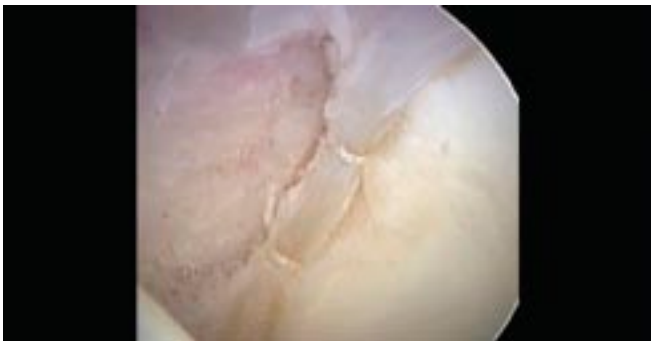
Trauma, congenital disorders of the hip, and femoroacetabular impingement can result in labral tears. Recognition of acetabular labral tears has led to new treatment techniques designed to restore the soft tissue function and return complete range of motion to the hip. The treatment methods currently available for labral tears include labral debridement or labral repair (refixation).

The Modified Harris Hip Score is an outcome score that has been recently used to document outcomes following hip arthroscopy. It measures symptoms such as pain, as well as the patients' ability to do functional activities such as walking and climbing stairs.

Bruise of the acetabular labrum.



Femoroacetabular impingement with the torn labrum of the hip.



Labral repair of the hip.

The senior author performed eight labral reconstructions in professional athletes who were unable to participate at the professional level. The modified Harris Hip Score and patient satisfaction were used to document patient outcomes.

There were eight males, and sports included soccer (5), figure skating (1), and hockey (1). Seven of the eight athletes had previous hip arthroscopy prior to their labral reconstruction. The average preoperative Modified Harris Hip Score was 74. The average time from initial injury to labral reconstruction was 21 months. All patients had evidence of femoroacetabular impingement. Six patients underwent microfracture for the treatment of grade IV chondral defects. Follow-up was obtained on 100 percent of patients at a minimum one year with an average of 17 months. The average postoperative Modified Harris Hip Score improved 19 points to 93 and the average patient satisfaction was 9 out of 10. The results of this study showed that patients who are

labral deficient or have advanced labral degeneration can, after arthroscopic acetabular labral reconstruction, have good outcomes and high patient satisfaction.

This study will be presented at the 2008 annual meeting of AANA, in Washington, D.C., and at the 2008 biennial meeting of ESSKA in Porto, Portugal. The authors of this study are Dr. Philippon, Karen Briggs, David Kuppersmith, and Michael Wahoff.

Femoroacetabular Impingement in 45 Professional Athletes:
Associated Pathologies and Return to Sport Following Arthroscopic Decompression

Femoroacetabular impingement (FAI) is described as abnormal or irregular, repetitive abutment at the head of the femur (ball) and/or acetabulum (socket). More recently, developments pioneered by open-hip surgeons have shown that morphologic abnormalities of both the femur and acetabulum underlie a large number of labral and chondral injuries in the hip.

With FAI, a structural or spatial abnormality of the femur (cam) or acetabulum (pincer) damages the chondrolabral structures during normal joint movement. The most common situation is a mixed cam and pincer pathology, occurring along the femoral neck and the acetabular rim. In high flexion and internal rotation movements, abutment and impingement of the labrum and cartilage occur. Cam and pincer lesions lead to distinct patterns of labral and chondral damage and long-standing impingement can be a cause of hip joint degeneration.

Although many surgeons have shown good results with "open" hip surgery, we believe that an arthroscopic, less invasive approach involves less postoperative morbidity and allows patients, including professional athletes, to return to high-functioning lifestyles. The purpose of this study was to define associated pathologies of FAI and determine whether professional athletes could return to high-level athletics following arthroscopic decompression of FAI.

Following hip arthroscopy, 93 percent of athletes returned to professional sport. Three athletes did not return to sport; however, all had diffuse osteoarthritis at the time of arthroscopy. Seventy-eight percent remained active in professional sport at an average follow-up of 1.6 years. The results of this study show that hip arthroscopy to treat debilitating hip pain, caused by FAI, may offer professional athletes a quick and effective return to sport.

This study was presented at the 2006 AOSSM Specialty Day, and AAOS annual meeting in Chicago. It was published in August 2007 in *The Journal of Knee Surgery, Sports Traumatology, and Arthroscopy*. The authors of this study are Dr. Philippon, Karen Briggs, Dr. Schenker, and David Kuppersmith.

Associated Pathologies of Hip Dislocation
Arthroscopic Findings Following Traumatic Hip Dislocation in 14 Professional Athletes

Forceful traumatic events in many sports can cause the hip joint to dislocate. Often, these dislocations are accompanied by a fracture requiring surgery. In addition, the cells of the femur head can begin to die (avascular necrosis), since the hip joint does not receive a lot of blood flow to this area after hip dislocation. This is a serious potential complication that must not be overlooked. When no fracture is present, nonoperative treatment is the most widely accepted practice. However, for athletes who sustain dislocation, continue to have persistent disabling hip pain, and are unable to participate at the professional level, nonoperative treatment is an unacceptable option. The purpose of this study was to report the hip joint pathologies identified at hip arthroscopy in professional athletes who had a forceful, traumatic dislocation.

Fourteen professional athletes sustained a traumatic hip dislocation. The average time from dislocation to surgery was 3.6 hours. The average age at the time of surgery was 30 years. All patients in this study had both labral pathology and chondral defects. Eleven patients had loose bone fragments and 9 patients had evidence of FAI. The results of this study concluded that traumatic hip dislocation is accompanied by a variety of intra-articular hip joint pathologies, the most common being labral, chondral, and intra-articular loose bone fragments, and disruption of a hip ligament, known as the ligamentum teres.

This study will be presented at the meeting of the AAOS in 2008 in San Francisco, the 2008 annual meeting of the AANA in Washington D.C., and the 2008 biennial meeting of the ESSKA in Porto, Portugal, and published in the *Arthroscopy Journal* in June 2008. The authors of this study are Dr. Philippon, Karen Briggs, David Kuppersmith, and Dr. Wolff.

SPINE RESEARCH

Factors Affecting Disability and Quality of Life in Back Patients
Independent Predictors of Disability and Quality of Life in Back Patients

Back problems can be extremely disabling and are widespread throughout our society. These can include low back pain itself, and leg pain caused by compression of nerve roots that exit the lumbar spine. Back problems often cause chronic pain, which can lead to severe depression. One of our research interests here at the Foundation is to investigate the connections between back pathologies and mental health, physical health and disability. In previous studies we have looked at physical exam findings and their correlation to patients' perceived mental and physical health and disability. We wanted to look at factors such as diagnosis, type of surgery required, and demographic and socioeconomic factors, as well

as physical exam findings and mental and physical health and disability. The purpose of this study was to determine factors that had the most effect on patients' health and disability.

Patients completed an Oswestry Low Back Pain Disability Questionnaire, which asks about limitation in activities of daily living related to back pathologies and then generates a disability score. Patients also completed an SF-12 General Health Survey, which generates mental and physical health scores and answers demographic and socioeconomic questions. In addition, the doctor collects data on physical exam parameters, surgical diagnosis, and type of surgery performed. Diagnosis, type of surgery required, physical exam parameters, history of prior spine surgery, history of smoking, age, gender, workers' compensation, and level of education were compared to the patients' perceived mental and physical health and disability.

Disability was found to differ with gender, workers' compensation cases, and in patients with physical exam findings that indicate nerve root compression. Physical health was significantly lower in patients with a history of smoking, and mental health was different for genders. Also, physical and mental health were both correlated with age. Predictors (variables that independently affect these scores the most) of health and disability were physical exam tests indicative of nerve root compression (a positive straight leg raise test and motor deficit) and gender. Disability itself and history of smoking were independent predictors of physical health. Disability, gender, and age were predictors of mental health.

This study was accepted for the 2008 Spine Week Annual Meeting. The authors of this study are Karen Briggs, Sarah Kelley-Spearing, Dr. Corenman, and Eric Strauch.

Accuracy of Back Diagnostic Tests

Diagnostic Value of the Braggards Test in Identifying Patients with Radiculopathy (Compressed Nerve Root)

A common lumbar spine pathology is leg pain, which is commonly referred to as sciatica. This occurs when a nerve root exiting the spinal canal is compressed. It is actually only called sciatica if one of the five nerve roots that give rise to the sciatic nerve is compressed. The spine is composed of vertebrae and in between the vertebrae is a disc, which acts as a shock absorber. The vertebrae themselves are part of the bony structure that forms a protective column around the spinal cord and the cauda equina (the bundle of nerves that extend down through the canal after the cord ends in the mid-back). Between the vertebrae is an opening in the bony structure called the foramen, and nerve roots exit from the foramen at every level of the spine. The disc is like a jelly-filled doughnut, thus if the outer annulus of the disc tears open and the "jelly" squeezes out, it can compress the exiting nerve roots. Also, with degeneration, spurs can form in the bony structure and compress the nerve roots. This compression is called "radiculopathy." When compression is the result of a herniation, that herniation is constantly pressing on the nerve root and is considered to be "compressive radiculopathy." When a spur occurs in the foraminal opening, it is considered to be a "dynamic radiculopathy" because it normally only compresses the nerve root when the patient bends backwards, which naturally narrows the foraminal opening.

Many physical exam tests are used to determine whether a patient's leg pain is the result of radiculopathy. One of these tests is the Braggards test. Braggards is performed in conjunction with a straight leg raise test. The patient lies down on his or her back and the physician raises the leg. If leg pain is produced, then the Braggards test is performed, the leg is lowered until the pain goes away and then the ankle is flexed. If it is nerve pain, this motion should reproduce the leg pain and it is called a positive Braggards test that indicates radiculopathy. However, the test should really only be positive for compressive radiculopathies (from herniations) since in dynamic radiculopathies the nerve root should not be compressed with the patient in this position. The purpose of this study was to look at the accuracy of Braggards in diagnosing compressive radiculopathy.

Analysis showed that Braggards is a sensitive test for compressive radiculopathies, but not specific. Most patients with compressive radiculopathy will have a positive Braggards test but patients with other diagnoses can also have a positive Braggards test. Eighty-four percent of patients with compressive radiculopathy had a positive Braggards test, 55 percent of patients with dynamic radiculopathy had a positive Braggards test, and 56 percent of patients without radiculopathy (primarily with degenerative disc disease and back pain) had a positive Braggards. However, the physician also considers the degrees of the straight leg raise (how far the leg is raised before pain is experienced) and this can help pinpoint radiculopathy as well. Degrees of the straight leg raise was significantly associated with diagnosis, with compressive radiculopathies having on average a straight leg raise of 51 degrees, patients with degenerative disc disease having a straight leg raise of 59 degrees, and patients with dynamic radiculopathy having a straight leg raise of 66 degrees. Therefore, patients with the most limitation in a straight leg raise tend to have compressive radiculopathies, and though a positive Braggards test does not rule out other pathologies, it can help diagnose a compressive radiculopathy.

This study will be presented at the 2008 North American Spine Society 23rd Annual Meeting. The authors of these studies are Sarah A. Kelley-Spearing, Dr. Corenman, and Eric L. Strauch.

Biomechanics Research Laboratory

Michael R. Torry, Ph.D., Director; Kevin B. Shelburne, Ph.D.; J. Erik Giphart, Ph.D.; Takashi Yanagawa, M.A.; Sepp Braun, M.D., Visiting Research Scholar

The Foundation's Biomechanics Research Laboratory (BRL) is a multidisciplinary laboratory in which the principles of mathematics and engineering are applied to solve complex problems in orthopaedics. We study dynamic joint function using motion analysis, computer modeling and dual-plane fluoroscopy imaging in an effort to understand injury mechanisms and to enhance rehabilitation techniques and outcomes.

2007 was dedicated to building a one-of-a-kind, bi-plane fluoroscopy system. This system is complex and has required considerable development time from the staff. The following is a description of the dual-plane fluoroscopy system and how it can be applied to clinically relevant problems and solutions. For this report, we use the shoulder as an example.

Left to right: John Brunkhorst, Tyler Anstett, J.D. Pault, Michael R. Torry, Ph.D., J. Erik Giphart, Ph.D., Kevin B. Shelburne, Ph.D., Charlie Yongpravat, Alex Horne, Jesal Parekh, Sepp Braun, M.D.

DUAL FLUOROSCOPY: AN INSIDE-THE-BODY VIEW OF A MOVING SHOULDER JOINT

Patients with osteoarthritis of the shoulder have pain and loss of function that significantly affect their quality of life. When the disease becomes more advanced and the symptoms do not respond to conservative methods, total shoulder arthroplasty (TSA) is the preferred surgical treatment. The number of TSAs performed annually in the U.S. has increased from about 5,000 in the early 1990s to more than 20,000 in 2005. This is largely because an aging population wants to stay active, but it may also be due to better prosthesis designs, better surgical techniques, and better training of surgeons.

While the overall outcomes after shoulder replacements are excellent, the motions of the bones or implants inside the shoulder joint during motion in living subjects are not well known because we haven't been able to "see" inside the joint.

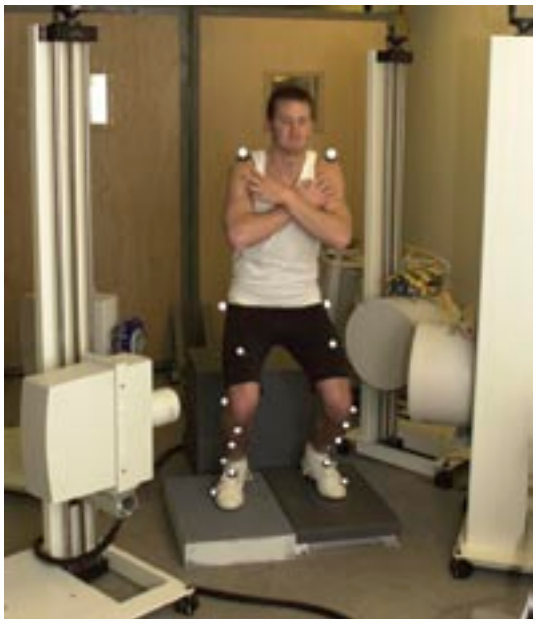
Dual Fluoroscopy

The newly developed, dual-plane fluoroscopy system is comprised of two commercially available BV Pulsera c-arms (Philips Medical Systems, Best, Holland), which were modified under appropriate FDA guidelines and Colorado State Radiation Safety Regulations. The image intensifiers were removed from their c-arm configuration and mounted on a custom gantry (Figure 1, page 40) that allows for variable Source-to-Image-Distance (SID: generator to image plane distance) of 1.0-2.0 meters, as well as variable beam-angle configurations between the two fluoroscopy systems to allow for the ability to optimize viewing volume, movement freedom, and technique factors.

Now we are able to study shoulder motion in normal subjects, in those with arthritis, and among those who have had a shoulder joint replacement by using a dual fluoroscopy system that captures images of bones and implants in living patients and in real time to accurately measure joint motion. These measurements will lead to deeper understanding of normal shoulder motion, of shoulder motion in those with osteoarthritis, and of implant motions following total shoulder arthroplasty. From these studies we hope to discover better ways of preventing arthritis and better ways of treating it once it develops. We also hope to develop improved surgical methods for implanting prostheses, perhaps in less invasive ways, and to develop better designs for the implants so they will be more functional and last longer.

Total Shoulder Arthroplasty

Depending on the cause of the arthritis, one of two types of prostheses is typically used: the primary shoulder replacement and the "reverse" or "inverse" shoulder replacement.



