



## Sports Medicine Foundation

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### Patients in the News

#### Cindy Nelson: Skiing or Golf, Staying the Course

Editor's note: The following profile is based on an interview by Richard Needham. Mr. Needham is editor of *Skiing Heritage* magazine and the health newsletter *Arthritis Advisor*.

*Not many skiers would equate a world-class downhill with a leisurely stroll on the links. And not many golfers would consider the act of putting an exercise in reading mountain terrain. Cindy Nelson sees things differently. (cont. pg 11)*



Cindy Nelson  
Photo: Mike Crabtree

### Sports and Wellness

#### Common Cycling Injuries and Their Prevention

By: Scott Bartel, MSPT

Editor's note: Scott Bartel, a physical therapist at Howard Head Sports Medicine Centers in Vail, specializes in sports injury rehabilitation and prevention. He races bicycles recreationally.

Although a winter full of downhill activities may feel like it's kept you fit, summer cycling requires a different set of muscle groups and fiber types. As with skiing, if proper off-season training isn't performed, your body will usually feel a little beat up following your initial summer cycling sessions. If unprepared, you'll likely experience a season of chronic injuries and less enjoyable cycling.

Three of the most important factors that play into a successful season of cycling, whether recreational or competitive, include proper off-season training, (cont. pg 8)

### Steadman-Hawkins Research Update

#### Tendon, Ligament and Cartilage Repair: A Preview of Previously Reported Concepts and a New Look at "Tissue Engineering"

By Juan J. Rodrigo, M.D., and Alfred Kuo, M.D., Ph.D.

Editor's note: Dr. Rodrigo is professor of Orthopaedic Surgery at the School of Medicine, University of California (Davis) and a member of the Steadman-Hawkins Sports Medicine Foundation's Scientific Advisory Committee.

Tendons and ligaments are the tissues that are most frequently injured in sports and other high-performance work activities. The tears frequently do not heal and gaps, or defects, occur. Nearby tendons or ligaments can be shifted into the defect, but more recently biological reconstruction of the defects with cells and tissue engineering has been investigated.

(cont. pg 12)



Photo: John Kelly

## What a Difference a Day Makes

Remember that song? How about: What a difference 15 years make? This year Steadman♦Hawkins Sports Medicine Foundation (SHSMF) celebrates its 15th anniversary. More than that, SHSMF celebrates 15 years of commitment to the passion that spurred Dr. Steadman to found SHSMF: the desire to keep people of all ages physically active through orthopaedic research and education in arthritis, healing, rehabilitation and injury prevention.

While this passion and dedication has brought a steady stream of accolades and awards to the Foundation, the real accolades go to you—our friends and supporters, whose financial commitment is at the heart of SHSMF's ability to fulfill its purpose.

It is our greatest wish to earn your continued support for our next 15 years and beyond. We're setting our sights on many future accomplishments together. To make your partnership fulfilling, financially and philanthropically, we are pleased to present a variety of gift plans that will enable you to continue your support even beyond your lifetime.

### Gifts for the Future

#### Bequests

A fundamental attribute of your will is its ability to protect loved ones while helping secure the future of SHSMF through a bequest. As you consider your plans for SHSMF, you may want to discuss the following bequests with your advisor:

- A *specific percentage bequest*, expressed as a percentage of your estate, allows appreciation in your estate during your lifetime to be passed through.
- A *specific bequest* is a specific dollar amount or asset.
- A *combination specific dollar and percentage bequest* provides at least a specific dollar amount for SHSMF as well as a percentage bequest to allow appreciation to be passed through.
- A *residuary bequest* expresses your gift as all or part of the property remaining in your estate after debts, expenses, and percentage and specific bequests have been paid.

### Gifts That Return Income To You

#### Charitable Gift Annuity — Immediate Payment (IGA)

Your gift of cash or securities can fund an IGA and, in return, SHSMF contractually agrees to pay you (and another if you choose) a lifetime income. An added benefit is that part of the income payment is usually tax-free. This gift annuity produces an income tax charitable deduction for a portion of your gift. And using long-term, appreciated securities renders additional tax savings through reduced capital gains tax liability.

#### Charitable Gift Annuity — Deferred Payment (DGA)

A DGA is similar to an IGA except that it allows you to make a gift today and arrange for your income to begin on a date in the future, which you select. The commitment of your gift today entitles you to claim an immediate income tax deduction even if the income does not begin for some time.

#### Charitable Remainder Trust (CRT)

A CRT is an irrevocable, legal agreement in which you can designate SHSMF to receive the trust's principal at the end of the trust's term. Trusts can be established with gifts of cash, securities, or real estate. Once established, you select:

- The trust's rate of return.
- Whether it will pay fixed or variable income to you (and/or another if you choose).
- Whether it will last for a specific number of years or the lifetime of the income recipient(s).

In addition to income benefits, there are also income, capital gains and estate tax benefits.

### Other Gifts for the Future

#### Life Insurance

Gifts of life insurance represent a generous gift with little to no current out-of-pocket cost plus the potential benefit of an income tax deduction. You can give a fully paid-up policy or one on which premiums are still being paid.

### Retirement Plans

Gifts of retirement plans can be an excellent strategy for preserving the value of your estate for family and loved ones. You can name SHSMF a beneficiary at any time without impacting plan arrangements.

#### Charitable Lead Trust (CLT)

This unique trust makes an annual income payment to SHSMF. The payment can be a fixed amount or an amount that reflects a fixed percentage of the trust's annual fair market value. At the end of the trust's term, generally a number of years, you or your beneficiaries (typically family members) receive the trust principal. Depending upon who receives the principal, the CLT may also provide an income tax deduction or gift tax benefits.

As you can see, there are many opportunities to support SHSMF's future. For more information or gift illustrations, please contact John M. McMurtry, vice president for Program Advancement, at 970-479-5781 or via E-mail at: [john.mcmurtry@shsmf.org](mailto:john.mcmurtry@shsmf.org).

## Orthopaedic Health Care in Developing Nations

### An Inside Look at Cuba

By Timothy O'Brien, M.D.