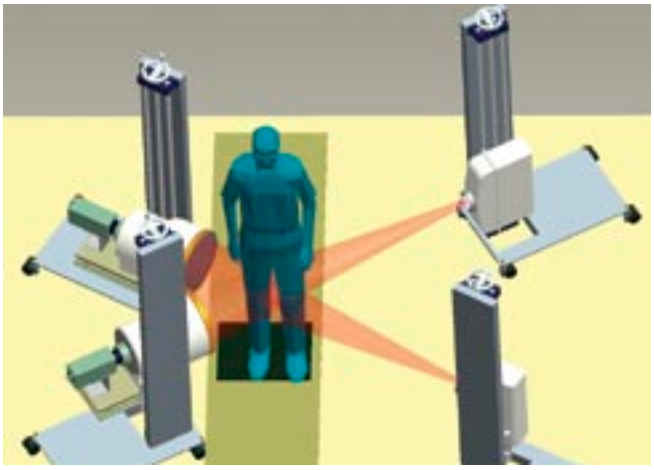


Figure 1. A rendering (above) of our dual fluoroscopy system imaging the knee (left). The gantry mechanism allows freedom of movement while imaging from the height of the ankle to the neck; this allows easy adjustments for different heights of subjects or landing platforms.

Primary Total Shoulder Arthroplasty

The goal of primary TSA is to return to normal function by restoring the original anatomy of the shoulder. The primary prosthesis consists of two parts (see Figure 2): the glenoid fossa, which is fitted with a polyethylene component and inserted into the scapula; and the humeral head, which is removed and replaced with a prosthesis specifically designed to match the humerus. In these studies, we hope to demonstrate how shoulder motion can be restored with a properly performed replacement. We also believe that we will be able to predict how long the implant will last using this technique.

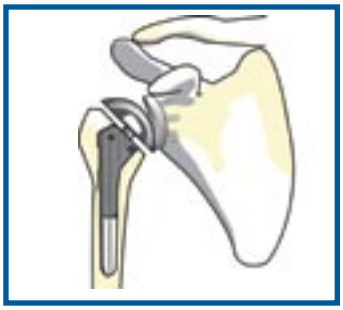


Figure 2

Reverse Total Shoulder Arthroplasty

The Reverse Shoulder is implanted when there is no functioning rotator cuff. This could happen in cases such as rotator cuff tears with arthritis, failed fracture repairs with loss of rotator cuff, massive rotator cuff tears resulting in an inability to raise the arm, failed shoulder replacement surgery, and failed partial arthroplasty for a shoulder fracture. It is called reverse because the ball is placed on the scapula (socket) and the cup is placed where the head of the humerus was located, inverting or reversing the ball and socket joint. Patients who need this type of replacement suffer from severe pain and have difficulties raising their arms and performing their activities of daily living.

Figure 3 Illustrations: Marty Bee

The goal of a Reverse TSA is to get these patients back to an independent lifestyle and to restore normal daily activities. The Reverse Shoulder consists of two parts (see Figure 3): a large glenoid ball and a humeral cup, or socket. This implant is constrained and restores a stable structure around which the humerus can rotate. An intact deltoid muscle is a prerequisite that allows for active motion. Due to the state of the soft tissues and/or bone, the unique configuration of the prosthesis, and the challenge of inserting the prosthesis correctly, it should only be performed by experts. It has been used in Europe for more than 15 years, but little is known about the biomechanics and loading patterns that occur with this type of implant. We plan to study shoulder motion after the reverse TSA using dual fluoroscopy to measure joint motions and loading in actual patients. We believe that we will be able to discover certain variables and limits that can predict the outcome of the TSA, and that these variables will be different from those found in the primary TSA group. We also believe we will be able improve the surgical implantation and make recommendations to improve the design of the implant.

Measuring Shoulder Motion as It Happens

Measuring accurate shoulder joint motion in living patients by attaching markers or sensors to the skin is impos-

sible because the shoulder blade (scapula) moves a great deal under the skin. Even attaching optical markers to pins inserted directly into bones will result in measurement errors, making it impossible to measure the subtle motion changes that are anticipated after TSA. Because of these limitations, even in healthy shoulders, the bony motions are largely unknown. In recent years, however, new techniques have been developed that use fluoroscopy to measure the motion of bones during activity. True joint measurements with accuracies of less than one millimeter are possible using computer-guided techniques that map three-dimensional bone positions. We will use such a high-resolution dynamic fluoroscopy system to measure the movement of the shoulder bones and implants.

The analyses of shoulders from a variety of studies have helped us understand the complexity of this joint in general. But our goal is to further understand the shoulder by using our fluoroscopy system during real-time motions to quantify how the joint components interact with each other in a three-dimensional way. By identifying these differences and changes based on the degeneration from osteoarthritis and surgery, we hope to improve the technical points of the surgical procedure and also improve prosthesis design. In this way, we will also improve the patient's outcome in function, range of motion, pain relief, and satisfaction.

Dual Fluoroscopy Project

Fluoroscopy is a technique that uses x-ray to create a movie of moving bones as opposed to the still snapshot that a regular x-ray system produces. Using fluoroscopy, the locations of the bones, implants, or implanted beads can be measured with an accuracy of better than 1.0 mm in general, and with accuracies of 0.14 mm or better in specific instances. Highest accuracy is obtained when two fluoroscopy units with crossing x-ray beams are used simultaneously (dual fluoroscopy system). With this system, the research possibilities will be limitless, ranging from comparing ACL reconstruction techniques to understanding the effect of post-surgical scarring/adhesions on the development of osteoarthritis in the knee. The system may even measure cartilage indentation in the knee during walking, running, and landing from a jump.

2007 BRL PROJECTS AND ACCOMPLISHMENTS

The BRL published numerous refereed abstracts that were presented at five national and international scientific conferences. The BRL also published six original full-length research papers in peer-reviewed journals. Following are some examples of the 2007 BRL research projects that are in progress:

Effectiveness of Foot Orthosis and Knee Bracing for Reducing Knee Loads During Walking

The majority of the joint load at the knee is borne by the medial or inner side. This concentration of joint load may explain the clinical observation that knee osteoarthritis (OA) occurs most frequently toward the medial side of the knee. The aim of treating knee OA with orthotics is to reduce pain and increase function by reducing the knee load. Lateral heel wedges shift load away from the medial side of the knee. However, clinical studies indicate that the effects of lateral wedges are of limited value in persons with more advanced knee OA, and they do not alter progression of the disease.

Likewise, there is limited evidence that valgus knee braces may slow the progression of knee OA. The mechanism by which valgus bracing relieves pain and improves function is not fully understood.

Therefore, BRL undertook a study to determine the change in knee load that may be achieved by a lateral heel wedge and a valgus knee brace during level walking. The effect of a lateral heel wedge and valgus brace on knee load was calculated using a combination of laboratory measurements and three-dimensional computer simulation.

The results showed that both lateral heel wedges and valgus knee braces reduce medial knee loading during walking, but the brace had a greater effect than lateral wedges. The valgus brace achieved a reduction in medial knee load throughout each stride of walking, whereas the lateral heel wedge was effective only when the force between the foot and the ground was high. Even with a knee brace and lateral heel wedge, the medial side of the knee still transmitted the vast majority of joint load. These results are consistent with the clinical finding that these interventions are less effective in patients with moderate to severe knee OA.

Effect of Tibial Plateau Slope on Knee Loads During Activity

The anterior/posterior shear force acting on the tibia largely determines the load in the cruciate ligaments of the knee. This anterior shear force can be quite substantial. During walking, for instance, the shear force from tibiofemoral load is as large as that produced by the ground reaction force and the muscles. Moreover, activities that produce high joint contact

force, such as landing from a jump, may produce enough shear force to cause injury to the ACL. Our focus on posterior tibial slope (PTS) stems from the variability in PTS that can accompany valgus high tibial osteotomy (HTO). Treatment of medial compartment OA with high tibial osteotomy is based on the premise that correcting varus deformity between the femur and tibia will shift joint load away from the medial side of the knee. Concern for the effect of PTS on knee load has led to the development of methods to precisely control PTS during HTO surgery. And, in fact, a deliberate surgical change in PTS may be beneficial for treatment of knee instability. However, there are no clear guidelines describing the amount of slope change necessary to obtain a desired treatment effect. This may be because it is uncertain how a change in PTS will affect joint contact and ligament loads in the knee during activity. These effects are all the more relevant when HTO is combined with ACL reconstruction and cartilage repair. The purpose of this study was to calculate the change in knee loads associated with a change in PTS. Joint contact, shear, and ligament forces and ATT were calculated during standing, squatting, and the moment of opposite toe-off (OTO) in walking. We hypothesized that the load between the bones and in the ligaments would be sensitive to change in PTS.

Our results showed that changing PTS changes the magnitude and location of forces in the knee. The change in knee load elicited by a change in PTS was dependent on tibiofemoral load and the forces in the muscles. For this reason, changing tibial slope may create changes in knee load that will only be evident under physiologic loading conditions. Tibial slope affected not only the magnitude of the tibiofemoral and patellofemoral loads, but also their location by virtue of a shift in tibia position relative to the femur. There was an approximately linear relationship between change in tibial slope and change in anterior shear force at the knee (Figure 4). The effect of tibial slope on ligament force was most considerable during walking. These results support the need for strict management of tibial slope in high tibial osteotomy surgery. A change in the normal load bearing of the knee may have consequences for the initiation and progression of OA and surgeries that combine ligament or cartilage repair with osteotomy.

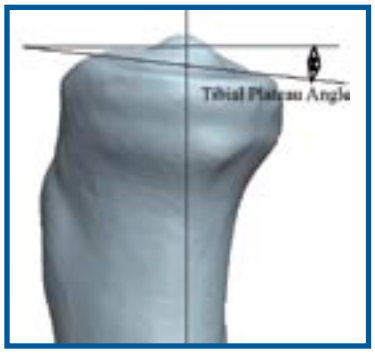


Figure 4

Investigation of Male and Female Anterior Cruciate Injuries

Females have a risk factor for ACL injuries that is two to eight times greater than males while doing the same sports.

Such high incidence in females, coupled with a significant rise in the number of females participating in sports, has led many to consider the phenomenon as an epidemic.

This research initiative represents a collaborative effort between the Steadman◆Hawkins Research Foundation and the Musculoskeletal Research Center (MSRC) at the University of Pittsburgh (Dr. Savio L-Y Woo). Our overall objective is to obtain better quantitative data of gender-specific function of the ACL that would lead to the understanding of cause and mechanisms of the higher rates of non-contact ACL injuries in females. To achieve our objective, we will utilize the recently developed state-of-the-art technologies to accurately assess knee function. A high-speed biplane fluoroscopy system has been developed to collect accurate tibiofemoral joint kinematics from healthy volunteers landing from a jump at the Steadman◆Hawkins Research Foundation. Then, the subject-specific knee kinematics will be reproduced on matched human cadaveric knees using a high payload robotic/universal force-moment sensor (UFS) testing system at the University of Pittsburgh to determine the force and force distribution in the ACL. The six degrees-of-freedom (6-DOF) knee kinematics will also be used as input data to subject-specific finite element models with a complex, but appropriate constitutive model of the ACL to determine the stress and strain distributions in the ACL during the same dynamic jump landing motion.

To date, scientists at the Steadman◆Hawkins Research Foundation have conducted a feasibility and validation study and have collected data on 9 individuals. The validation data showed that joint coordinate data can be measured with an error and precision of 0.2±0.3 mm and 0.3±0.3 deg. Human subject data shows knee joint translations of 0.6 mm (lateral), 9.4 mm (anterior) and 0.8 mm (compression) during the first 100ms of the landing. These translations are within normal physiological ranges, even when landing stiffly. Moreover,

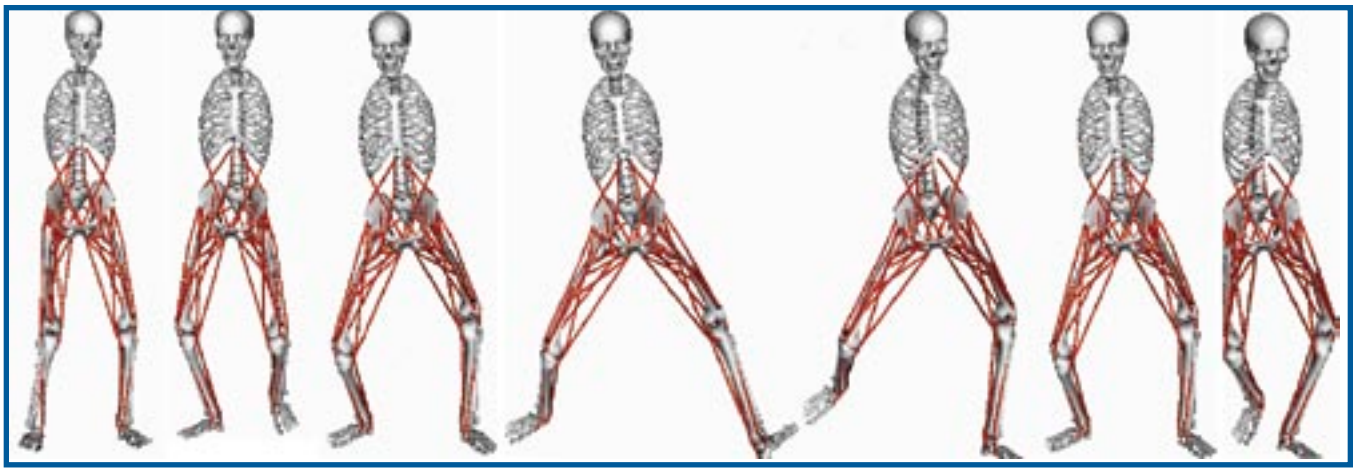


Figure 5: Sequence of pictures from our computational modeling lab showing the skate stride (left to right; push off of right foot through begin push off of left foot). This forward dynamic model calculates the individual muscle forces that are producing the 3D motion of the limbs. In this case, the motion of the model was constrained to mimic that data collected in our laboratory for the NCAA player's data. The model can be scaled to mimic all physical sizes of youth and adult players.

we have measured the knee motion of women who are [based on published criteria] predicted to be at risk of tearing their ACL. Our data, however, does not support the commonly held theory that a larger knee valgus angle (the bending inwards of the knee) causes greater ACL load. This result, although very preliminary, suggests that the common belief that a high knee valgus angle landing may not be the true cause of ACL load during the land.

Biomechanical Evaluation of Rehabilitative Exercises Pre- and Post-Arthroscopy of the Hip

Hip arthroscopy has evolved over the last five years, but validated protocols for postoperative rehabilitation of arthroscopic labral repairs are non-existent in the peer-reviewed literature. The purpose of this study is to assess a comprehensive hip rehabilitation protocol for the treatment of post-surgical hip labral injuries. We also expect to obtain new electromyographic data from muscles not previously examined, specifically, the piriformis muscle. The piriformis muscle is believed to play an important role in hip stabilization. In order to record the activity of the piriformis muscle and other deep muscles, wire electrodes will be inserted into the muscle bellies and their positions verified using ultrasound imaging.

Analysis of Ice Hockey Movements in Youth and Adult Players

Ice hockey is a popular winter sport throughout Canada and many parts of the United States, and its popularity is rising due to increased exposure in many non-traditional, geographic areas. Ice hockey combines tremendous speeds with aggressive physical play, and therefore has great inherent potential for injury. A large majority (more than 75 percent) of the injuries suffered by hockey players occur due to an impact with either another player or with the boards. These impacts lead to the high number of concussions, knee medial collateral ligament sprains, acromioclavicular joint injuries, and ankle sprains. In addition to these common injuries, many other injuries do not result from impact. Adductor strains, sacroiliac dysfunction, chondral injuries, labral injuries, and many of the previously mentioned problems occur without impact.

To study hockey injuries, the first problem was to build an "ice rink" in the laboratory. To recreate the ice rink environment, the BRL has laid down a 12- by 28-foot artificial ice slab with a force plate imbedded. The research project is designed to provide performance data on ice hockey players ranging in age from eight to over 40 years. To date, 51 youth and adult players have undergone biomechanical testing on the artificial ice.

Our modeling techniques (Figure 5) will allow us to: (1) estimate the individual muscle forces in all muscles that cross the hip, knee and ankle to gain a better understanding of the load generated by each muscle; (2) determine which muscles are essential to the motion; (3) determine which muscles contribute most significantly to hip, knee, and ankle joint loads; and (4) determine when in the motion, each muscles reaches its maximal force output. The latter is essential in understanding when in the skate stroke, for instance, a player might be generating muscle loads that are indicative of adductor (groin), hamstring and quadriceps muscle strains.