Editor's note: Dr. O'Brien has just completed his fellowship year with the Steadman♦Hawkins Sports Medicine Foundation and Steadman-Hawkins Clinic. He graduated cum laude from Harvard University with a degree in government, attended Brown School of Medicine, and completed his orthopaedic surgery residency at the University of California at San Francisco. He has been a leader in many volunteer and community-based projects. Following his Fellowship, Dr. O'Brien will open his practice at Alpine Orthopaedics in Bozeman, Mont.

Recently, I had the opportunity to travel to Cuba to attend the annual Cuban orthopaedic conference, which serves as one of the major conferences for all of Latin America. Dr. John Feagin, professor emeritus of Duke University and a member of the Steadman-Hawkins Scientific Advisory Committee, was the keynote speaker. He graciously invited me to join him in this adventure, one of his many overseas mission efforts.



The convention consisted of several days of lectures on various topics, from orthopaedic trauma to sports medicine to pediatrics. Following Dr. Feagin's invitation, I was asked to give a talk at the conference. Since I have had the chance to enhance my knowledge and skills in arthroscopy in Vail with Drs. Steadman, Hawkins and Sterett, I chose to speak on the subject of microfracture. With the help of Karen Briggs at the Steadman-Hawkins Sports Medicine Foundation, I was able to give a presentation that included Dr. Steadman's long-term results with cartilage regeneration. In addition, with the help of Karen Melhart of the audiovisual department, I was able to show an excellent intra-operative video, explaining the technique in detail. Since arthroscopy is still very much a developing art in Cuba, the lecture and video clips were well received.

Several techniques exist to regenerate cartilage. Unfortunately, many of them require very specialized instruments and cost upwards of \$20,000 U.S. The advantage of the microfracture technique developed by Dr. Steadman is that it can be performed without the expense and resources needed for many of the other techniques. Not only are the results equal to if not better than those of other published techniques, microfracture also lends itself to being performed in underdeveloped countries.

In addition to teaching the Cuban surgeons, we also learned much about the practice of orthopaedics in Cuba and about the people and the country itself. We had a chance to interact with Cuban surgeons on both a professional and social level. Since the Cuban revolution was led by intellectuals — including Che Guevara, who was a medical doctor — medicine has always been highly regarded and well funded under Castro's regime.

Despite its categorization as an underdeveloped nation, medicine in Cuba is unsurpassed by any other non-industrialized nation. Although the country has few resources, it has no fewer than 11 medical schools and actually exports doctors to other countries. Infant mortality rates, which are often used as a measure of living standards, are on par with those of the United States and better than many countries in Europe. In addition, life expectancy is also on the same level as the United States.

In the year 2000, I had the opportunity to travel to rural South Africa as part of my residency training program at the University of California. There I worked with orthopaedic surgeons from several underdeveloped nations. By far, the Cuban surgeons were technically and intellectually superior to surgeons from the other countries. Despite limited resources, Cuba's doctors perform to very high standards.

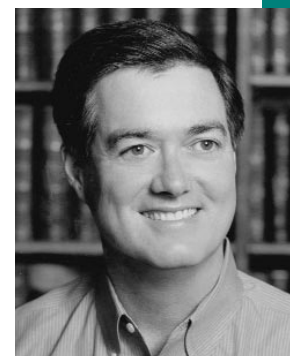
Unfortunately, 80 percent of the world's orthopaedic surgeons care for only 20 percent of the world's population. Clearly, this leaves most of the world underserved in terms of orthopaedic care. Even in developed nations, it often takes years for patients to receive the orthopaedic surgeries that they need. Much of the care in the underdeveloped world is necessarily focused on trauma, infections, and birth abnormalities. There are few resources left to even consider joint replacement or sports-related injuries.

It is my hope, and the hope of many orthopaedic surgeons, that this disparity can be resolved. The largest effort is being made by Orthopaedic Overseas, which is a branch of Health Volunteers Overseas, a nonprofit government organization with headquarters in Washington, D.C. Throughout the world, several sites have been established with the cooperation of local governments in an effort to promote better health care. Opportunities exist for orthopaedic surgeons to spend a week, a month, a year or more on a volunteer basis to provide care to the other 80 percent of the world. It is a chance to care for patients without paperwork or insurance concerns, and it allows us to get back to the true reason that most of us chose our careers.

With that in mind, it is a future goal to establish our own Steadman-Hawkins overseas site staffed with a rotating group of former Fellows who are now in their own practice. With more than 130 Fellows to date, it would be possible to share our knowledge with surgeons from all over the world and care for patients who have real needs but nothing to offer but their gratitude. The reality, as anyone who has been involved with volunteerism on any level will attest, is that you always learn more than you teach and you always get back more than you give.

## Colorado Governor Owens Proclaims June 27-30 "Steadman-Hawkins Sports Medicine Foundation Days"

The work and achievements of the Steadman-Hawkins Sports Medicine Foundation were officially recognized at the highest level of Colorado state government this summer as Governor Bill Owens issued an Honorary Proclamation, declaring June 27-30 as "Steadman-Hawkins Sports Medicine Foundation Days."



Governor Owens

The proclamation, issued on May 28, states that the Foundation "is recognized throughout the world as a center of excellence in orthopaedic sports medicine and research," as well as "a valuable medical resource for the State of Colorado."

The June 27-30 dates coincided with the Foundation's "Colorado Classic" festivities, a four-day athletic, cultural and culinary extravaganza throughout the Vail Valley, celebrating the organization's 15th anniversary.

The proclamation also recognizes the Foundation's dedication to keeping people of all ages physically active through orthopaedic research and education, in addition to pioneering new surgical procedures and the development of more cost-effective and efficient surgical and rehabilitative techniques. The proclamation recognizes the dedication and commitment of the Foundation over the past 15 years, as well as the promise that the future holds.

Founded in 1988 by internationally renowned orthopaedic surgeon Dr. J. Richard Steadman, the Steadman-Hawkins Sports Medicine Foundation has undertaken significant research in the treatment and prevention of osteoarthritis, along with developing new rehabilitation protocols.

The Foundation's Fellowship Program has trained more than 130 highly skilled surgeons, who now practice worldwide, while also hosting more than 2,000 visiting physicians and scientists from around the globe for courses and seminars.



## Arthritis Self-Management Programs Produce Results

By Karen K. Briggs, B.S., M.B.A.