The data derived from this study will be compared among the age ranges to determine similarities and differences in shot and skating mechanics across the lifespan. Inverse dynamics will also be used to calculate forces and moments within the hip, knee, and ankle joints during the various movements.

These data will provide information on how and why both youth and adult hockey players obtain or exacerbate orthopaedic injuries.

Analysis of Golf Swing Mechanics of Youth and Adult Players

Golf is one of the most popular sports among men and women over 50 years of age in the United States. Golf is also becoming more affordable and, thus, more accessible to youth as well. Unfortunately, golf requires excessive and repetitive rotary motions that often cause upper and lower extremity injury in youth and/or exacerbates injury in adults and the ageing population. Similarly, the injury demographics between male and female golfers are quite different, with women experiencing more upper extremity injuries than their male counterparts. The current proposal is designed to provide performance data on the golf swing in golfers ranging from 12 to 80 years. By studying a cross-section of golfers based on age and gender we will: (1) outline golf swing performance differences across the lifespan; and (2) observe golf performance differences between genders that may explain the injury demographics. The ultimate goal is to establish the best swing suited to increase each individual golfer's on-course performance, while also minimizing stress and potential injuries.

Volunteers will have their swing analyzed (driver-tee shot) using high-speed filming techniques, a force-sensing platform and EMG sensors (Figure 6). The data will yield body motions and club head speed, dynamic weight bearing for each leg, as well as muscle activation patterns. These variables will be compared among the age ranges and genders to determine similarities and differences in swing mechanics across lifespan and genders. This session allows interactive training with the golfer and a golf coach with real-time biofeedback regarding the speed and performance of the swing. The biofeedback system allows us to measure every aspect of the swing in real time. We can then quickly assess both swing performance enhancement and safety. The golf teaching pro can then implement new swing characteristics "on the fly," and we can immediately assess the injury potential of that swing. We plan to open the enrollment to all levels of golfers in the fall of 2008.

Figure 6

Ted O'Leary: Fast-Track Intern

By Jim Brown, Ph.D., Executive Editor, Steadman◆Hawkins Research Foundation News

To say that Ted O'Leary is on a fast track is an understatement. At 24, he already has a B.S. (magna cum laude) in biological sciences and an M.B.A., both from the University of Denver. Prior to enrolling at DU, he was the valedictorian of his graduating class at Battle Mountain High School in Vail, Colorado. He has played two years with the Cedar Rapids Rough Riders in the United States Hockey League, was a member of two NCAA National Hockey Championship teams at the University of Denver, and was captain of his team. Ted is completing a year-long internship in the Biomechanics Research Laboratory at the Steadman◆Hawkins Research Foundation and is now getting ready for his next big career challenge.

In some families, Ted's achievements would be considered exceptional. But in the family of Michael and Kathleen O'Leary, expectations were as high for Ted's older brothers and a sister as they are for him. His sister, Suzanne, graduated from Georgetown University, received her M.B.A. from the Wharton School at the University of Pennsylvania, and is now managing director for Asset Management at Goldman Sachs. The brothers, Michael, Sean, and James, graduated from prestigious universities, two of them played college hockey, one played soccer, and all are on the O'Leary family version of the fast track to success.

"I was the youngest child, and my family has had a big influence on my life," says Ted. "They have all been very supportive, but I have some personal goals and just want to do my part."

Intern Opportunities

Doing his part brought him to the Steadman◆Hawkins Research Foundation as an intern in 2006. Interns who are interested in pursuing careers in the orthopaedic field have the opportunity to gain practical research experience in a variety of settings. The idea is to provide an exceptional learning environment dedicated to producing world-class researchers in the field of orthopaedic sports medicine, rehabilitation, and human performance.

Hockey Research

The Biomechanics Research Laboratory was establishing a research program to investigate the types and causes of hockey injuries. Ted's hockey credentials, as well as his academic background, made him a perfect match for a Steadman◆Hawkins Research Foundation internship. He has been working 40 hours a week for the past year, at first spending most of his time helping put together a hockey research facility at the Foundation. Now more of his efforts involve preparing, collecting, and analyzing information for the department's growing hockey injury database.

"One of the Foundation's first investigations will look at the slap shot because it is a high-profile element of hockey and because the movement is similar to that of the golf swing, which the Foundation has been studying for some time," explains O'Leary. "Dr. Marc Philippon and Dr. Michael Torry also want to study the starting and accelerating phases of skating." Groin injuries are the number one reason for missed games and the Steadman-Hawkins team suspects that these movements are the cause. They will use a three-dimensional motion-tracking system and force plates to determine the downward, forward, and lateral forces that go onto the ice, as well as in the opposite direction into the body.

Ted's talents are apparent to those who work with him. "Poised, composed, mature, dedicated, and intelligent," says Dr. Torry. "These are just a few words that I use to describe Ted O'Leary. My only regret is that Teddy is smart enough to move on from here quickly. Fortunately, he has decided to go to medical school. Ted is already an established leader and he will be a great MD, as well."

First Impressions

When he arrived in Vail to begin his internship, O'Leary was quickly impressed with the atmosphere at the Foundation and the Clinic. "During the first week, I had discussions with Dr. Steadman and Dr. Philippon. They took time to talk with a new intern, and I don't think that happens in a lot of places. The entire Foundation staff, including Dr. Torry, who directs the work of the Biomechanics Research Lab, made me feel like I was a partner instead of an inexperienced underling."

Although Ted has been a member of the Steadman-Hawkins team for less than a year, he fully understands the Foundation's mission. "We see many elite and professional athletes, but the true mission of the Foundation is to keep active people active. The information obtained for the database on a variety of hockey players will enable the Foundation to develop efficient and safe coaching techniques and protect players from injuries at the grass-roots level," says Dr. Torry. "Take a good look at Ted O'Leary while you can. He's a moving target who has applied for medical school and who may soon be on another fast track to become an orthopaedic surgeon. Given his record so far, he's likely to reach that goal sooner rather than later."

Dr. Michael Torry on Ted O'Leary

Dr. Michael Torry, director of the Biomechanical Research Laboratory at the Steadman◆Hawkins Research Foundation, used the words poise, composure, maturity, dedication, and intelligence to describe intern Ted O'Leary. Below are some other Dr. Torry comments regarding Ted, his accomplishments, and his future.

"Those words (above) probably sound familiar to Ted, as he has no doubt heard them from every coach he's had since he put on skates and started playing hockey. Ted is one of those rare individuals who, at a young age, has attained great successes and experiences in his life through his athletic abilities.

"However, it is more important to keep in mind that while also being co-captain of a high-profile hockey team, he graduated in biological sciences in just three years with a 3.85 GPA. While still playing out his final year of NCAA hockey eligibility, he could have elected an academically easy fourth year with a padded class schedule. Instead, he chose to enroll and complete his M.B.A. during that year.

"Suffice to say that because of the level of education, coupled with the pressures of high-profile athletics that Ted has experienced, I had no doubt he could lead a research program dedicated to hockey. I hold him to a pretty high scientific standard, but he can handle it. Solve complex mathematical equations — no problem. Work on high-level engineering programs — a breeze. Speak eloquently on NBC's *Today Show* about hockey research — a piece of cake. So when you hear about Steadman-Hawkins Foundation hockey research program, it is falling squarely on Ted's shoulders.

"As I stated in the accompanying article, my only regret is that Ted is smart enough to move on from here quickly. He has decided to go to medical school and that is good for all of us."

Education

Greta Campanale, coordinator

The Foundation's primary mission is to conduct research that can be applied directly to orthopaedic medicine. To this end, education is also an important part of our work. We offer training throughout the year to physicians in residence, to visiting medical personnnel, and during international medical meetings. In addition, the education department produces videotapes and educational programs on the Internet. Members of the staff report their research through publications, presentations, and posters. The education department provides administrative support for educational programs and conferences, responds to the press, and teaches high school students about human anatomy and injury.

FELLOWSHIP PROGRAM:

Learning As We Teach

Considered one of the most prominent and rigorous academic fellowship programs in orthopaedic sports medicine, the Steadman-Hawkins Fellowship Program is at the core of the Foundation's educational effort. Each year, six young orthopaedic surgeons are chosen from more than 100 candidates to become Steadman-Hawkins Fellows. They are with us for an intensive 12-month training period to refine their skills in orthopaedic surgery and to investigate the causes, prevention, and cures of degenerative arthritis, as well as the treatment and prevention of injuries. Our goal is to prepare our Fellows to be leaders in the field of orthopaedic sports medicine for the remainder of their careers.

The Foundation currently maintains a network of more than 160 Fellows who share advanced ideas and inspire each other to higher levels. We are fortunate in Vail to work with the best young physicians in the world. Their insight and enthusiasm during this rewarding program has demonstrated to us many times over that we, too, learn as we teach.

We have successfully completed our first year of the Visiting Scholars Program, with Sepp Braun, M.D. from Germany. Dr. Braun spent one year in our Foundation and conducted research under the direction of Peter Millett, M.D. and our Biomechanics Research Laboratory, under the supervision of Michael Torry, Ph.D. His paper, "The Complex of the Long Head of the Biceps Tendon and the Biceps Reflection Pulley," is novel and has been submitted for publication. In 2008, this effort will continue to grow with the additions of visiting scholars from Germany and Brazil. These educational and research oriented programs are sponsored by corporate and individual donors. Arthrex, Inc. is sponsoring our European Visiting Scholars and Jorge Paulo Lemann is supporting our Brazilian Visiting Scholar. These scholars learn new surgical techniques and conduct research which is submitted for publication in leading orthopaedic journals. In 2009, the Foundation will be offering a unique, first of its kind, Sports Medicine Imaging Research Fellowship, sponsored by Siemens.

2006-07 Fellows

Six new members of the incoming "class" of Steadman-Hawkins Fellows spend a year refining their skills as they make final preparations for a career as orthopaedic surgeons. Each Fellow has the opportunity to be actively involved in Clinical Research, Basic Science, and Biomechanics Research. In addition, they also experience hands-on medical coverage of Major League Baseball's Colorado Rockies, the NFL's Denver Broncos, the U.S. Ski Team, and Eagle County High School sports teams.

The stream of knowledge and information flows both ways. The Fellows, having completed their formal training in leading orthopaedic programs, share knowledge they have gained from years of training with the physicians and scientists of the Foundation.

2007-08 Steadman-Hawkins Fellows

Casey D. Taber, M.D.

Dr. Taber graduated cum laude from Louisiana State University with a degree in zoology and was a letterman on the LSU football team. He attended medical school at University of Texas – San Antonio, where he was awarded the Charles A. Rockwood Scholarship for Top Orthopaedic Student. Dr. Taber completed his general surgery internship and orthopaedic residency at University of Texas – Southwestern (Parkland Hospital). His research projects include hip arthroscopy and investigating the economic impact of orthopaedic trauma.

How do surgeons get accepted into the Fellowship Program?

Every year, on average, approximately 600 surgeons graduate from orthopaedic residency programs in the United States. These surgeons become board certified and are ready to enter practice. A select few elect to continue their education for one more year in a fellowship program such as Steadman-Hawkins' program. Last year more than 160 applications were received by the Foundation from young surgeons around the world. After interviews and presentations, six were selected by the screening committee.

Our Founder J. Richard Steadman M.D.

Thank you

A special "thank you" to our sponsors who make the Fellowship Program possible. We'd like to recognize those individuals and foundations that support the entire Fellowship Class through the sponsorship of Academic Chairs.

Chair sponsors of the 2007/2008 Steadman-Hawkins Fellowship Class are

Mr. and Mrs. Harold Anderson

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Mr. and Mrs. Brian P. Simmons

Fellowship Benefactors fund the research of one Fellow for one year. Each benefactor is assigned a Fellow, who provides written reports and updates of his or her work. We extend our gratitude to the following individuals for their generous support:

Mr. Ronald V. Davis

Mr. J. Michael Egan

Mr. and Mrs. Milledge Hart

The Fred and Elli Iselin Foundation

Mr. and Mrs. John W. Jordan

Mr. and Mrs. S. Robert Levine

Mr. and Mrs. Kent Logan

Mr. Tim McAdam

Mr. and Mrs. Jay Precourt

Mr. and Mrs. Stewart Turley

Douglass R. Weiss, M.D.

Dr. Weiss earned his bachelor of arts degree in economics from Dartmouth College and captained the Dartmouth hockey team. Before deciding to pursue a career in medicine, Dr. Weiss played professional hockey in the United States and Europe, and he also participated in the U.S. Olympic hockey program. He then completed medical school at Dartmouth and his residency in orthopaedic surgery at the University of Massachusetts. Dr. Weiss has presented his research on the accuracy of a computer-aided guidance system and has studied cryocuff therapy following ACL reconstruction, as well as SLAP lesions in the presence of rotator cuff tears.

Deeply involved in youth and adult hockey schooling and community volunteer work, Dr. Weiss looks forward to honing his sports medicine skills in Vail to prepare for a career in caring for both the recreational and competitive athlete.

Brian J. White, M.D.

Dr. White graduated magna cum laude from Washington and Lee University and went on to medical school at Georgetown University, where he earned the distinction of membership in the Alpha Omega Alpha Medical Honor Society. He completed his internship and orthopaedic residency at New York University – Hospital for Joint Diseases, where he worked with the New York Mets, Alvin Ailey Dance Theater, and New York City high school football. Dr. White's numerous research projects include investigating revision reconstruction of pectoralis major rupture, flexion limits in total knee replacement, and contact locations in the knee during deep squatting.

Andrew B. Wolff, M.D.

Dr. Wolff studied history and Spanish and played varsity football at Amherst College. He received his medical training at Washington University and completed his internship and orthopaedic residency at Yale University. Well accomplished in research, Dr. Wolff has participated in a number of orthopaedic papers in the areas of surgical techniques and soft tissue reconstruction. He has been published in the *Journal of Pediatric Orthopaedics (British)*, *Journal of Orthopaedic Trauma*, *Arthroscopy*, and *Journal of Bone and Joint Surgery*.

Chad T. Zehms, M.D.

Dr. Zehms graduated magna cum laude with a degree in biology from the University of Wisconsin – Milwaukee, where he also was a record holder in distance running. At the Medical College of Wisconsin, he earned membership in the Alpha Omega Alpha Medical Honor Society. An officer in the U.S. Navy, Dr. Zehms completed his surgical internship and orthopaedic residency at the Naval Medical Center in Portsmouth, Virginia. He has published papers on PCL reconstruction, humeral shaft fractures, and on return to active military duty following open versus arthroscopic shoulder stabilization.

Bojan B. Zoric, M.D.

After playing professional soccer in Sweden, Dr. Zoric majored in biology-molecular genetics and minored in chemistry at the University of Rochester, graduating magna cum laude and earning distinction as a scholar and soccer athlete. He then attended medical school at the University of California – Los Angeles and received numerous academic excellence awards. Dr. Zoric completed his residency at the Harvard Combined Orthopaedic Residency Program. He is active in research, and his studies of pediatric ACL reconstruction and ACL and PCL graft reconstructions have been published in the *American Journal of Sports Medicine*, *Journal of Orthopaedic Research*, and *Arthroscopy*.

Where are they now. . .

Members of the graduating class of 2006/2007 Steadman-Hawkins Fellows are busy establishing new careers in orthopaedics.

Brett Cascio – returned to his hometown and has joined the faculty and practice of academic medicine at Louisiana State University Department of Orthopaedic Surgery.

Mike Huang – private practice in Grand Junction, Colorado (remaining in his home state – grew up in Denver).

Ben Huffard – private practice in Portland, Maine (grew up in New England).

Dave King – private practice in St. Louis, Missouri.

Colin Looney – private practice in Franklin, Tennessee.

Tom Viehe – Foot and Ankle Fellowship with Dr. Roger Mann in Oakland, California.

Yi-Meng Yen – Pediatric Orthopaedic Fellowship at Boston Children's Hospital.

Yi-Meng Yen, M.D. - A Case Study in Preparation

By Jim Brown, Ph.D., Executive Editor, Steadman◆Hawkins Research Foundation News

His father is a physician with ties to USC and UCLA. His mother has a Ph.D. in psychology and teaches Chinese at the university level. His sister has a degree in journalism from Stanford, was a writer for *Sports Illustrated*, and recently joined *Business 2.0* as chief of reporters. His brother has an M.B.A. from Yale and left eBay to help build an Internet startup company called Adbrite.

If you are Yi-Meng Yen, how can you possibly measure up to the high standards set by your parents and siblings? You start by graduating cum laude from UCLA with degrees in chemical engineering and economics. Then you complete a master of engineering before entering the Medical Scientist Training Program at UCLA. Next, you earn a Ph.D. in biological chemistry and you are accepted into Alpha Omega Alpha Honor Medical Society — the "Phi Beta Kappa" for medical schools — at UCLA on your way to becoming a Doctor of Medicine.

Is that enough? No, not if you're Dr. Yen. You complete your residency at UCLA, become published in medical and scientific journals, receive awards for basic and clinical science, and then you are accepted for not one, but two of the most prestigious medical fellowship programs in the world, including the one at the Steadman◆Hawkins Research Foundation.

"I remember visiting Vail while I was still in school, taking a picture in front of the Foundation's building, and thinking I'd never be able to get into the Steadman-Hawkins program," Dr. Yen recalls. "But eventually I applied and went through the process of trying to become one of seven applicants (out of a field 160) chosen for the 2006-2007 class of Steadman-Hawkins Fellows. During one of the interviews, Dr. Steadman asked me what I thought about molecular markers for osteoarthritis. That blew me away. Here I was sitting at a table with some of the most accomplished physicians and scientists in the world. I was nervous, but I tried not to show it."

The Genealogy

Apparently, Dr. Yen's answer to Dr. Steadman's question was satisfactory. He was accepted and recently finished his year of advanced training at the Foundation. "You have to experience it to really understand what sets the Steadman-Hawkins program apart," explains Dr. Yen. "First is the Steadman-Hawkins genealogy — the reputation of Dr. Steadman and his colleagues who have come here to practice medicine and conduct research."

Dr. Yi-Meng Yen (left) with Dr. Marc J. Philippon.

The Environment

"Then there is the environment," Dr. Yen continues. "It has a lot of intangibles that you don't get at other places. It shows in the way patients are treated and how the doctors interact with them, whether they are famous athletes, entertainers, leaders in the business world, or active people who want to remain active in spite of their injuries or conditions."

The Team Approach

"At Steadman-Hawkins there is a team approach to almost everything," says Dr. Yen. "You do your rounds with the attending physician, as well as with physical therapists. They allow you to formulate your own plan, then compare it to that of the attending physician. There is no miscommunication."

The Clinic and the Foundation

"One of the most important differences is that there are two Steadman-Hawkins entities — the Clinic and the Foundation. Although they are separate, they are intertwined. What we did in the Clinic was based on the work done in the Foundation. For example, I worked with Dr. Philippon to analyze about 300 X-rays taken one year after surgeries to determine the parameters that will affect the eventual outcome of a patient's treatment. As a result, we have concrete data that can help us tell a patient exactly how likely he or she is to need certain procedures over the next few years."

The Opportunity

Finally, the Steadman◆Hawkins Research Foundation gave Dr. Yen the opportunity to participate in a variety of medical research projects. "I would like to stay in academic medicine, and I'll be expected to publish. My training here has prepared me to practice medicine, conduct surgical procedures, engage in research, and publish the results of those studies."

Although he could have gone into any of several medical directions, he has chosen surgery over medicine and children over adults. Why? "I don't like medicine as much because the results can't be seen immediately. Medicine takes time. You can see the results of surgery right now, and orthopaedic surgery allows me to use some of my training in engineering. I like using my hands, and I don't mind using a drill in the operating room." Dr. Yen has also decided to concentrate on pediatric sports medicine. Again, why? "Because you may be able to make a difference in children and young people that will last a lifetime," he answers. He and his wife, Kate, have three children of their own.

To further prepare for that specialty, he is now participating in a pediatric orthopaedic fellowship program at Children's Hospital Boston, and he hopes to eventually settle into a career of teaching at Harvard and practicing at Children's Hospital. It is a reasonable goal. After all, he is arguably one of the best-prepared young pediatric orthopaedic surgeons in the country, if not the world. And, he has to keep up the Yen family tradition of excellence, whether it's in medicine, education, or business.

Presentations & Publications

A primary goal of the Foundation is to distribute the results of its research. In 2007, principal investigators and Fellows published 59 papers in scientific and medical journals and delivered 174 presentations to a variety of professional and lay audiences worldwide.

2007 PRESENTATIONS

Briggs KK, Matheny LM, Horan MP, Steadman JR. Psychometric Properties of a Patient Satisfaction Score Following Arthroscopic Knee Surgery. *International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine*, Florence, Italy, May 2007.

Briggs KK, Matheny LM, Sterett WI. Predictors of Patient Expectations for HTO vs TKA. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Briggs KK, Matheny LM, Steadman JR. Initial Result of Treatment with Hylan G-F 20 and Corticosteroid. Poster. *2007 World Congress on Osteoarthritis, Osteoarthritis Research Society International,* Fort Lauderdale, Fla, Dec 2007.

Briggs KK, Rodkey WG, Steadman JR. How Long Do Beneficial Effects of Partial Meniscectomy Persist? *American Orthopaedic Society for Sports Medicine*, Calgary, Canada, July 2007.

Briggs KK, Rodkey WG, Steadman JR. How Long Do Beneficial Effects of Partial Meniscectomy Persist? *International Cartilage Repair Society*, Warsaw, Poland, Sept 2007.

Briggs KK, Rodkey WG, Steadman JR. Factors Associated with Repeat Meniscus Surgery in Patients Undergoing Suture Meniscus Repair. *2007 World Congress on Osteoarthritis, Osteoarthritis Research Society International*, Fort Lauderdale, Fla, Dec 2007.

Briggs KK, Steadman JR. Predictors of Decreased Function and Activity Level in Patients Seeking Treatment for Osteoarthritis of the Knee. Poster. *2007 World Congress on Osteoarthritis, Osteoarthritis Research Society International*, Fort Lauderdale, Fla, Dec 2007.

Carreira DS, Kuppersmith DA, Briggs KK, Steadman JR. ACL Injury Patterns and Associated Pathologies in the Adolescent Knee. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Carreira DS, Steadman JR, Matheny LM, Briggs KK, Rodkey WG. Outcomes Following the "Healing Response" Procedure to Treat Full-Thickness Tears of the Proximal ACL. Poster. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Carreira DS, Steadman JR, Matheny LM, Briggs KK, Rodkey WG. Outcomes Following the "Healing Response" Procedure to Treat Full-Thickness Tears of the Proximal ACL. Poster. *International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine*, Florence, Italy, May 2007.

Carreira DS, Kuppersmith DA, Briggs KK, Steadman JR. ACL Injury Patterns and Associated Pathologies in the Adolescent Knee. Poster. *International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine,* Florence, Italy, May, 2007.

Cascio BM, Yen Y, Bennett J, Briggs KK, Steadman JR. Revision Microfracture Clinical Results. Poster. *International Cartilage Repair Society,* Warsaw, Poland, Sept 2007.

Corenman DS, Karli DC, Pateder DB, Kelley-Spearing SA, Strauch EL. Upper Extremity Range of Motion: Effect on Tension of the Cervical Nerve Roots. Poster. *Cervical Spine Research Society 2007 Annual Meeting,* San Francisco, Calif, Nov 2007.

Reaching Out to the World

The Foundation's research findings are shared with physicians and scientists around the world. We offer training throughout the year to physicians-in-residence, visiting medical personnel, and participants at the international medical conferences that we host.

To reach professionals who are unable to come to us, Foundation scientists and physicians report their research worldwide through peer-reviewed publications and presentations. We have produced more than 539 papers, 1,374 presentations, and 80 teaching videos—many award-winning—that have been accepted by medical and scientific journals and organizations worldwide.

We disseminate our findings to the general public and students as well, through videotapes, educational programs, the Internet, and media outlets.

Corenman DS, Kelley-Spearing SA, Karli DC, Strauch EL, Glassman RD. Physical Exam Findings Relate to Perceived Disability in Neck Patients. *North American Spine Society 2007 Annual Meeting,* Austin, Tex, Oct 2007.

Corenman DS, Kelley-Spearing SA, Karli DC, Strauch EL, Glassman RD. Physical Exam Findings Relate to Perceived Disability in Back Patients. *North American Spine Society 2007 Annual Meeting,* Austin, Tex, Oct 2007.

Corenman DS. On-Slope Management of Spine Injuries. *Vail Ski Patrol,* Vail, Colo, Nov 2007.

Corenman DS. Inflammatory and Autoimmune Spondyloarthropathies. *Steadman◆Hawkins Research Foundation Orthopaedic & Spine Lecture Series,* Vail, Colo, Oct 2007.

Fernandez JW, Akbarshahi M, Shelburne KB, Steadman JR, Pandy MG. The Effects of Patellar Tendon Adhesion on Patellar Mechanics During Gait: an Anatomically Based Modelling Approach. *Biomechanics of the Lower Limb in Disease,* Salford, UK, Sept 2007.

Fernandez JW, Kim HJ, Dorn T, Schache A, Crossley KM, Shelburne KB, Pandy MG. Patellar Loading During Gait in an Individual with Patellofemoral Osteoarthritis: an Anatomically Based Modelling Approach. *Biomechanics of the Lower Limb in Disease,* Salford, UK, Sept 2007.

Giphart JE, Kaptein BL, Shelburne KB, Torry MB. A Calibration Method for Stereo Fluoroscopic Imaging Systems. Poster Presentation. *American Society of Biomechanics,* Stanford, Calif, Aug 2007.

Gobezie R, Zurakowski D, Millett PJ, Cole BJ, Warner JJP. Interobserver and Intraobserver Variability in the Diagnosis and Treatment of SLAP Lesions. *American Academy of Orthopaedic Surgeons, Specialty Day AOSSM,* San Diego, Calif, Feb 2007.

Holsten DG, Rodkey WG, Briggs KK, Schwabke R. Inside-Out versus All-Inside Suture Techniques for Fixation of Collagen Meniscus Implants (CMI). *Arthroscopy Association of North America,* San Francisco, Calif, Apr 2007.

Holsten DG, Rodkey WG, Briggs KK. Collagen Meniscus Implants (CMI): Inside-Out Versus All-Inside Suture Techniques. *European Federation of National Associations of Orthopaedics and Traumatology (EFORT),* Florence, Italy, May 2007.

Holsten DG, Rodkey WG, Briggs KK, Schwabke R. All-Inside Suture Techniques Have Advantages Over Inside-Out Sutures for Collagen Meniscus Implant (CMI) Fixation. *International Cartilage Repair Society,* Warsaw, Poland, Oct 2007.

Horan MP, Briggs KK. Developing & Managing a Patient Database for Outcomes Research in Sports Medicine. *Arthroscopy Association of North America Traveling Fellows,* Vail, Colo, Apr 2007.

Huffard BH, Horan MP, Millett PJ, Hawkins RJ. Outcomes of Full-Thickness Articular Cartilage Injuries of the Shoulder Treated with Microfracture. *Arthroscopy Association of North America, Annual Meeting,* San Francisco, Calif, Apr 2007.

Hunt SA, Noble D, Briggs KK, Steadman JR. Are Outcomes of Microfracture for Isolated Chondral Defects in the Knee Related to Location? *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Hunt SA, Noble D, Briggs KK, Steadman JR. Are Outcomes of Microfracture for Isolated Chondral Defects in the Knee Related to Location? *International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine Biennial Meeting,* Florence, Italy, May, 2007.

Johnston TL, Briggs KK, Schenker ML, Philippon MJ. Hip Alpha Angles as Predictors of Acetabular Chondral Injury in FAI. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Johnston TL, Briggs KK, Schenker ML, Philippon MJ. Hip Alpha Angles as Radiographic Predictors of Chondral Injury and Decreased Hip Range of Motion in Femoroacetabular Impingement. *International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine,* Florence, Italy, May, 2007.

Kelley-Spearing SA, Corenman DS, Glassman RD, Briggs KK. General Health Relates to Disability in Neck and Back Patients. *North American Spine Society 2007 Annual Meeting,* Austin, Tex, Oct 2007.

Kimmerly WS, Schenker ML, Briggs KK, Philippon MJ. Labral Tear Morphology is Associated with Type of Femoroacetabular Impingement. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Millett PJ. Acute Dislocation: Is There a Place for Arthroscopic Treatment? *6th Advanced Course on Shoulder Arthroscopy,* Val d' Isere, France, Jan 2007.

Millett PJ. Findings in Posterior Instability. *6th Advanced Course on Shoulder Arthroscopy,* Val d' Isere, France, Jan 2007.

Millett PJ. Arthroscopic Treatment of Recurrent Posterior Instability. *6th Advanced Course on Shoulder Arthroscopy,* Val d' Isere, France, Jan 2007.

Millett PJ. Surgical Anatomy of 10 Common Upper Extremity Conditions: A Refresher for the General Orthopaedic Surgeon. Instructional Course Lecture. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Millett PJ. Complex Shoulder Revisions. *American Orthopaedic Association, Traveling Fellows,* Vail, Colo, Feb 2007.

Millett PJ. Common Shoulder Disorders: What's New in 2007? Vail, Colo, Feb 2007.

Millett PJ. Open Technique for Posterior Instability. *8th Annual American Academy of Orthopaedic Surgeons/American Orthopaedic Society for Sports Medicine, Sports Medicine Course: From the Slopes to the Sidelines,* Steamboat Springs, Colo, Mar 2007.

Millett PJ. Coracoid Impingement: Fact or Fiction? *8th Annual American Academy of Orthopaedic Surgeons/American Orthopaedic Society for Sports Medicine, Sports Medicine Course: From the Slopes to the Sidelines,* Steamboat Springs, Colo, Mar 2007.

Millett PJ. Muscle Tendon Injuries about the Shoulder. *8th Annual American Academy of Orthopaedic Surgeons/ American Orthopaedic Society for Sports Medicine, Sports Medicine Course: From the Slopes to the Sidelines,* Steamboat Springs, Colo, Mar 2007.

Millett PJ. Point/Counterpoint: Lateral Epicondylitis: It Ought to be Treated Open, No Kidding. *8th Annual American Academy of Orthopaedic Surgeons/ American Orthopaedic Society for Sports Medicine, Sports Medicine Course: From the Slopes to the Sidelines,* Steamboat Springs, Colo, Mar 2007.

Millett PJ. Arthroscopic Debridement and Microfracture. *American Academy of Orthopaedic Surgeons, Cartilage Restoration of the Knee #3111. OLC,* Rosemont, Ill, June 2007.

Millett PJ. Microfracture (video demonstration). *American Academy of Orthopaedic Surgeons, Cartilage Restoration of the Knee #3111. OLC,* Rosemont, Ill, June 2007.

Millett PJ. Proximal Tibial Distraction Technique. *American Academy of Orthopaedic Surgeons, Cartilage Restoration of the Knee #3111. OLC,* Rosemont, Ill, June 2007.

Millett PJ. Massive Tears/Repair and Tendon Transfer. *Rocky Mountain Shoulder and Elbow Surgeons Meeting,* Boulder, Colo, July 2007.

Millett PJ. Primary TSA: Subscapularis/ Long Head Biceps /Posterior Capsule. *Rocky Mountain Shoulder and Elbow Surgeons Meeting,* Boulder, Colo, July 2007.

Millett PJ. TECHNIQUE Suprascapular Nerve /Snapping Scapula. *Rocky Mountain Shoulder and Elbow Surgeons Meeting,* Boulder, Colo, July 2007.

Millett PJ. Evaluation and Treatment of the Injured Athlete. *Boston University School of Medicine,* Boston, Mass, July 2007.