Editor's note: Karen Briggs is director of Clinical Research at the Steadman•Hawkins Sports Medicine Foundation. She recently graduated with a master's in Public Health from the University of Northern Colorado. As part of her master's program, she developed a community health education program entitled "Inform, educate and empower our community in the fight against arthritis."

According to the Centers for Disease Control and Prevention, arthritis and related conditions affect one in six people. It estimates that by 2020, as current baby boomers age, 60 million Americans will have developed arthritis. Not only is arthritis the leading cause of disability in the United States, it also is responsible for significant health-care costs. The goal of many treatment programs is to reduce impairments and disabilities while reducing health-care expenditures. In order to reduce the burden of arthritis, awareness of disability reduction or prevention programs for arthritis sufferers needs to be heightened.

### Self-Management Programs

Self-management programs are health education programs designed to provide arthritis sufferers with the knowledge, skills and confidence to manage their disease. Self-management programs, taught in a group or individual setting, focus on basic disease information, how to deal with the arthritis and its consequences, problem-solving, communicating with providers, and adopting and maintaining health-related behaviors such as exercise, relaxation and energy-saving techniques. Many of these programs are designed to complement services provided by health-care providers. Internet-based, interactive self-management programs are also being developed.

Studies have shown that these programs produce positive results. In a study of one such program delivered in the United Kingdom, participants demonstrated improvements in physical and psychological well-being and reduced pain and fatigue. These improvements were maintained up to 12 months following enrollment in the program.

The Arthritis Self-Management Program, developed by Kate Lorig, Ph.D., and adopted by the Arthritis Foundation in 1981, has been extensively studied. Research has shown that program participants reduced their pain by 12 percent to 19 percent in the course of one month to four years. It has also been shown



Photo: John Kelly

that participants have undergone fewer physician visits and have experienced a decrease in depression. Several studies have also demonstrated the cost-effectiveness of this program. In a study of patients with osteoarthritis, visits to physicians dropped by 39 percent, an estimated saving of \$189 per participant. In another study of patients in an HMO, participants in a self-management program saved more than \$1,150 in health-care expenditures over the period of one year.

Although these programs save money for the patient and reduce the burdens of arthritis, it is estimated that fewer than 1 percent of individuals with arthritis have taken a course. This may be due to the perception that arthritis is unmanageable, lack of knowledge of the programs and their benefits, and other barriers. These programs give patients a critical role in management of their arthritis and provide physicians an additional tool in helping their patients in their fight against arthritis. Self-management programs can complement traditional treatments and reduce costs, but awareness and access to these programs needs to be increased.

### NFL Charities Awards Grant for Shoulder Research: Study Will Use Sophisticated Computer Model

For the 11th successive year, NFL Charities, the charitable foundation of the National Football League, has awarded a substantial research grant to the Steadman•Hawkins Sports Medicine Foundation for new and continuing work on the causes, treatments and prevention of sports-related injuries. The research project, "Force in the Upper Extremity Muscles with Intact and Ruptured Biceps Tendons: Part II" is a continuation of a 2002 grant from NFL Charities to broaden our knowledge of how to treat bicep tendon injuries. The principal investigators are Drs. Richard J. Hawkins, Kevin B. Shelburne and Michael R. Torry of the Steadman•Hawkins Sports Medicine Foundation and Dr. Marcus Pandy of the University of Texas.

The study will utilize a sophisticated

model of the upper extremity to quantify and explain the roles of the individual muscles of the shoulder and elbow in standard motions. This complex computer model was developed by Dr. Marcus Pandy and Dr. Brian Garner at the University of Texas at Austin.

The goal of this investigation is to quantify the functional roles and interactions of the biceps tendons (long head and short head) and the subscapularis muscle on glenohumeral joint reaction forces during active arm motions. This study will help elucidate the specific role and relative contributions of the subscapularis to shoulder stability and function in an intact shoulder, and a biceps ruptured and tenodesed shoulder; allowing physicians to inform patients who sustain these injuries of the relative risks and benefits of both conservative and surgical treatment.

Upon full completion, this project will be one of the most comprehensive analyses of the functional role of the biceps brachii muscle and subsequent treatments, both surgical and conservative, as well as the functional roles of the subscapularis rotator cuff muscle in normal and abnormal glenohumeral joint function.

This joint research effort between the University of Texas and the Steadman•Hawkins Sports Medicine Foundation has already produced several quality abstracts that were recently presented by Takashi Yanagawa, M.A. (currently full time Staff Scientist of the Foundation and former student of Dr. Pandy's). "The next year and a half will be very exciting for our research group, as this research is beginning to capture the attention of noted shoulder specialists around the world" states Dr. Torry. "This type of research is no small endeavor and we are extremely proud of Takashi and the strides he and his collaborators at the University of Texas have made in developing and applying one of the world's most comprehensive shoulder models in orthopedics today".

Future applications of the computer model include simulating muscle and joint mechanics in the rotator cuff-deficient shoulder. For example, understanding the altered mechanics of the deltoid following rotator cuff tear is critical to the rehabilitation of persons who have limited range of motion at the glenohumeral joint. Experimental studies are also being undertaken in parallel to carefully validate the results obtained from the computer simulations. In vivo data from bone-pin motion experiments performed on healthy subjects are being compared with the predictions of the shoulder model to evaluate the accuracy of the model simulations.



## Steadman-Hawkins Update

### Publications, Presentations and Research

#### Annual Meeting of the American Academy of Orthopaedic Surgeons

The Foundation is once again on track to set a record for the number of presentations and publications accepted by medical and scientific research, education and communications organizations.

New Orleans was the location and February 5-9 were the dates of the 70th Annual Meeting of the American Academy of Orthopaedic Surgeons (AAOS), an organization representing 17,000 members. As in past years, the Foundation was well represented by the Clinical Research Department, which prepared eight poster exhibits and presentations that were made by Foundation principals for this annual meeting.

#### Academy Highlights:

**Richard J. Hawkins, M.D.**, authored the paper *The Relative Risk of Glenohumeral Arthritis in Patients With Shoulder Instability*. Co-authors included Michelle L. Cameron, M.D.; Karen K. Briggs, M.B.A., M.P.H.; and Marilee P. Horan. This study demonstrated the increased risk of arthritis in patients with shoulder instability, particularly older patients. This information is useful when counseling patients regarding the risk of arthritis following the onset of shoulder instability (Source: Annual Meeting Proceedings, American Academy of Orthopaedic Surgeons).