Millett PJ. Management of Complex and Revision Instability of the Shoulder. *Orthopaedic Grand Rounds, Aspen Valley Hospital,* Aspen, Colo, Aug 2007.

Millett PJ. Shoulder Injuries in the Throwing Athlete. *Orthopaedics & Spine Lecture Series,* Vail, Colo, Sept 2007.

Millett PJ. Common Shoulder Injuries: Rotator Cuff Tears and Instability in an Active Population Including Both Surgical and Rehabilitation Strategies to Prevent and Manage Them. *Howard Head Lecture,* Edwards, Colo, Sept 2007.

Millett PJ. Double-Row Repair Techniques. *Arthrex Shoulder Symposium,* Naples, Fla, Sept 2007.

Millett PJ. The Suture Bridge Technique. Live surgical demonstration. *Arthrex Shoulder Symposium,* Naples, Fla, Sept 2007.

Millett PJ. Subscapularis Repair and Biceps Tenodesis. *Arthrex Shoulder Symposium,* Naples, Fla, Sept 2007.

Millett PJ. Arthroscopic Subscapularis Repair and Biceps Tenodesis. Live surgical demonstration. *Arthrex Shoulder Symposium,* Naples, Fla, Sept 2007.

Millett PJ. Posterior Instability. *Didactic Session; Arthrex Shoulder Symposium,* Naples, Fla, Sept 2007.

Millett PJ. Fractures of the Proximal Humerus. *Didactic Session; Arthrex Shoulder Symposium,* Naples, Fla, Sept 2007.

Pandy MB, Torry MR, Shelburne KB. Contributions of Individual Muscles to Medio-lateral Stability in Normal Walking. *International Society of Biomechanics,* Taipei,Taiwan, July 2007.

Philippon MJ. Hip Arthroscopy. *10th Advanced Arthroscopy Course,* Courmayer, Italy, Jan 2007.

Philippon MJ. New Techniques in Hip Arthroscopy. *Smith & Nephew Global Sales Meeting,* Miami, Fla, Jan 2007.

Philippon MJ. "Can the Labrum Heal?" *2007 Vail Hip Symposium,* Vail, Colo, Feb, 2007.

Philippon MJ. Labral Repair. *2007 Vail Hip Symposium,* Vail, Colo, Feb 2007.

Philippon MJ. Outcomes of Microfracture in the Hip. *2007 Vail Hip Symposium,* Vail, Colo, Feb 2007.

Philippon MJ. Outcomes of Arthroscopic Surgery for FAI in the Athlete. *2007 Vail Hip Symposium,* Vail, Colo, Feb 2007.

Philippon MJ, Kuppersmith DA, Schenker ML. Intra-articular Hip Injury Patterns in Professional Hockey Players. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Philippon MJ, Briggs KK, Johnston TL, Hines SL. Hip Labral Healing After Repair: Results from Second Look Arthroscopy. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Philippon MJ, Briggs KK, Maxwell RB, Kuppersmith DA, Hines SL. Time Frame for Improvement Following Arthroscopic Hip Surgery. *American Academy of Orthopaedic Surgeons Annual Meeting,* San Diego, Calif, Feb 2007.

Philippon MJ. Arthroscopic Acetabular Labral Repair Video. *Arthroscopy Association of North America Specialty Day,* San Diego, Calif, Mar 2007.

Philippon MJ. Intra-articular Arthroscopic Anatomy of the Affected Hip. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. What I Would Have Done Differently if I Could Go Back in Time Today. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. Basic Principles of Labral Repair. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. FAI & Labral Resection Labral Repair and Rim Trimming. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. FAI – Is it the Future? *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. Capsulectomy in FAI: In Opposition. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. FAI and Labral Repair / Reconstruction Technique Video. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. Hip Arthroscopy in PVNS. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. Problems and Complication. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. Growth Factors. *3rd International Hip Arthroscopy Meeting,* Sao Paulo, Brazil, Mar 2007.

Philippon MJ. Labral Tears and Capsule Pathology. *1st Hip Arthroscopy Course / 2nd Annual Meeting of Hip Surgery in Young Adult,* Madrid, Spain, Mar 2007.

Philippon MJ. Perspective in Hip Arthroscopy. *1st Hip Arthroscopy Course / 2nd Annual Meeting of Hip Surgery in Young Adult,* Madrid, Spain, Mar 2007.

Philippon MJ. Hip Arthroscopy. *Aspen Valley Hospital Grand Rounds,* Aspen, Colo, Mar 2007.

Philippon MJ. Hip Arthroscopy: Indications and Technique. *26th Annual Cherry Blossoms Seminar,* Washington, DC, Apr 2007.

Philippon MJ. Arthroscopy in Treating the Arthritic Hip. *26th Annual Cherry Blossoms Seminar,* Washington, DC, Apr 2007.

Philippon MJ. Arthroscopy for Arthritis. *American Academy of Orthopaedic Surgeons Boomeritis®: Musculoskeletal Care of the Mature Athlete,* Hilton Head, SC, Apr 2007.

Philippon MJ. Impingement and Labral Tears. *AAOS Boomeritis®: Musculoskeletal Care of the Mature Athlete,* Hilton Head, SC, Apr 2007.

Philippon MJ. Minimally Invasive Hip Arthroplasty – Advantages in the Athlete. *American Academy of Orthopaedic Surgeons Boomeritis®: Musculoskeletal Care of the Mature Athlete,* Hilton Head, SC, Apr 2007.

Philippon MJ, Briggs KK, Hines SL, Kuppersmith DA, Maxwell RB. Early Results of Labral Repair. *Arthroscopy Association of North America Annual Meeting,* San Francisco, Calif, Apr 2007.

Philippon MJ, Briggs KK, Kuppersmith DA. Outcomes Following Hip Arthroscopy with Microfracture. *Arthroscopy Association of North America Annual Meeting,* San Francisco, Calif, Apr 2007.

Philippon MJ. Labral Tears: Etiology and Treatment Algorithm. Instructional Course Lecture. *Arthroscopy Association of North America Annual Meeting,* San Francisco, Calif, Apr 2007.

Philippon MJ, Schenker ML, Briggs KK. Radiographic Evidence of Acetabular Dysplasia as a Predictor of Hip Joint Instability. *International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine,* Florence, Italy, May 2007.

Philippon MJ, Kuppersmith DA, Briggs KK, Clark AM. Hip Range of Motion in Professional Baseball Players. *International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine,* Florence, Italy, May 2007.

Philippon MJ, Arnoczky SP, Torrie A. Arthroscopic Hip Labral Repair: An In Vivo Model. *International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine,* Florence, Italy, May 2007.

Philippon MJ. Hip Instability. *University of California, Los Angeles / Ottawa Sports Medicine Hip Conference,* Marina Del Rey, Calif, June 2007.

Philippon MJ. Arthroscopic Repair of the Acetabular Labrum. *University of California, Los Angeles / Ottawa Sports Medicine Hip Conference,* Marina Del Rey, Calif, June 2007.

Philippon MJ. New Frontiers in Hip Arthroscopy. *Grand Rounds; Columbia University,* New York, NY, June 2007.

Philippon MJ. Acute and Chronic Hip Injuries in Professional Hockey Players. *NHL Trainers and Physicians Meeting,* Phoenix, Ariz, June 2007.

Philippon MJ. Hip Alpha Angles as Radiographic Predictors of Chondral Injury. *Arthroscopy Association of North America, Masters Course,* Chicago, Ill, June 2007.

Philippon MJ. Labral Repair and Outcomes in Professional Athletes. *Arthroscopy Association of North America. Masters Course,* Chicago, Ill, June 2007.

Philippon MJ. Surgical Evaluation and Management of FAI. *Current Issues in MRI,* San Francisco, Calif, Aug 2007.

Philippon MJ. The Future of Hip Arthroscopy. *Stockholm Arthroscopy Meeting,* Stockholm, Sweden, Sept 2007.

Philippon MJ. Labral Tears. *Stockholm Arthroscopy Meeting,* Stockholm, Sweden, Sept 2007.

Philippon MJ. Exam & Anatomy of the Athletes Hip. *University of Colorado Fall Sports Medicine Symposium,* Boulder, Colo, Sept 2007.

Philippon MJ. FAI and Labral Tears: Surgical Advances in Treatment of Hip Pathology. *University of Colorado Fall Sports Medicine Symposium,* Boulder, Colo, Sept 2007.

Philippon MJ. Why Fix the Labrum? *Advances in Arthroplasty Course, Harvard / Mass General,* Boston, Mass, Sept 2007.

Philippon MJ. Arthroscopic Partial Surface Replacement. *Advances in Arthroplasty Course, Harvard / Mass General,* Boston, Mass, Sept 2007.

Philippon MJ. Hip Instability. *Advances in Arthroplasty Course, Harvard / Mass General,* Boston, Mass, Sept 2007.

Philippon MJ. Hip Alpha Angle as Radiographic Predictors of Chondral Injury. *Arthroscopy Association of North America, Masters Course,* Rosemont, Ill, Oct 2007.

Philippon MJ. Labral Repair and Outcomes in Athletes. *Arthroscopy Association of North America, Masters Course,* Rosemont, Ill, Oct 2007.

Philippon MJ. Surgical Evaluation and Management of Pincer Impingement. *Arthroscopy Association of North America, Masters Course,* Rosemont, Ill, Oct 2007.

Philippon MJ. Importance of the Acetabular Labrum: Preservation and Reconstruction in FAI. *San Francisco Smith & Nephew Hip Course,* San Francisco, Calif, Oct 2007.

Philippon MJ. Evidence of Validity of the Hip Outcome Score. *San Francisco Smith & Nephew Hip Course,* San Francisco, Calif, Oct 2007.

Philippon MJ. 2nd Look Arthroscopy: Labral Repair vs. Refixation. *San Francisco Smith & Nephew Hip Course,* San Francisco, Calif, Oct 2007.

Philippon MJ. Labral Repair: Suture Anchor Technique. *Arthroscopy Association of North America, Fall Course,* Orlando, Fla, Nov 2007.

Philippon MJ. FAI: How I Manage it. *Hong Kong Orthopaedic Association Sports Medicine/Hip Arthroscopy Congress,* Hong Kong, Nov 2007.

Philippon MJ. Treatment Options of Labral Injuries: Repair vs. Debridement. *Hong Kong Orthopaedic Association Sports Medicine/Hip Arthroscopy Congress,* Hong Kong, Nov 2007.

Philippon MJ. Revision Hip Arthroscopy. *Hong Kong Orthopaedic Association Sports Medicine/Hip Arthroscopy Congress,* Hong Kong, Nov 2007.

Philippon MJ. History and Indications for Hip Arthroscopy. *Hong Kong Orthopaedic Association Sports Medicine/Hip Arthroscopy Congress,* Hong Kong, Nov 2007.

Philippon MJ. Hip Injuries in the Professional Athlete. *Major League Baseball Team Physicians / Trainers Academic Meeting,* Nashville, Tenn, Dec 2007.

Rodkey WG. Collagen Meniscus Implants (CMI). *A Knee Innovation Summit: From Birth to Death, The Cleveland Clinic,* Cleveland, Ohio, Apr 2007.

Rodkey WG. New Tissue Growth after Placement of the Collagen Meniscus Implant (CMI). *Sportsmedizin Gardasee 2007,* Riva di Garda, Italy, Sept 2007.

Rodkey WG. The Collagen Meniscus Implant (CMI): Why it Works. *Polskie Towarzystwo Traumatologii Sportowej (Polish Society for Sports Traumatology),* Warsaw, Poland, Sept 2007.

Rodkey WG, Steadman JR. Implications of surgical procedures to rehabilitation for microfracture. *International Cartilage Repair Society (ICRS) Rehabilitation Consensus Meeting,* Zurich, Switzerland, June 2007.

Rodkey WG, Briggs KK, Steadman JR. New Tissue Growth after Collagen Meniscus Implant (CMI) Placement Increases Activity Levels after Two Years. *Arthroscopy Association of North America,* San Francisco, Calif, Apr 2007.

Rodkey WG, Briggs KK, Steadman JR. Clinical Symptoms, Function, and Activity Levels Correlate with Meniscus Loss During Meniscectomy. *Arthroscopy Association of North America,* San Francisco, Calif, Apr 2007.

Rodkey WG, Briggs KK, Steadman JR. Collagen Meniscus Implant (CMI)-Regenerated New Tissue Increases Activity Levels after Two Years. *European Federation of National Associations of Orthopaedics and Traumatology (EFORT),* Florence, Italy, May 2007.

Rodkey WG, Briggs KK, Steadman JR. Correlation of Extent of Meniscus Loss during Meniscectomy with Clinical Symptoms, Function, and Activity Levels. *European Federation of National Associations of Orthopaedics and Traumatology (EFORT),* Florence, Italy, May 2007.

Rodkey WG, Briggs KK, Steadman JR. Clinical Symptoms, Function, and Activity Levels Correlate with Degree of Tissue Loss Following Meniscectomy. *American Orthopaedic Society for Sports Medicine, Specialty Day,* San Diego, Calif, Feb 2007.

Rodkey WG, Briggs KK. New Tissue Generated by the Collagen Meniscus Implant (CMI) Leads to Increased Activity Levels After 2 Years. *American Orthopaedic Society for Sports Medicine, Specialty Day,* San Diego, Calif, Feb 2007.

Rodkey WG, Briggs KK, Steadman JR. Collagen Meniscus Implants (CMI) Decrease the Rate of Reoperation in Chronic Patients: A Survivorship Analysis. *Arthroscopy Association of North America,* San Francisco, Calif, Apr 2007.

Rodkey WG, Briggs KK, Steadman JR. Function and Activity Levels Correlate with Location of Tissue Loss Following Meniscectomy. *2007 World Congress on Osteoarthritis, Osteoarthritis Research Society International,* Fort Lauderdale, Fla, Dec 2007.

Rodkey WG, Briggs KK, Steadman JR. Factors Associated with Improvements in Function Following Partial Meniscectomy. *2007 World Congress on Osteoarthritis, Osteoarthritis Research Society International,* Fort Lauderdale, Fla, Dec 2007.

Rodkey WG, Briggs KK, Steadman JR. Collagen Meniscus Implants (CMI) Decrease Reoperation Rates in Chronic Patients: A Survivorship Analysis. *European Federation of National Associations of Orthopaedics and Traumatology (EFORT),* Florence, Italy, May 2007.

Rodkey WG, Briggs KK, Steadman JR. Clinical Symptoms, Function, and Activity Levels Correlate with Degree of Tissue Loss Following Meniscectomy. *International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS),* Florence, Italy, May 2007.

Rodkey WG, Briggs KK, Steadman JR. New Tissue Generated by the Collagen Meniscus Implant (CMI) Leads to Increased Activity Levels after Two Years. *International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS),* Florence, Italy, May 2007.

Rodkey WG, Briggs KK, Steadman JR. Collagen Meniscus Implant (CMI)-Generated New Tissue Leads to Increased Activity Levels after Two Years. *Kongress der Deutschsprachigen Arbeitsgemeinschaft für Arthroskopie (AGA) (Congress of the German Speaking Association of Arthroscopy),* Cologne, Germany, Sept 2007.

Rodkey WG, Briggs KK, Steadman JR. Collagen Meniscus Implants (CMI) Decrease the Reoperation Rate in Chronic Knee Patients: A Survivorship Analysis. *Kongress der Deutschsprachigen Arbeitsgemeinschaft für Arthroskopie (AGA) (Congress of the German Speaking Association of Arthroscopy),* Cologne, Germany, Sept 2007.

Rodkey WG, Briggs KK, Steadman JR. Meniscus Loss During Meniscectomy Is Correlated with Clinical Symptoms, Function, and Activity Levels. *International Cartilage Repair Society,* Warsaw, Poland, Sept 2007.

Rodkey WG, Briggs KK, Steadman JR. Collagen Meniscus Implant (CMI)-Treated Patients have Increased Activity Levels after Two Years. *International Cartilage Repair Society,* Warsaw, Poland, Sept 2007.