**J. Richard Steadman, M.D.**, was the author of two papers. The first was *Lysis of Pretibial Patellar Tendon Adhesions (Anterior Interval Release) to Treat Anterior Knee Pain after ACL Reconstruction*. He was joined by co-authors Sumant G. Krishnan, M.D.; Peter J. Millett, M.D.; Kimberly Hydeman; and Matthew Close. Pretibial patellar tendon adhesions after ACL reconstruction can be a debilitating source of anterior knee pain and poor functional results. The abstract concludes: "We have altered our postoperative ACL rehabilitation program to include aggressive emphasis on patellar and patellar tendon mobilization exercises. Operative intervention (anterior interval release) has been shown in this series to result in significantly improved function."

The second paper by **Dr. Steadman** was *Patient Satisfaction and Functional Outcome after Microfracture of the Degenerative Knee*. Co-authors included Bruce S. Miller, M.D.; Karen K. Briggs, M.B.A., M.P.H.; Jason W. Folk, M.D.; and Juan J. Rodrigo, M.D. The microfracture technique is an effective surgical option for the treatment of degenerative chondral lesions of the knee (Source: Annual Meeting Proceedings, American Academy of Orthopaedic Surgeons).

Poster presentations included three by **Dr. Hawkins**. The first, *Determinants of Patient Satisfaction with Outcome after Rotator Cuff Surgery*, was co-authored by James D. O'Holleran, M.D.; Mininder S. Kocher, M.D.; Marilee P. Horan; and Karen K. Briggs, M.B.A., M.P.H. In assessing the outcome of rotator cuff surgery from the perspective of patient satisfaction, the abstract concludes: "We would emphasize the importance of patient-derived subjective assessment of symptoms and function" (Source: Annual Meeting Proceedings, American Academy of Orthopaedic Surgeons).

The second poster by Dr. Hawkins, *Rupture of the Subscapularis Tendon After Shoulder Arthroplasty: Diagnosis, Treatment and Outcome*, was co-authored by Bruce S. Miller, M.D.; Thomas A. Joseph, M.D.; Thomas J. Noonan, M.D.; and Marilee P. Horan. The complication of symptomatic subscapularis rupture following shoulder arthroplasty introduces the need for additional surgery and a period of protected or delayed rehabilitation. Although symptoms were adequately addressed with appropriate surgical treatment, decreased functional outcomes were observed when compared to age-matched patients who underwent uncomplicated shoulder arthroplasty (Source: Annual Meeting Proceedings, American Academy of Orthopaedic Surgeons).

The third poster by Dr. Hawkins, *A Critical Review of the Recurrence of Glenohumeral Instability after Open Surgical Procedures: One Surgeon's Experience*, was co-authored by Sumant G. Krishnan, M.D.; and Marilee P. Horan. Recent reports by other authors seem to concur that the results of open instability operations are not as successful as once thought. The published results with the arthroscopic treatment of instability approach, and may even better, these outcomes with longer-term follow-up (Source: Annual Meeting Proceedings, American Academy of Orthopaedic Surgeons).

**William I. Sterett, M.D.**, authored the poster presentation *Posterior Tibial Slope Following Medial Opening Wedge Proximal Tibial Osteotomy for Varus Arthrosis of the Knee*. Co-authors included Thomas A. Joseph, M.D.; Bruce S. Miller, M.D.; and Valerie Rich. This study suggests that, in addition to correcting knee alignment in the coronal plane, medial opening wedge osteotomies of the tibia may alter sagittal alignment by increasing posterior tibial slope. Clinically, this may result in a loss of knee extension (Source: Annual Meeting Proceedings, American Academy of Orthopaedic Surgeons).

An interesting topic in orthopaedics has been the application of heat to treat shoulder instability. **Dr. Hawkins** was the author of the exhibit *Electrothermal Arthroscopic Shoulder Capsulorrhaphy (ETAC): A Minimum Two-Year Follow-Up*. Co-authors included Sumant G. Krishnan, M.D.; Spero Karas, M.D.; Marilee P. Horan; and Thomas J. Noonan, M.D.

Because of high failure rates, Dr. Hawkins now augments ETAC with capsular plication and/or rotator interval closure in posterior and MDI instability and lengthens initial immobilization periods to improve outcomes (Source: Annual Meeting Proceedings, American Academy of Orthopaedic Surgeons).

#### American Orthopaedic Society for Sports Medicine (AOSSM) meeting, February 6-7, New Orleans, Louisiana

At the AOSSM meeting, Dr. Hawkins co-authored the presentation *A Critical Review of the Recurrence of Glenohumeral Instability after Open Surgical Procedures: One Surgeon's Experience*. Other authors included Sumant G. Krishnan, M.D.; and Marilee P. Horan (see poster presentation above).

#### American Academy of Orthopaedic Surgeons Multimedia Education Center

The Academy accepted 26 teaching video presentations. Two of these videos were produced by the Foundation, and the video *Anatomic Lateral Ligamentous Reconstruction of the Ankle Utilizing Autologous Hamstring Graft*, by Michael J. Curtin, M.D.; Robert T. Burks, M.D.; and Karen Mehlhart was one of three 2003 distinguished award winners. Congratulations to video services producer Karen Mehlhart!

The other video accepted was *Ulnar Collateral Ligament Reconstruction of the Elbow: The Docking Procedure*, by Michael J. Curtin, M.D.; Sumant J. Krishnan, M.D.; Richard J. Hawkins, M.D.; David W. Altchek, M.D.; and Karen Mehlhart.

### **2003 International Society of Arthroscopy, Knee Surgery and Sports Medicine (ISAKOS) Meeting, Auckland, New Zealand, March 10-14.**

ISAKOS is an international organization of surgeons established to develop, support and promote charitable, scientific and literary works that further the knowledge of arthroscopy, knee surgery and orthopaedic sports medicine. The meeting was the Society's Fourth Biennial Congress and was attended by 1,200 orthopaedic surgeons.