Rodkey WG, Briggs KK, Steadman JR. Survivorship Analysis Confirms that Collagen Meniscus Implants (CMI) Decrease Reoperation Rates in Chronic Patients. *International Cartilage Repair Society,* Warsaw, Poland, Sept 2007.

Schlegel TF, Boublik M, Hawkins RJ. Grade III Acromioclavicular Separations in NFL Quarterbacks. *25th Anniversary American Shoulder and Elbow Surgeons Closed Meeting,* Dallas, Texas, Oct 2007.

Schlegel TF. Towards the Double Row, Knotless Systems and Beyond: An Evolution in Rotator Cuff Repair. *Rocky Mountain Shoulder and Elbow Society Meeting,* Boulder, Colo, July 2007.

Schlegel TF. Shoulder Injuries in Contact Athletes. *Rocky Mountain Athletic Trainers Conference,* Denver, Colo, Apr 2007.

Schlegel TF. Evolution to Arthroscopic Cuff Repair. *Hawkins Society Meeting,* Hilton Head, SC, Apr 2007.

Shelburne KB. Computer Simulation of Knee Mechanics: Application to High Tibial Osteotomy. *The University of Melbourne,* Victoria, Australia, Mar 2007.

Shelburne KB, Torry MR, Pandy MG, Steadman JR. The Effect of Valgus Bracing and Lateral Wedge Orthotics on Intra-articular Knee Loads During Gait. *American College of Sports Medicine,* New Orleans, La, May 2007.

Strauch, EL. What Everyone Wants to Know About the Spine but Is Afraid to Ask. *Vail Valley Medical Center Educational Lecture,* Vail, Colo, June 2007.

Strauch, EL. Perioperative Spine Surgical Management Update. *Vail Valley Medical Center Educational Lecture,* Vail, Colo, Sept 2007.

Strauch EL. Evaluation and Treatment of Thoracolumbar Fractures. *Steadman◆Hawkins Research Foundation Orthopaedic & Spine Lecture Series*, Vail, Colo, Nov 2007.

Steadman JR. The Microfracture Technique. *Vail Hip Symposium,* Vail, Colo, Feb 2007.

Steadman JR. ACL Reconstruction. *International Symposium on Ligament & Tendons-VII.* San Diego, Calif, Feb 2007.

Steadman JR. Microfracture. *American Orthopaedic Society for Sports Medicine, Specialty Day,* San Diego, Calif, Feb 2007.

Steadman JR. Treatment of Anterior Interval Scarring. *4th Annual Dallas-Fort Worth Sports Medicine Symposium Injuries in Football,* Dallas, Tex, Mar 2007.

Steadman JR. Cartilage Problems in Athletes. *4th Annual Dallas-Fort Worth Sports Medicine Symposium Injuries in Football,* Dallas, Tex, Mar 2007.

Steadman JR. Microfracture: Basic Science, Technique & Outcome. *American Academy of Orthopaedic Surgeons Boomeritis®: Musculoskeletal Care of the Mature Athlete,* Hilton Head, SC, Apr 2007.

Steadman JR. The Collagen Meniscus Implant. *American Academy of Orthopaedic Surgeons Boomeritis®: Musculoskeletal Care of the Mature Athlete,* Hilton Head, SC, Apr 2007.

Steadman JR. Osteoarthritis: Arthroscopic Treatment Package. *American Academy of Orthopaedic Surgeons Boomeritis®: Musculoskeletal Care of the Mature Athlete.* Hilton Head, SC, Apr 2007.

Steadman JR. Anterior Interval Scarring. *16th Annual Current Issues in MRI,* San Francisco, Calif, Aug 2007.

Sterett WI. Transitioning from Single to Double-Bundle ACL Reconstruction. Instructional Course Lecture. *26th Arthroscopy Association of North America, Fall Course,* Orlando, Fla, Nov 2007.

Sterett WI. Lower Extremity and ACL Issues in Patrolling. *Vail Ski Patrol,* Vail, Colo, Nov 2007.

Sterett WI. How to Prevent Common Golf Injuries. *Red Sky Ranch and Golf Club,* Wolcott, Colo, June 2007.

Sterett WI. Knee MRI & Arthroscopy: Pearls and Pitfalls from the Orthopaedic Perspective. *Advanced Orthopaedic Imaging in Wine Country*, Sonoma, Calif, June 2007.

Sterett WI. Shoulder MRI & Arthroscopy: Pearls and Pitfalls from the Orthopaedic Perspective. *Advanced Orthopaedic Imaging in Wine Country,* Sonoma, Calif, June 2007.

Sterett WI. Advances in the Treatment of DJD. *Shaw Center,* Edwards, Colo, May 2007.

Sterett WI. Joint Preservation & the Post-Meniscectomy Knee. *Arthroscopy Association of North America, Traveling Fellows,* Vail, Colo, Apr 2007.

Sterett WI. The Post-Meniscectomy Knee: Evaluation and Management. *American Academy of Orthopaedic Surgeons Annual Meeting Instructional Course Lecture,* San Diego, Calif, Feb 2007.

Sterett WI. Joint Preservation. *American Orthopaedic Association, Traveling Fellows,* Vail, Colo, Feb 2007.

Sterett WI. ACL Reconstruction and Rehabilitation. *2007 Ski School Safety,* Crested Butte, Colo, Jan 2007.

Torry MR. Ice Hockey Research in Professional and Youth Players. *NBC Today Show,* June 2007.

Torry MR, Shelburne KB, Pandy MG. Biomechanics of Drop Landing: Effects of Muscles' Forces on ACL Loads. *American Orthopaedic Association Traveling Fellows Visit, Steadman◆Hawkins Research Foundation,* Vail, Colo, Feb 2007.

Torry MR, Shelburne KB, Giphart JE. Structure, Function, Injury and Reconstruction of the ACL. *Universtiy of Colorado Department of Applied Physiology and Kinesiology,* Denver, Colo, Oct 2007.

Yanagawa T, Millett PJ, Torry MR, Shelburne KB, Pandy MG. Glenohumeral joint reaction forces following latissimus tendon transfer. *American Society of Biomechanics,* Stanford, Calif, Aug 2007.

Yanagawa T, Torry MR, Shelburne KB, Pandy MG. The effect of hand position on subscapularis force during the belly-press test. Poster Presentation. *American Society of Biomechanics,* Stanford, Calif, Aug 2007.

2007 PUBLICATIONS

Briggs KK, Matheny LM, Steadman JR. Initial results of treatment with Hylan G-F 20 and corticosteroid. *Osteoarthritis and Cartilage.* 2007;15(Suppl);C209.

Briggs KK, Rodkey W, Steadman JR. How long do beneficial effects of partial meniscectomy persist? *Osteoarthritis and Cartilage.* 2007;15(Suppl);B95.

Briggs KK, Rodkey W, Steadman JR. Collagen Meniscus Implant (CMI) Decreased the Rate of Re-Operation in Chronic Patients: A Survivorship Analysis. *Arthroscopy.* 2007;23:e17.

Briggs KK, Steadman JR. Predictors of decreased function and activity level in patients seeking treatment for osteoarthritis of the knee. *Osteoarthritis and Cartilage.* 2007;15(Suppl): C150-C151.

Cascio BM, Yen Y, Bennett J, Briggs KK, Steadman JR. Revision microfracture clinical results. *Osteoarthritis and Cartilage.* 2007;15(Suppl):B95.

Chen AL, Bain EB, Horan MP, Hawkins RJ. Determinants of patient satisfaction with outcome after shoulder arthroplasty. *J Shoulder and Elbow Surgery.* 2007;16:25-30.

Chen NC, Boykin RE, Millett PJ. Broken femoral cross pin after hamstring anterior cruciate ligament reconstruction: case report. *J Knee Surgery.* 2007;20:245-8.

Clark MA, Millett PJ. Arthroscopic Rotator Cuff Repair Instruments and Equipment: Setting Yourself Up for Success. Minimally Invasive Shoulder and Elbow Surgery. Levine WN, Blaine TA, Ahmad CS. Eds. 2007, Informa Healthcare USA, INC. New York, NY

Clavert P, Millett PJ, Warner JJ. Glenoid resurfacing: what are the limits to asymmetric reaming for posterior erosion? *J Shoulder and Elbow Surgery.* 2007;16:843-8.

Corenman DS, Kelley-Spearing SA, Karli DC, Strauch EL, Glassman RD. Physical Exam Findings Relate to Perceived Disability in Back Patients. *The Spine Journal.* 2007;7:59S.

Corenman DS, Kelley-Spearing SA, Karli DC, Strauch EL, Glassman RD. Physical Exam Findings Relate to Perceived Disability in Neck Patients. *The Spine Journal.* 2007;7:65S-66S.

Crawford K, Briggs KK, Rodkey WG, Steadman JR. Reliability, Validity, and Responsiveness of the IKDC Score for Meniscus Injuries of the Knee. Aug 2007 *Arthroscopy.* 2007;23:839-44.

Elvin NG, Elvin AA, Arnoczky SP, Torry MR. The correlation of segment accelerations and impact forces with knee angle in jump landing. *J Applied Biomechanics.* 2007;23:203-12.

Gobezie R, Kho A, Krastins B, Sarracino DA, Thornhill TS, Chase M, Millett PJ, Lee DM. High abundance synovial fluid proteome: distinct profiles in health and osteoarthritis. *Arthritis Res Ther.* 2007;9: R36.

Gobezie R, Pacheco IH, Petit CJ, Millett PJ. Dislocation and Instability after Arthroscopic Capsular Release for Refractory Frozen Shoulder. *Am J Orthop.* 2007;36:672-674.

Godfrey J, Hamman R, Lowenstein S, Briggs K, Kocher M. Reliability, Validity, and Responsiveness of the Simple Shoulder Test: Psychometric Properties by Age and Injury Type. *J Shoulder and Elbow Surgery.* 2007;16:260-267.

Hatch RGF, Gobezie R, Millett PJ. Stiffness After Rotator Cuff Repair. In Complications in Orthopaedics: Rotator Cuff Surgery Monograph. Editor, Green A. *JAAOS,* 2007.

Hawkins RJ, Shank J, Kissenberth MJ, Ramappa A, Singleton SB, Torry MR, Decker M. A comparison of forearm supination and elbow flexion strength in patients with either long head of the biceps tenotomy or tenodesis. *J Shoulder and Elbow Surg.* 2007;16:e64.

Hawkins RJ, Krishnan SG, Karas S, Noonan TJ, Horan MP. Electrothermal Arthroscopic Shoulder Capsulorrhaphy: A Minimum Two-Year Follow-Up. *Am J Sports Med.* 2007;35:1484-8.

Holsten DG, Rodkey WG, Briggs KK, Schwabke R. All-inside suture techniques have advantages over inside-out sutures for Collagen Meniscus Implant (CMI) Fixation. *Osteoarthritis and Cartilage.* 2007;15(Suppl):B88.

Huffard BH, Horan MP, Millett PJ, Hawkins RJ. Outcomes of Full-Thickness Articular Cartilage Injuries of the Shoulder Treated with Microfracture. *Arthroscopy.* 2007;23 (suppl):pe24 - pe25.

Kelly BT, Philippon MJ. Arthroscopic Hip Anatomy. In Callaghan JJ, Rosenberg, Rubash HE eds. The adult hip. 2007 Lippincott William & Wilkins, Philadelphia, Pa, p68-80.

Kelly BT, Draovitch P, Enseki KR, Martin RL, Erhardt R, Philippon MJ. Hip arthrosocpy and the management of nonarthritic hip pain. In eds. ElAttrache NS, Harner CD, Mirzayan R, Sekiya JK, *Surgical Techniques in Sports Medicine.* 2007 Lippincott Williams & Wilkins, Philadelphia Pa, p 583-611.

Kelly-Spearing SA, Corenman DS, Glassman RD, Briggs KK. General Health Relates to Disability in Neck and Back Patients. *The Spine Journal.* 2007; 7: 75S.

Kernozek TW, Torry MR, Iwasaki M. Gender differences in lower extremity landing mechanics caused by neuromuscular fatigue. *Am J Sports Med.* Epub 2007 Nov 15.

Lawrence R, Kernozek T, Miller E, Torry MR, Reutemann P. Influences of Hip External Rotation Strength on Knee Mechanics during Single-Leg Drop Landings in Females, *Archives of Physical Medicine and Rehabilitation.* 2007(in press/online).

Looney CG, Kokmeyer D, Allwein CS, Millett PJ. Rehabilitation for Rotator Cuff Tears. *Minerva Ortop Traumatol.* 2007 58:125-35.

Martin RL, Philippon MJ. Evidence of validity for the hip outcome score in hip arthroscopy. *Arthroscopy.* 2007;23:822-6.

Miller BS, Joseph TA, Barry EM, Rich VJ, Sterett WI. Patient satisfaction after medial opening high tibial osteotomy and microfracture. *J Knee Surg.* 2007;20:129-33.

Millett PJ. One of the Most Complicated Joints in Your Body. *Bottom Line Publications Boardroom Inc.* Stamford, Conn, 2007 www.BottomLineSecrets.com.

Noonan TJ, Sakryd G, Espinoza LM, Packer D. Posterior rib stress fracture in professional baseball pitchers. *Am J Sports Med.* 2007;35:654-8.

Pacheco IH, Gobezie R, Tsaniklides N, Krastins B, Millett PJ. Acromioclavicular joint reconstruction with Coracoacromial ligament transfer using the docking technique. *J Shoulder and Elbow Surg.* 2007;16.

Pandy MG, Shelburne KB, Torry MR. Contributions of muscles and ligaments to knee joint stability during gait. *Computer Methods in Biology and Biomedical Engineering.* 2007(in press/available online).

Pateder DB, Hungerford MW. Use of fluoroscopically guided intra-articular hip injection in differentiating the pain source in concomitant hip and lumbar spine arthritis. *Am J Orthop.* 2007;36:591-3.

Pateder DB, Kebaish KM, Cascio BM, Neubaeur P, Matusz DM, Kostuik JP. Posterior only versus combined anterior and posterior approaches to lumbar scoliosis in adults: a radiographic analysis. *Spine.* 200715;32:1551-4.

Pateder DB, Khanna AJ, Lieberman IH. Vertebroplasty and kyphoplasty for the management of osteoporotic vertebral compression fractures. *Orthop Clin North Am.* 2007;38:409-18.

Philippon MJ, Arnoczky SP, Torrie A. Arthroscopic repair of the acetabular labrum: a histologic assessment of healing in an ovine model. *Arthroscopy.* 2007;23:376-80.

Philippon MJ, Briggs KK, Kuppersmith D, Hines S, Maxwell RB. Outcomes Following Hip Arthroscopy With Microfracture. *Arthroscopy.* 2007;23:e11.

Philippon MJ, Hines SL, Kuppersmith D, Maxwell RB. Early Results of Labral Repair. *Arthroscopy.* 2007;23:e9-e10

Philippon MJ, Kuppersmith DA, Yen Y-M, Briggs KK. Predictors of progression to total hip arthroplasty following arthroscopic decompression of femoroacetabular impingement. *Osteoarthritis and Cartilage.* 2007;15(Suppl):C38-C39.

Philippon MJ, Maxwell RB, Johnston TL, Schenker M, Briggs KK. Clinical Presentation of Femoroacetabular Impingement. *Knee Surg Sports Traumatol Arthrosc.* 2007;1:1041-7.

Philippon M, Schenker M, Briggs KK, Kuppersmith D. Femoroacetabular impingement in 45 professional athletes: associated pathologies and return to sport following arthroscopic decompression. *KSSTA.* 2007;15:908-914.

Philippon MJ, Schenker ML, Briggs KK, Maxwell RB. Can microfracture produce repair tissue in acetabular chondral defects? *Arthroscopy.* Epub 2007 Nov 5.

Philippon MJ, Schenker ML, Briggs KK, Kuppersmith DA, Maxwell RB, Stubbs AJ. Revision hip arthroscopy. *Am J Sports Med.* 2007;35:1918-1921.

Philippon MJ, Stubbs AJ, Schenker ML, Maxwell RB, Ganz R, Leunig M. Arthroscopic Management of Femoroacetabular Impingement: Osteoplasty Technique and Literature Review. *Am J Sports Med.* 2007;35:1571-1580.

Ramappa A, Gill TJ, Bradford C, Ho CP, Steadman JR. Magnetic resonance imaging to assess knee cartilage repair tissue after microfracture of chondral defects. *J Knee Surg.* 2007;20:228-34.

Ramappa A, Hawkins RJ, Suri M. Shoulder Disorders in the Overhead Athlete. *Instr Course Lect.* 2007;56:35-43.

Rodkey WG, Briggs KK, Steadman JR. Tissue Loss at Meniscectomy Correlates with Clinical Symptoms, Function and Activity Levels. *Arthroscopy.* 2007;23:e16.

Rodkey WG, Briggs KK, Steadman JR. Function and activity levels correlate with location of tissue loss following meniscectomy. *Osteoarthritis and Cartilage.* 2007;15(Suppl):C45.

Rodkey WG, Briggs KK, Steadman JR. Factor associated with repeat meniscus surgery in patients undergoing suture meniscus repair. *Osteoarthritis and Cartilage.* 2007;15(Suppl):C205.

Rodkey WG, Briggs KK, Steadman JR. Meniscus loss during meniscectomy is correlated with clinical symptoms, function, and activity levels. *Osteoarthritis and Cartilage.* 2007;15(Suppl):B86.

Rodkey WG, Briggs KK, Steadman JR. Survivorship analysis confirms that collagen meniscus implants (CMI) decrease reoperation rates in chronic patients. *Osteoarthritis and Cartilage.* 2007;15(Suppl):B87.

Rodkey WG, Briggs KK, Steadman JR. Collagen Meniscus Implant (CMI)-treated patients have increased activity levels after two years. *Osteoarthritis and Cartilage.* 2007;15(Suppl):B86.

Rodkey WG, Steadman JR. Arthroscopic meniscus reconstruction with collagen meniscus implants (published in Spanish as Reconstrucción artroscópia del menisco con el implante meniscal de colágeno). *Cuadernos de Artoscopia.* 2007;14 (Supl. 1):35-41, 2007.

Schlegel TF, Hawkins RJ, Lewis CW, Turner AS. An in vivo comparison of the modified Mason-Allen suture technique versus an inclined horizontal mattress suture technique with regard to tendon-to-bone healing: a biomechanical and histologic study in sheep. *J Shoulder and Elbow Surg.* 2007;16:115-21.

Shelburne KB, Torry MR, Pandy MG, Steadman JR. The Effect of Valgus Bracing and Lateral Wedge Orthotics on Intra-articular Knee Loads During Gait. *Med Sci Sports Exerc.* 2007;39:S5.

Steadman JR, Ramappa AJ, Maxwell RB, Briggs KK. An arthroscopic treatment regimen for osteoarthritis of the knee. *Arthroscopy.* 2007;23:948-955.

Terry MA, Steadman JR, Rodkey WG, Briggs KK. Microfracture for Chondral Lesions. In eds. ElAttrache NS, Harner CD, Mirzayan R, Sekiya JK, *Surgical Techniques in Sports Medicine.* 2007 Lippincott Williams & Wilkins, Philadelphia Pa, p 565-570.

Recognition

The Arthroscopy Association of North America (AANA) at their annual meeting presented Foundation scientists and physicians with two significant awards:

Steadman-Hawkins 2005 Fellow **Todd L. Johnston, M.D.**, and the Foundation's Clinical Research Department were recognized April 28 by AANA with the **2007 Clinical Research Fellows Essay Award** for research entitled *Hip Alpha Angles as Radiographic Predictors of Chondral Injury in Femoroacetabular Impingement*. This study applied advanced techniques in arthroscopic surgery of the hip to investigate potential causes of early hip arthritis. The paper was presented at the national meeting in April.

In addition to Dr. Johnson, the authors of the paper include Dr. Marc Philippon, Karen K. Briggs, and Mara Schenker. The criteria for the award were based on scientific quality, design, and data analysis; relevance to arthroscopy; and originality, clarity, composition, completeness, and organization of the application. This is the third time the Clinical Research Department has won this award, winning previously in 2001 and 2006.

Since graduating from the Steadman-Hawkins Fellowship Program in 2006, Dr. Johnson has proudly joined his father in a busy practice at Cedar Valley Medical Specialists in Waterloo, Iowa.

Also at the AANA annual meeting, Steadman-Hawkins 2007 Fellow **Brett Cascio, M.D.**, was awarded the Resident/Fellow Scholarship for research he conducted at the Department of Biomedical Engineering and Department of Orthopaedic Surgery at Johns Hopkins University. The title of the paper was *Repair of Cartilage Defects with Photopolymerizable Hydrogel, Adhesive, and Bone Marrow Stimulation in a Large Animal Model*. The project involved the use of a hydrogel to fill in cartilage defects and shining UV light to gel the polymer. It is used with microfracture. The stem cells from the microfracture get caught in the hydrogel scaffold and hopefully become cartilage cells. A human trial is going to start in Europe in the next 12 months. The award was based on scientific quality, design, and data analysis.

Dr. Casio attended Duke University, where he majored in history and biology. He graduated with honors from Louisiana State University Medical School in New Orleans, where he was president of Alpha Omega Alpha. Dr. Cascio completed his orthopaedic surgery residency at The Johns Hopkins Hospital, where he was named Administrative Chief Resident. Dr. Cascio is a Captain in the U.S. Army Reserves.

The Arthroscopy Association of North America is an accreditation council for continuing medical education. AANA exists to promote, encourage, support, and foster the development and dissemination of knowledge of arthroscopic surgery in order to improve upon the diagnosis and treatment of diseases and injuries of the musculoskeletal system.

In the Media

THE FOUNDATION HAS BEEN MENTIONED OR FEATURED RECENTLY IN NATIONAL AND INTERNATIONAL MEDIA.

NBC *Today Show* Features Foundation

On April 9, the Biomechanics Research Laboratory of the Steadman◆Hawkins Research Foundation hosted a film crew from the NBC *Today Show*. The crew of five, including on-air personality Kevin Tibbles, visited the Foundation to tape the ongoing biomechanics research of ice hockey players. The objective of this research is to prevent needless injuries among youth hockey players through the teaching of correct biomechanics by coaches.

The crew filmed interviews with the director of the Biomechanics Research Laboratory, Mike Torry, Ph.D.; Steadman-Hawkins hip surgeon Dr. Marc Philippon; research intern Ted O'Leary; and visiting NHL star Rob Blake. The taping also included demonstrations of the equipment and procedures involved in the study of biomechanics.

Using the visual appeal of this ice hockey study and the biomechanics laboratory, the NBC segment showcased how the research of the Foundation impacts the lives of millions worldwide by studying the causes of orthopaedic injury and devising techniques to prevent them. The mission of the Foundation's research is to benefit mankind.

Rob Blake, defenseman for the Los Angeles Kings, was also interviewed for the segment. He stated that any research that could help his son and other youth hockey players avoid injury was well worth conducting. Blake also said he wished the study could have been conducted while he was coming through the ranks as a player.

The September 23 *Denver Post* sports section featured Dr. Steadman and the Foundation in the article "Steadman Knee-Deep in Healing Powers," by Jason Blevins. "By the early '90s, Vail's Steadman◆Hawkins Research Foundation, a scientific base for pioneering joint research formed by Steadman in 1988, had refined the microfracture technique and proved it success-

ful. He has since lured some of the top orthopedic surgeons in the world to his research foundation.

In the article, Dr. Steadman remarked, "We have great people looking at things that would take me ten years to figure out (before) and now we can figure them out in weeks and months."

BRITISH MEDICAL JOURNAL RANKS EVIDENCE-BASED MEDICINE AS A TOP MEDICAL BREAKTHROUGH

Foundation Leads the Way

The development of evidence-based medicine (EBM) by researchers at McMaster University in Hamilton, Ontario, has been selected by the prestigious *British Medical Journal* as one of the 15 greatest medical breakthroughs of the past 166 years. Other medical milestones include the development of anesthesia, antibiotics, the Pill, and vaccines.

Dr. Marc Philippon, a member of the Board of Directors of the Steadman◆Hawkins Research Foundation and one of the world's leading orthopaedic hip surgeons, earned his medical degree from McMaster.

EBM is healthcare practice based on integrating knowledge gained from best available research evidence, clinical expertise, and patient values and circumstances. Readers of this pre-eminent medical journal nominated 70 milestones, then a panel of editors and advisors narrowed the field to 15.

According to an article published by the *British Medical Journal*, "Evidence Based Medicine: Increasing, Not Dictating, Choice," the milestone evolved from changes in our culture with a growing recognition that:

> The systematic synthesis of all reliable information on a topic has greater value than traditional reviews.
>
> Bias can explain results in many individual studies, and randomized clinical trials are now recognized as the study design that is best suited to avoiding bias in questions of intervention effectiveness, although other types of study may be better for other types of questions.
>
> Tragedy can result from paying attention to poor quality evidence instead of good quality evidence.
>
> Clinicians need information, and they don't get enough from the sources they typically use.
>
> The medical literature is growing exponentially, and there is not enough time in the day to read even the good content.
>
> Undesirable gaps and variation in practice exist.

When Dr. Steadman established the Foundation 20 years ago, his objective was to create the best clinical research group in the world for sports medicine and EBM. It is something that has been practiced ever since, and it has been the starting point for research at the Foundation. The practice of EBM was a key factor in Dr. Philippon's decision to join Dr. Steadman in Vail.

Since 1993, the records of every patient seen at the Steadman-Hawkins Clinic have been entered into a database. Approximately 700 pieces of evidenced-based information, objective and subjective, exist on every patient. There are now more than 15,000 knees (meaning surgical procedures on knees), 5,000 shoulders, and more than 2,000 hips in the database. Patient outcomes are tracked 5-10 years after surgery. The goal is to monitor progress over a number of years to determine how long patients experienced continued improvement and whether they required additional surgery. The evidence-based information related to patient outcomes is made available to physicians around the world through presentations and publications, contributing to their continuing medical education. Examples of how the Foundation's database has changed surgical procedures include the development and validation of microfracture. Thirteen years ago only a small percentage of the world's surgeons performed microfracture, a procedure to grow and repair cartilage. Today, because of the research of the Foundation and the publication of its findings, it is a procedure routinely used by orthopaedic surgeons to relieve pain and slow the progression of arthritis in the knee. More than one million patients around the world have benefited from this procedure.

Associates

The Steadman◆Hawkins Research Foundation is proud to recognize its team of associates, who carry out the Foundation's research and educational mission in Vail. The staff has been nationally selected for its diverse training and background in biomechanics, engineering, clinical research, veterinary science, and computer science. Together, the staff members take a multidisciplinary approach to their work in solving orthopaedic sports medicine problems.

ADMINISTRATION

J. Michael Egan
President and Chief Executive Officer

Marc Prisant
Executive Vice President and Chief Financial Officer

William G. Rodkey, D.V.M.
Chief Scientific Officer

Amy Ruther
Human Resources and Accounting Manager

DEVELOPMENT

John G. McMurtry, M.A., M.B.A.
Vice President for Program Advancement

Paige Prill
Vice President for Development and Communications

BASIC SCIENCE

William G. Rodkey, D.V.M.
Director

CLINICAL RESEARCH

Karen K. Briggs, M.B.A., M.P.H.
Director

Marilee Horan
Research Associate

Lauren Matheny
Research Associate

Sarah Kelley-Spearing
Research Associate

David Kuppersmith
Research Intern

BIOMECHANICS RESEARCH LABORATORY

Michael Torry, Ph.D.
Director

Kevin B. Shelburne, Ph.D.
Senior Staff Scientist

J. Erik Giphart, Ph.D.
Senior Staff Scientist

EDUCATION

Greta Campanale
Coordinator

VISUAL SERVICES

Joe Kania
Coordinator

Tage Plantell
Coordinator

Lauren Matheny

Lauren Matheny, originally from Toledo, Ohio, received her degree in zoology and neuroscience in 2005 from Miami University of Oxford, Ohio. One year during undergraduate study, her sister invited her on a trip to Colorado. They drove cross-country, visiting various regions, and finally ended up in Vail. "I remember driving into the Rocky Mountains for the first time. I was in awe of the vast beauty. At that moment, I knew I would end up in Colorado."

Lauren joined the Steadman◆Hawkins Research Foundation in September of 2005 as a clinical research intern and then, in November 2005, joined the team as a full-time clinical research assistant to Dr. Sterett. In the past year, Lauren has been engaged in new studies involving patient satisfaction, outcomes, and expectations. Since joining the team, Lauren has been a part of three studies that were presented at the American Academy of Orthopaedic Surgeons in 2007. Lauren plans on earning her master's degree in public health and continuing on to medical school. "I have learned so much being a part of this incredible team. Being able to contribute to the medical field is amazing, and if I can contribute by putting new medical information out there, then I've done my job."

In her spare time, Lauren enjoys traveling, good wine, mountain biking, horseback riding, and snowboarding. "I had only been skiing two times before moving to Colorado. In fact, that is how I ended up at Steadman-Hawkins." Lauren was skiing in Snowmass and got injured on the mountain. After inquiring about clinics in the area, Steadman-Hawkins was mentioned. The injury was not serious, but the outcome was. She found out about the internship and the rest is history.

2007 Financial Statements

Independent Accountants' Report

Board of Directors
Steadman◆Hawkins Research Foundation
Vail, Colorado

We have audited the accompanying statements of financial position of Steadman◆Hawkins Research Foundation (the Foundation) as of December 31, 2007 and 2006, and the related statements of activities and cash flows for the years then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Steadman◆Hawkins Research Foundation as of December 31, 2007 and 2006, and the changes in its net assets and its cash flows for the years then ended in conformity with accounting principles generally accepted in the United States of America.