Two papers were accepted for presentation at the ISAKOS meeting. The first paper was *Patient Satisfaction and Functional Outcome after Microfracture of the Degenerative Knee*, by Bruce S. Miller, M.D.; J. Richard Steadman, M.D.; Karen K. Briggs, M.B.A., M.P.H.; Jason W. Folk, M.D.; and Juan J. Rodrigo, M.D.

The second paper was entitled *The Relative Risk of Glenohumeral Arthritis in Patients with Shoulder Instability* and was co-authored by Michelle L. Cameron, M.D.; Karen K. Briggs, M.B.A., M.P.H.; Marilee P. Horan; and Richard J. Hawkins, M.D.

### **The Arthroscopic Association of North America (AANA) Annual Meeting, Phoenix, Arizona, Spring 2003.**

AANA is an Accreditation Council for Continuing Medical Education that exists to promote, encourage, support and foster, through continuing medical education, the development and dissemination of knowledge in the discipline of arthroscopic surgery.

One paper and one poster were accepted at AANA for presentation: *Accuracy of Rotator Cuff Diagnoses on the Basis of Physical Exam With and Without MRI*, by C.B. Smith-Teunis, M.D.; John W. Xerogeanes, M.D.; and Richard J. Hawkins, M.D.

Poster: *Correlation Between the 2000 IKDC Score, Lysholm Score, and Patient Satisfaction*, by Karen K. Briggs, M.B.A., M.P.H.; and J. Richard Steadman, M.D.

### **2003 Annual Meeting of the American Orthopaedic Society for Sports Medicine (AOSSM), San Diego, California, July 20-23.**

The American Orthopaedic Society for Sports Medicine, a national organization of orthopaedic surgeons specializing in sports medicine, includes both national and international leaders in sports medicine. The AOSSM works closely with many other sports medicine specialists and clinicians, including family physicians, emergency physicians, pediatricians, athletic trainers and physical therapists, to improve the identification, prevention, treatment and rehabilitation of sports injuries.

The AOSSM Annual Meeting accepted the following abstracts for presentation:

*Association Between Glenohumeral Arthritis and the Grade of Translation in Patients with Longstanding Anterior Instability of the Shoulder*, by Michelle Cameron, M.D.; Karen K. Briggs, M.B.A., M.P.H.; Marilee P. Horan; and Richard J. Hawkins, M.D.

*Reliability, Validity and Responsiveness of the Lysholm Score for Chondral Disorders of the Knee*, by Mininder S. Kocher, M.D.; Karen K. Briggs, M.B.A., M.P.H.; and J. Richard Steadman, M.D.

*Complications after HTO*, by William I. Sterett, M.D.; Valerie Rich; and Elizabeth Barry.

Poster: *Accuracy of Rotator Cuff Diagnoses on the Basis of Physical Exam With and Without MRI*, by C.B. Smith-Teunis, M.D.; John W. Xerogeanes, M.D.; and Richard J. Hawkins, M.D.

**Karen Briggs, M.B.A., M.P.H.**, director of Clinical Research, also reports that in 2003 the following papers have been accepted for publication in peer-review journals:

*Arthroscopy*: "Outcomes of patients treated arthroscopically by microfracture for traumatic chondral defects of the knee: average 11-year follow-up," by J. Richard Steadman, M.D.; Karen K. Briggs, M.B.A., M.P.H.; Juan J. Rodrigo, M.D.; Mininder S. Kocher, M.D.; Tom J. Gill, M.D.; and William G. Rodkey, D.V.M.

*American Journal of Sports Medicine*: "The Prevalence of Glenohumeral Osteoarthritis with Shoulder Instability," by Michelle L. Cameron, M.D.; Mininder S. Kocher, M.D.; Karen K. Briggs, M.B.A., M.P.H.; Marilee P. Horan; and Richard J. Hawkins, M.D.

*American Journal of Sports Medicine*: "Reproducibility and Reliability of the Outerbridge Classification for Grading Chondral Lesions of the Knee," by Michelle L. Cameron, M.D.; Karen K. Briggs, M.B.A., M.P.H.; and J. Richard Steadman, M.D.

*Orthopedics*: "Decreased Range of Motion Following Acute vs. Chronic Anterior Cruciate Ligament Reconstruction," by William I. Sterett, M.D.; K.S. Hutton, M.D.; Karen K. Briggs, M.B.A., M.P.H.; and J. Richard Steadman, M.D.

*American Journal of Knee Surgery*: "The Microfracture Technique in the Treatment of Full-Thickness Chondral Lesions of the Knee in National Football League Players," by J. Richard Steadman, M.D.; Spero Karas, M.D.; Bruce S. Miller, M.D.; Ted Schlegel, M.D.; Karen K. Briggs, M.B.A., M.P.H.; and Richard J. Hawkins, M.D.

*American Journal of Knee Surgery*: "Effect of Functional Bracing on Subsequent Knee Injury in Professional Skiers: A Prospective Cohort Study," by Mininder S. Kocher, M.D.; William I. Sterett, M.D.; Karen K. Briggs, M.B.A., M.P.H.; David Zurakowski, Ph.D.; and J. Richard Steadman, M.D.

**Michael Torry, Ph.D.**, director of the Biomechanics Research Laboratory, reports that the following papers and abstracts are in review or have been accepted for publication and presentation in peer-review publications and organizations:

### **Publications**

*Clinical Biomechanics*: "Gait Re-Training ACL Reconstructed Individuals," by Michael J. Decker, M.S.; Michael Torry, Ph.D.; Tom J. Noonan, M.D.; and J. Richard Steadman, M.D.

*Journal of Shoulder and Elbow Surgery*: "Clinical Evaluation of Upper and Lower Subscapularis Muscle Activity During the Lift-Off and Belly Press Tests," by J. T. Tokish, M.D.; Michael J. Decker, M.S.; Michael R. Torry, Ph.D.; Henry E. Ellis; and Richard J. Hawkins, M.D.

*American Journal of Sports Medicine*: "EMG Evaluation of Select Rehabilitation Exercises for the Subscapularis Muscles," by Michael J. Decker, M.S.; Michael R. Torry, Ph.D.; J. T. Tokish, M.D.; Henry E. Ellis; and Richard J. Hawkins, M.D.