\s\ BKD, LLP
July 1, 2008
Colorado Springs, Colorado

Statements of Financial Position

December 31, 2007 and 2006

ASSETS

	2007	2006
Cash	**$ 1,419,892**	$ 585,011
Accounts receivable	**21,078**	128,167
Accounts receivable, related party	**27,983**	2,836
Investments	**4,342,493**	4,130,879
Contributions receivable	**332,107**	279,893
Contributions receivable, related party	**750**	750
Prepaid expenses and other assets	**15,909**	65,609
Property and equipment, net	**484,730**	328,583
Total assets	**$ 6,644,942**	$ 5,521,728

LIABILITIES AND NET ASSETS

Liabilities		
Accounts Payable	**$166,463**	$72,594
Accrued expenses	**107,315**	96,148
Deferred revenue	**20,023**	18,000
Long-term debt	**447,849**	–
Total liabilities	**741,650**	186,742
Net Assets		
Unrestricted	**5,129,064**	4,561,769
Temporarily restricted	**774,228**	773,217
Total net assets	**5,903,292**	5,334,986
Total liabilities and net assets	**$ 6,644,942**	$ 5,521,728

See Notes to Financial Statements

Statement of Activities

Year Ended December 31, 2007

	Unrestricted	Temporarily Restricted	Total
REVENUES, GAINS AND OTHER SUPPORT			
Corporate partner support	$ 926,000	$ –	$ 926,000
Contributions	1,254,250	538,101	1,792,351
Grants	–	242,215	242,215
Fundraising events, net of $125,787 of expenses	275,440	–	275,440
Video income	4,740	–	4,740
Other income	27,651	–	27,651
Net assets released from restrictions	779,305	(779,305)	–
Total revenues, gains and other support	3,267,386	1,011	3,268,397
EXPENSES			
Biomechanics research program	696,364	–	696,364
Basic science program	92,991	–	92,991
Bioskills	97,182	–	97,182
Clinical research program	570,126	–	570,126
Education program	254,101	–	254,101
Office of Information Services	226,748	–	226,748
Management and general	636,042	–	636,042
Fundraising	462,309	–	462,309
Total expenses	3,035,863	–	3,035,863
OTHER INCOME (EXPENSE)			
Investment income	347,259	–	347,259
Interest expense	(11,487)	–	(11,487)
Total other income (expense)	335,772	–	335,772
CHANGE IN NET ASSETS	567,295	1,011	568,306
NET ASSETS, BEGINNING OF YEAR	4,561,769	773,217	5,334,986
NET ASSETS, END OF YEAR	$ 5,129,064	$ 774,228	$ 5,903,292

See Notes to Financial Statements

Statement of Activities

Year Ended December 31, 2006

	Unrestricted	Temporarily Restricted	Total
REVENUES, GAINS AND OTHER SUPPORT			
Corporate partner support	$ 572,500	$ 262,000	$ 834,500
Contributions	893,699	460,578	1,354,277
Grants	15,000	354,937	369,937
Fundraising events, net of $156,720 of expenses	368,847	-	368,847
Fellows and other meetings	–	3,400	3,400
Video income	4,100	–	4,100
Other income	15,513	–	15,513
Net assets released from restrictions	895,111	(895,111)	–
Total revenues, gains and other support	2,764,770	185,804	2,950,574
EXPENSES			
Biomechanics research program	531,758	–	531,758
Basic science program	69,057	–	69,057
Bioskills	54,839	–	54,839
Clinical research program	442,830	–	442,830
Education program	266,354	–	266,354
Office of Information Services	173,015	–	173,015
Management and general	407,269	–	407,269
Fundraising	513,534	–	513,534
Total expenses	2,458,656	–	2,458,656
OTHER INCOME (EXPENSE)			
Investment income	479,372	–	479,372
Interest expense	(59,183)	–	(59,183)
Total other income (expense)	420,189	–	420,189
CHANGE IN NET ASSETS	726,303	185,804	912,107
NET ASSETS, BEGINNING OF YEAR	3,835,466	587,413	4,422,879
NET ASSETS, END OF YEAR	**$ 4,561,769**	**$ 773,217**	**$ 5,334,986**

See Notes to Financial Statements

Statements of Cash Flows

Years Ended December 31, 2007 and 2006

	2007	2006
OPERATING ACTIVITIES		
Change in net assets	**$ 568,306**	$ 912,107
Items not requiring (providing) cash		
Depreciation	**184,578**	119,457
Realized and unrealized gains on investments	**(272,695)**	(381,618)
Loss on disposal of fixed assets	**22,625**	59,183
In-kind contributions of investments	**-**	(109,204)
Changes in		
Accounts receivable	**81,942**	20,595
Contributions receivable	**(52,214)**	16,161
Prepaid expenses and other assets	**49,700**	(8,869)
Accounts payable	**93,869**	(35,764)
Accrued expenses	**11,167**	7,212
Deferred revenue	**2,023**	(116,500)
Net cash provided by operating activities	**689,301**	482,760
INVESTING ACTIVITIES		
Purchase of property and equipment	**(363,350)**	(292,646)
Purchase of investments	**(184,340)**	(1,750,686)
Sales of investments	**245,421**	1,230,487
Net cash used in investing activities	**(302,269)**	(812,845)
FINANCING ACTIVITIES		
Principal payments on long-term debt	**(25,668)**	-
Proceeds from issuance of long-term debt	**473,517**	-
Net cash provided by financing activities	**447,849**	-
INCREASE (DECREASE) IN CASH	**834,881**	(330,085)
CASH, BEGINNING OF YEAR	**585,011**	915,096
CASH, END OF YEAR	**$ 1,419,892**	$ 585,011

See Notes to Financial Statements

Statement of Functional Expenses

Year Ended December 31, 2007

	Programs									
	Biomechanics Research	Basic Science	Bioskills	Clinical Research	Education	Office of Information Services	Total	Management and General	Fundraising	Total
Salary and benefits	$ 403,400	$ –	$ 1,027	$ 397,732	$ 55,448	$ 72,850	$ 930,457	$ 382,740	$185,387	$1,498,584
Payroll taxes	24,716	–	43	26,980	6,176	5,025	62,940	23,852	11,666	98,458
Travel	12,568	512	–	17,847	18,040	916	49,883	29,873	4,507	84,263
Utilities	14,345	–	9,345	7,598	4,538	4,538	40,364	3,643	2,122	46,129
Telephone	4,209	–	106	3,468	900	1,352	10,035	7,323	5,045	22,403
Consulting and contract labor	14,298	86,610	16,019	39,925	862	9,470	167,184	16,626	60,197	244,007
Legal and accounting	20,088	70	923	9,722	1,790	1,990	34,583	6,166	5,108	45,857
Postage and freight	5,768	74	373	6,284	1,658	1,275	15,432	5,051	6,455	26,938
Exhibits and meetings	3,820	–	–	1,120	–	–	4,940	–	249	5,189
Research projects	55,671	–	–	100	–	–	55,771	–	–	55,771
Facility rent	23,167	–	11,682	12,263	6,745	6,740	60,597	5,038	4,947	70,582
Promotion	2,000	–	–	–	90	–	2,090	769	–	2,859
Repair, maintenance and equipment	8,309	–	185	358	358	63,794	73,004	358	358	73,720
Board meetings	–	–	–	–	4,679	–	4,679	3,897	–	8,576
Dues, subscriptions, books and journals	462	–	–	91	9,191	21	9,765	277	446	10,488
General insurance	961	–	–	961	259	222	2,403	18,808	591	21,802
Printing	1,139	262	–	5,599	131	248	7,379	1,846	88,694	97,919
Supplies	28,430	–	48,445	17,300	5,017	7,465	106,657	14,412	8,262	129,331
Program support	–	–	–	–	–	–	–	–	16,621	16,621
Depreciation	70,692	–	9,034	17,797	13,007	50,072	160,602	16,880	7,096	184,578
Other	2,321	5,463	–	4,981	125,212	770	138,747	98,483	54,558	291,788
Total	$ 696,364	$ 92,991	$ 97,182	$ 570,126	$ 254,101	$ 226,748	$ 1,937,512	$ 636,042	$ 462,309	$ 3,035,863

See Notes to Financial Statements

Statement of Functional Expenses

Year Ended December 31, 2006

	Programs									
	Biomechanics Research	Basic Science	Bioskills	Clinical Research	Education	Office of Information Services	Total	Management and General	Fundraising	Total
Salary and benefits	$ 361,758	$ –	$ 25,372	$ 331,421	$ 117,097	$ 62,989	$ 898,637	$ 264,183	$ 194,613	$ 1,357,433
Payroll taxes	20,679	–	1,845	20,833	7,711	4,516	55,584	17,348	11,514	84,446
Travel	15,356	2,479	367	9,782	35,447	2,668	66,099	15,974	2,725	84,798
Utilities	4,196	-	1,501	3,248	2,784	5,104	16,833	8,352	2,088	27,273
Telephone	2,892	-	248	2,460	548	1,696	7,844	4,653	1,574	14,071
Consulting and contract labor	12,364	63,299	7,493	14,089	18,600	2,173	118,018	30,000	69,750	217,768
Legal and accounting	8,234	654	115	7,524	1,172	1,424	19,123	10,475	3,510	33,108
Postage and freight	3,905	8	404	4,496	1,130	1,282	11,225	3,136	6,211	20,572
Exhibits and meetings	2,620	–	–	617	29,605	–	32,842	–	–	32,842
Research projects	50,000	–	–	3,989	12,439	–	66,428	–	–	66,428
Facility rent	5,461	–	1,855	4,365	3,426	6,232	21,339	10,327	3,356	35,022
Promotion	1,000	–	–	–	269	–	1,269	–	42,329	43,598
Repair, maintenance and equipment	–	–	–	–	-	33,206	33,206	–	-	33,206
Board meetings	–	–	–	–	1,535	–	1,535	–	20,907	22,442
Dues, subscriptions, books and journals	541	–	11	927	9,108	81	10,668	113	805	11,586
General insurance	960	–	111	1,070	185	221	2,547	14,042	480	17,069
Printing	1,453	403	32	7,529	1,963	63	11,443	190	107,487	119,120
Supplies	16,103	–	6,541	9,942	13,844	9,310	55,740	4,392	8,543	68,675
Program support	57	–	7	63	14	24	165	46	25,488	25,699
Depreciation	23,722	–	8,937	12,352	9,308	41,961	96,280	12,211	10,966	119,457
Other	457	2,214	–	8,123	169	65	11,028	11,827	1,188	24,043
Total	$ 531,758	$ 69,057	$ 54,839	$ 442,830	$ 266,354	$ 173,015	$ 1,537,853	$ 407,269	$ 513,534	$ 2,458,656

See Notes to Financial Statements

Notes to Financial Statements

December 31, 2007 and 2006

NOTE 1: NATURE OF OPERATIONS AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Nature of Operations

Steadman◆Hawkins Research Foundation (the Foundation) is a not-for-profit foundation located in Vail, Colorado, that is dedicated to keeping active people of all ages physically active through orthopedic sports medicine research and education in the areas of arthritis, healing, rehabilitation and injury. The Foundation's primary sources of support are public donations, grants, special events and corporate partners.

Corporate Partners

The Foundation has agreements with several corporations who sponsor the Foundation's research. This research is for the general use of and publication by the Foundation. These agreements are recorded as income in the year payment is due.

Contributions

Gifts of cash and other assets received without donor stipulations are reported as unrestricted revenue and net assets. Gifts received with a donor stipulation that limits their use are reported as temporarily or permanently restricted revenue and net assets. When a donor-stipulated time restriction ends or purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statements of activities as net assets released from restrictions.

Gifts of land, buildings, equipment and other long-lived assets are reported as unrestricted revenue and net assets unless explicit donor stipulations specify how such assets must be used, in which case the gifts are reported as temporarily or permanently restricted revenue and net assets. Absent explicit donor stipulations for the time long-lived assets must be held, expirations of restrictions resulting in reclassification of temporarily restricted net assets as unrestricted net assets are reported when the long-lived assets are placed in service.

Unconditional gifts expected to be collected within one year are reported at their net realizable value. Unconditional gifts expected to be collected in future years are reported at the present value of estimated future cash flows. The resulting discount is amortized using the level-yield method and is reported as contribution revenue.

Cash

At various times during the year, the Foundation's cash accounts exceeded federally insured limits.

Accounts Receivable

Accounts receivable are stated at the amount billed to customers. The Foundation provides an allowance for doubtful accounts, which is based upon a review of outstanding receivables, historical collection information and existing economic conditions. Accounts receivable are ordinarily due 30 days after the issuance of the invoice. Accounts past due more than 120 days, are considered delinquent. Delinquent receivables are written off based on individual credit evaluation and specific circumstances of the customer.

Property and Equipment

Property and equipment are depreciated on a straight-line basis over the estimated useful life of each asset. Leasehold improvements are depreciated over the shorter of the lease term plus renewal options or the estimated useful lives of the improvements.

Investments and Investment Return

Investments in equity securities having a readily determinable fair value and all debt securities are carried at fair value. Investment return includes dividend, interest and other investment income and realized and unrealized gains and losses on investments carried at fair value. Investment return is reflected in the statements of activities as unrestricted or temporarily restricted based upon the existence and nature of any donor or legally imposed restrictions.

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues, expenses, gains, losses and other changes in net assets during the reporting period. Actual results could differ from those estimates.

Income Taxes

The Foundation is a qualifying organization under Section 501(c)(3) of the Internal Revenue Code and a similar provision of state law. Consequently, no provision for income taxes has been made in the financial statements.

NOTE 2: INVESTMENTS AND INVESTMENT RETURN

Investments at December 31, consist of the following:

	2007	2006
Stock and equity funds	**$ 1,628,242**	$ 2,311,208
Equity securities	**–**	51,812
Fixed income funds	**–**	202,696
Money market funds	**671,586**	236,886
Limited partnerships	**2,042,665**	1,328,27
	$ 4,342,493	$ 4,130,879

At December 31, 2007 and 2006, approximately 85% and 89%, respectively, of the Foundation's investments consisted of equity securities and equity mutual funds.

Investment income during 2007 and 2006, consists of the following:

	2007	2006
Interest and dividend income	**$ 74,564**	$ 97,754
Net realized and unrealized gains on investments	**272,695**	381,618
Investment income	**$ 347,259**	$ 479,372

NOTE 3: CONTRIBUTIONS RECEIVABLE

Contributions receivable at December 31, are due as follows:

	2007	2006
Due in less than one year	**$ 101,400**	$ 192,750
Due in one to five years	**264,200**	112,448
	365,600	305,198
	(33,493)	(25,305)
Less unamortized discount	**$ 332,107**	$ 279,893

Discounts were 5% for 2007 and 8% 2006.

Approximately 100% and 98% of total contributions receivable at December 31, 2007 and 2006, respectively, are from four donors and two donors.

The Foundation receives support and pledges from members of the Board of Directors and employees. These pledges receivable are included in contributions receivable, related party.

NOTE 4: PROPERTY AND EQUIPMENT

Property and equipment at December 31, consists of the following:

	2007	2006
Equipment	**$ 1,236,719**	$ 1,019,504
Furniture and fixtures	**96,627**	1,379
Leasehold improvements	**38,361**	10,107
	1,371,707	1,030,990
Less accumulated depreciation	**886,977**	702,407
	$ 484,730	$ 328,583

NOTE 5: TEMPORARILY RESTRICTED NET ASSETS

Temporarily restricted net assets at December 31, are available for the following purposes:

	2007	2006
Education	**$ 540,957**	$ 495,325
Biomechanics research	**131,433**	136,054
Administration	**101,838**	141,838
	$ 774,228	$ 773,217

NOTE 6: RELEASE OF TEMPORARILY RESTRICTED NET ASSETS

Net assets were released from donor restrictions by incurring expenses satisfying the restricted purposes or by occurrence of other events specified by donors as follows:

	2007	2006
Purpose restrictions accomplished		
Education	**$ 254,156**	$ 266,317
Biomechanics research	**422,394**	359,144
Basic science programs	**18,457**	10,465
Administration	**40,000**	4,029
Bioskills	**5,241**	4,692
Clinical research	**39,057**	145,464
	779,305	790,111
Time restrictions expired		
Collection of contributions receivable	**–**	105,000
Total restrictions released	**$ 779,305**	$ 895,111

NOTE 7: LONG-TERM DEBT

	2007	2006
Capital lease obligations (A)	$ 447,849	$ –

(A) Capital leases include leases covering various medical equipment for five years expiring November 30, 2012.

Aggregate annual payments on capital lease obligations at December 31, 2007 are:

	Capital Lease Obligations
2008	$ 94,934
2009	94,934
2010	94,934
2011	94,934
2012	151,791
	531,527
Less amount representing interest	83,678
Present value of future minimum lease	$ 447,849

Property and equipment include the following property under capital leases at December 31, 2007:

Equipment	$ 473,517
Less accumulated depreciation	77,584
	$ 395,933

NOTE 8: OPERATING LEASES

Noncancellable operating leases for property and equipment expire in various years through 2012. Two of the property leases require the Foundation to pay all executory costs (property taxes, maintenance and insurance).
Future minimum lease payments at December 31, 2007, are:

2008	$ 105,253
2009	105,176
2010	104,794
2011	104,794
2012	104,794
	$ 524,811

Rental expense of $58,206 and $62,295 for the years ended December 31, 2007 and 2006, respectively, is recorded in the statements of activities.

NOTE 9: PENSION PLAN

The Foundation has a defined contribution retirement plan under IRS Section 401(k). The plan is open to all employees after one year of employment. The Foundation's contributions to the plan are determined annually. The Foundation elected to match 50% of participants' contributions up to 6% during 2007 and 2006. Under this formula, the Foundation made contributions of $19,021 and $20,323 for the years ended December 31, 2007 and 2006, respectively.

NOTE 10: RELATED PARTY TRANSACTIONS

During 2007 and 2006, the Foundation received approximately $531,000 and $363,000, respectively, in contributions from related parties, including various board members as well as the Steadman Hawkins Clinic.

Steadman◆Hawkins Research Foundation

A 501(c)(3) nonprofit organization

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