*Research Quarterly for Exercise and Sport*: "Predicting the Minimum Rate of Loading During Walking," by Michael J. Decker, M.S.; Michael R. Torry, Ph.D.; Thomas





J. Noonan, M.D.; William I. Sterett, M.D.; and J. Richard Steadman, M.D.

*Arthritis Care and Research*: “Gender Differences in Loading Rates During Walking” by Michael J. Decker, M.S.; Michael R. Torry, Ph.D.; Thomas J. Noonan, Ph.D.; William I. Sterett, M.D.; and J. Richard Steadman, M.D.

#### Abstracts/Presentations

*American College of Sports Medicine, Rocky Mountain Chapter*, Denver, Colo., Feb. 20-23, 2003: “Surgical Treatment, Rehabilitation and Functional Gait Analysis of High Tibial Osteotomy,” by William I. Sterett, M.D.; Michael R. Torry, Ph.D.; Kevin B. Shelburne, Ph.D.; and Takashi Yanagawa, M.S.

*Injuries in Winter Sports Symposia, National Science Foundation*, Denver, Colo., Feb. 20-23, 2003: “Biomechanics of Skiing and Skiing Injuries,” by Don Corenman, M.D.; Michael R. Torry, Ph.D.; Kevin B. Shelburne, Ph.D.; and Takashi Yanagawa, M.S.

*The American Society of Mechanical Engineers, Summer Bioengineering Conference*, Key Biscayne, Fla., June 25-29, 2003: “Effects of Tendon Rupture on Maximal Isometric Elbow Flexion and Forearm Supination Torque,” by Takashi Yanagawa, M.S.; Marcus G. Pandy, Ph.D.; Kevin B. Shelburne, Ph.D.; Richard J. Hawkins, M.D.; and Michael R. Torry, Ph.D.

*The American Society of Mechanical Engineers, Summer Bioengineering Conference*, Key Biscayne, Fla., June 25-29, 2003: “Estimation of Muscle and Joint Reaction Force During Arm Abduction: A Musculoskeletal Model Approach,” by Takashi Yanagawa, M.S.; Marcus G. Pandy, Ph.D.; Kevin B. Shelburne, Ph.D.; Richard J. Hawkins, M.D.; and Michael R. Torry, Ph.D.

*The American Society of Mechanical Engineers, Summer Bioengineering Conference*, Key Biscayne, Fla., June 25-29, 2003: “Theoretical Analysis of the Flexed Knee Pattern in ACL-Deficient Gait,” by Kevin B. Shelburne, Ph.D.; Michael R. Torry, Ph.D.; Takashi Yanagawa, M.S.; and Marcus G. Pandy, Ph.D.

*NFL Physicians Society*, Indianapolis, Ind., Feb. 20-23, 2003: “Biomechanics of the Upper Extremity,” by Richard J. Hawkins, M.D.; Michael R. Torry, Ph.D.; Takashi Yanagawa, M.S.; and Kevin B. Shelburne, Ph.D.

#### Awards

A paper authored by the members of the Steadman-Hawkins staff placed second in the

Richard B. Caspari Award competition for best upper-extremity paper at the 2003 International Society of Arthroscopy, Knee Surgery and Sports Medicine Meeting in Auckland, New Zealand, March 10-14. Entitled “The Relative Risk of Glenohumeral Arthritis in Patients with Shoulder Instability,” the paper was authored by Michelle Cameron, M.D.; Karen K. Briggs, M.B.A., M.P.H.; Marilee P. Horan; and Richard J. Hawkins, M.D.

**Karen Briggs, M.B.A., M.P.H.**, has been nominated for the 2003 Retirement Research Foundation Student Research Award for her abstract entitled “Physical Activity Goals in Patients Seeking Treatment for Osteoarthritis of the Knee.” Congratulations are also due Karen, who received her master’s degree in Public Health from the University of Northern Colorado in May. She has also been named to the Colorado Department of Public Health’s Arthritis Advisory Council.

**The American Academy of Orthopaedic Surgeons Multimedia Education Center** selected the teaching video, *Anatomic Lateral Ligamentous Reconstruction of the Ankle Utilizing Autologous Hamstring Graft*, as one of three award winners. The award was made at the 70th Annual Meeting of the American Academy of Orthopaedic Surgeons, Feb. 5-9 in New Orleans. Authors include Michael J. Curtin, M.D.; Robert T. Burks, M.D.; and Karen Mehlhart.

#### Media

National and international media continue to focus on the work of the Steadman-Hawkins Sports Medicine Foundation and its physicians, especially since many of the world’s soccer stars have been making their way to Vail, Colo., for treatment. Journalist David Powell of *The Times* of London flew to Vail last December to do a story on Dr. J. Richard Steadman and the Foundation. Of Dr. Steadman, Powell wrote in the Dec. 16 edition of *The Times*, “**Ronaldo, Alessandro Del Piero, Oliver Kahn and Lothar Matthäus** are among those who give Dr. Steadman a football celebrity patient list second to none.

“Footballers — Craig Bellamy is the latest premier player to be seen here — have grown Dr. Steadman’s reputation in

Europe, although his work in other sports goes back 30 years.

“Dr. Steadman has a modesty to match his skills,” says Powell.

*The Basel Zeitung* interviewed Dr. Steadman in its Jan. 28 edition during his visit to the Third International Knee Congress in Basel, Switzerland. Dr. Steadman was also present to celebrate famed Swiss orthopaedic surgeon Dr. Werner Müller’s 70th birthday. The interview begins, “When the ligament of a professional player from the German champion FC Bayern München soccer club is injured, the player travels to Vail, Colorado. There, he is taken in by Dr. Richard Steadman.” Dr. Steadman was asked if he had become an “honorary member” of FC Bayern. “I have a good connection with the club,” he said. “The relationship is built on mutual trust.”

The leading German soccer publication *Kicker* interviewed Dr. Steadman for a feature entitled “Dr. Knie” which appeared in the Feb. 3 edition. The article was timely because Dr. Steadman has treated 20 former or current soccer stars from Germany’s famed Bundesliga. In the interview, Dr. Steadman was asked why he specialized in the knee. His reply: “The knee operation was and is today the most common operation in orthopaedics. That is appealing.”

The trade publication *Orthopaedic Review* featured the Clinic and Foundation in an article entitled “A Perfect Location” in the January/February issue.



(Update cont. from pg. 7)

## Chris Evert Tennis Clinic

Chris Evert, one of the top female players in tennis history, brought the skills and technique that carried her to 18 career Grand Slam titles to the Vail Valley on June 29, where she and her sister Clare conducted a free tennis clinic for the community. The event took place at the Sonnenalp Golf Club at Singletree in conjunction with the Steadman-Hawkins Colorado Classic 15th anniversary celebration.

“For me, she pretty much brought back the fundamentals of the game,” said Roger Dadlani, who played, years ago, in high



Chris Evert teaches fundamentals during Colorado Classic celebration.

Photo Courtesy of Ken Lawdermilk, *Vail Daily*.

school. “Chris and her sister are some of the nicest people I’ve ever met. They were very patient and helpful.”

Ranked No. 1 in the world for seven years, Evert’s 18 Grand Slam titles include seven French Open championships, six U.S. Open wins, three Wimbledon crowns and two Australian Open victories. She captured at least one Grand Slam singles title for 13 consecutive years, setting a record for both men’s and women’s professional tennis.

“Doctors Steadman and Hawkins are famous for their research,” said Evert. “They’re two of the greatest surgeons in the world — more advanced in their field than anybody else.” Evert’s husband, Andy Mill, a former member of the U.S. Ski Team, has undergone nine knee surgeries. “They’ve helped so many athletes to live normal lives again,” said Evert. “My husband and I really believe in their work” (Source, Andrew Harley, *Vail Daily*).

(Cycling Injuries cont. from pg. 1)

and appropriate pre- and post-riding stretches.

Off the bike, strength and conditioning training are critical to a cycling program. Among the benefits are prevention of overuse injuries, a more powerful pedal stroke, and increased strength to push up those long mountain passes. A good gym program throughout the winter and spring months should include a weight program for leg strengthening and aerobic spinning. Leg strengthening should include a balance between anterior and posterior leg musculature exercise and combine strength training with endurance training. If unfamiliar with the use of weights, consult a personal trainer for their proper use.

A balanced weight program should include gluteal, hamstring, quadriceps and gastrocnemius (calf) muscle groups. Prior to each leg-strengthening workout (and prior to riding), begin with appropriate stretches for each of the above-mentioned muscle groups. The simplest and safest leg-strengthening exercises can be performed on machines, though we will provide suggestions for free-weight exercises as well.

### Stretching

Stretching prior to and after riding is as critical to maintaining an injury-free season as any other factor. Lower-extremity muscle tightness and chronic overuse injuries can be reduced through a proper stretching program. Common problems for cyclists include iliotibial band syndrome, chondromalacia patella, quadriceps tendonitis, and patellar tendonitis, among others. **Tendonitis** is an inflammation of the connective tissue between muscle and bone. It is often the result of repetitive stress or trauma occurring over time without relief. **Chondromalacia** is irritation of articular cartilage, often due to wear over time.

Several common stretches can be used to reduce the incidence of these problems. The iliotibial band consists mainly of a band of connective tissue between the hip and knee on the lateral side of the leg. It is a common site of irritation among cyclists and can result in lateral knee pain, also known as iliotibial band friction syndrome. Tightness usually presents itself as the inability to adduct the hip in an extended position.

To stretch this tissue, stand with the affected side facing away from the wall, cross the inside leg over the outside leg, and gently push the affected hip away from the wall. Most commonly, a stretch will be felt near the hip on the lateral surface. Another method is to lie on your back with the affected leg extended, bring the leg in and rotate the leg inward, then roll the foot inward. You can use a towel to hold the foot if unable to reach the foot for this stretch. As with any stretch, hold the position for 20-30 seconds.

### Strengthening Exercises

With all exercises, setting the lower abdominal muscles/transverse abdominis muscles and maintaining proper lifting posture are important to prevent back injury. To set the transverse abdominis, pull the belly button towards your spine while breathing evenly.

#### Gluteal muscles:

- Hip extension – Standing with resistance against the back of the thigh, extend the leg backward against the resistance.
- Hip abduction – While standing, raise the leg out to the side away from the midline of the body.

#### Quadriceps:

- Leg press – While seated, place feet approximately shoulder-width apart. Do not bend knees past 90 degrees.
- Squats – Keep feet shoulder-width apart, with toes turned slightly out. Do not bend the knees past 90 degrees.
- Lunges – Step with a medium stride forward on the front leg. The front knee should remain behind the toe. Return to a standing position.
- Reverse lunges – Step back with a medium stride. Use the forward leg to perform a controlled lowering motion.

#### Hamstrings:

- Curls – Slowly flex both knees by pulling the heels toward the buttocks. (These can be performed while either prone or seated.)

#### Gastrocnemius and Soleus:

- Standing calf raises – While standing on a step, rise up on your toes with or without weight resistance.





A general guideline for strength training is to lift a weight with which you can maintain proper form for three sets of 8-10 repetitions. As the season approaches, and the goal is to promote endurance as well as strength, you should progress to three sets of 15-30 repetitions. Strength training should be performed 2-3 times per week, though this may diminish as cycling time increases in the summer.



Iliotibial Stretch



Leg Press



Lunges



Calf Raises

## Health Matters

### The Benefits of Regular Exercise: A Healthy Heart

By Laurence W. Gaul, M.D., F.A.C.C.

Editor's note: Dr. Gaul, an employee of the Denver Cardiology Group, began his career in medicine as a paramedic at the Vail Valley Medical Center. He has been a practicing cardiologist for 10 years and is the cardiovascular consultant to the U.S. Ski Team and team physician for the U.S. Nordic Ski Team.

This newsletter has included many articles on how individuals can improve functional capacity and maximize their enjoyment of life through an active lifestyle, especially from an orthopaedic standpoint. For years, my friends and I have often joked that we stay active to make sure that the only physician we ever need is an orthopaedist and not me, a cardiologist.

At this juncture, I think it's worth some time discussing the benefits of this sort of lifestyle and, specifically, how dedicated exercise programs might benefit us. For many years, the American Heart Association has encouraged people to exercise routinely, and yet — as pointed out in the Jan. 4, 2003, *Journal of the American Medical Association* — obesity and diabetes have become a major problem throughout the United States. Our culture is not one that fosters activity. A visiting German medical student once told me of a trip he had taken that day with his roommate, who asked him to join him while he went to the bank and the market. The bank was about 400 meters away and the market about one mile. He was astonished to see that this healthy, fit young man planned to drive his car for only a one-mile trip. Here in the West, distances are farther, but nonetheless most people are inclined to ride elevators, take escalators and drive their cars. Many will spend large amounts of money on home exercise equipment and health club memberships. Often the health club membership goes unused and the exercise equipment becomes a clothes hanger.

Fortunately, for those of us who live in Vail the situation is somewhat different. Several years ago, a visiting doctor asked me if there were any obese people in Vail. I told him there were very few, which led to a discussion of exercise. He had recently completed an evaluation of 10,000 patients at the Mayo Clinic on a standard exercise test. The average time clinic patients spent on a tread-

mill was 7 minutes 38 seconds. He was astonished to learn that here, at an elevation of 8,150 feet, the average time patients spend on a treadmill is approximately 12.5 minutes. Even our patients who consider themselves “couch potatoes” by and large are far more active than people elsewhere. That said, over the age of 40, cardiovascular disease remains the number one cause of death. Yes, even in Vail.

Much has been written about the role of exercise in preventing cardiovascular disease. I am not convinced that it prevents cardiovascular disease; however, I am 100 percent convinced that it minimizes the chance of myocardial infarction and sudden death. Evidence for this is ample, as the following story will attest.

A friend of mine was an avid cyclist, covering between 250 and 400 miles per week, even in winter. He had high but untreated cholesterol. One morning he was awakened at 4 o'clock by crushing substernal chest pain. It went away after an hour, and he wondered if it could have been his heart. He tried to ride over Independence Pass to Aspen. The pain returned, so he went home. This pattern repeated over several days, and eventually he sought medical attention. A heart catheterization revealed a blockage in the arteries that we call the “widow maker.” He had 100 percent blockage in the artery that supplies the front side of his heart. Through cycling, he had built up massive collateral blood vessels around his blockage, effectively bypassing it. When the artery completely closed off, he lived. Other studies have shown that exercise increases an enzyme that has an antioxidant potency 10,000 times that of vitamin E. This may be part of the mechanism by which exercise helps.

If exercise is so good, what should we do? A friend — a former Olympic Nordic skier — started walking 45 minutes a day at the age of 15, a minimum of four days a week, because he realized that all the people he knew who lived a long, healthy life did the same. He continued this even while training for the Squaw Valley Olympics. Now 50 years have passed and he has missed only three weeks.

Walking — as well as running, hiking, swimming, bicycling, rowing or whatever your joints will tolerate — is the cornerstone of cardiovascular exercise. Many studies have been done, and controversy exists, as to how much exercise you need, and at what intensity. Recent studies have shown that intensity of

## *(The Benefits of Regular Exercise cont. from pg. 9)*

exercise is inversely related to development of symptomatic coronary artery disease. In other words, the harder you work, the less likely you are to die of a heart attack. Additionally, recent evidence has shown that strength training, especially with relatively light weights and higher repetitions, is beneficial not only for the joints but also for the cardiovascular system. The exercise benefits for hypertension, while few, are also consistent and well documented. Additionally, there may be a favorable impact on a person's lipid profile (this may be genetically determined, since not everyone responds).

Although I have never been able to confirm it, it is rumored that Dr. Paul Dudley White, one of the giants of modern cardiology, never used an elevator and was seen frequently running up and down the stairs at Massachusetts General Hospital. His reasoning: All activity is good, and even small amounts done consistently over a lifetime help. I follow much the same philosophy, although many of my patients think I'm a bit off the deep end about it. In between my crazier endeavors, I walk the stairs, walk to the bank, hike in the hills, etc.

For those who say they do not have enough time, find it. With a little planning, almost everyone can find the equivalent of 45 minutes a day, four days a week, to go for a walk. Simple activities do not require going to a gym, changing clothes, showering, etc. The important thing is to find something you like — then, as the Nike shoe commercial says, "Just do it." If you only have 20 minutes available, use them. Short periods of exercise, added up over time, can pay big dividends.

## **The Search for a Safer Aspirin**

By Kenneth Paul Glassman, M.D.

Editor's note: Dr. Glassman is an associate clinical professor in the Department of Medicine at the University of Colorado Health Sciences Center and an assistant director of the Clinical Research Unit. He is in private practice at the Denver Arthritis Clinic in Denver.

From time immemorial, the treatment of pain and inflammation has long been a paramount focus of medical providers. Ancient civilizations used multiple plant species, especially willow bark, to accomplish this objective.

These herbal therapies were the forerunners of "modern" anti-inflammatory medicines. In 1899, in an attempt to help his father's rheumatism, a chemist at the Bayer Company synthesized salicylic acid, or aspirin, the active compound in willow bark. Aspirin thus became the first and only pharmaceutical agent for pain and inflammation into the middle of the 20th century.

Despite its effectiveness, aspirin has a significant gastrointestinal toxicity, which limits its utility in many people and has necessitated the search for a safer alternative. That search culminated in the discovery of cortisone, which has dramatic anti-inflammatory effects in rheumatoid arthritis. For this important discovery, Dr. P. Hench won the Nobel Prize in medicine in 1950, marking the first and only time this prestigious honor was awarded in the field of arthritis and rheumatic diseases. However, enthusiasm waned for this treatment because of the untenable side effects (diabetes, infection, osteoporosis) experienced with long-term use. The need existed for not only a safer aspirin, but a safer cortisone.

The story progresses to 1963, when pharmaceutical drug research into inflammation in animal models gave rise to a new class of therapeutic agents, nonsteroidal anti-inflammatory drugs (NSAIDs). Phenylbutazone and indomethacin were the first two drugs introduced. Further research in the 1970s led to the discovery that NSAIDs inhibited cyclooxygenase, a key enzyme that promoted the development of substances (prostaglandins) which hastened inflammation. However, prostaglandins also were responsible for protecting the lining of the stomach and normal function of platelets, a blood-clotting cell. NSAIDs proliferated in the 1970s and 1980s. Unfortunately, so did the incidence of fatal bleeding and perforated ulcers.

More recently, two forms of cyclooxygenase have been discovered: COX-1 enzyme, which is responsible for maintaining the normal lining of the stomach, and COX-2, which is involved mainly in promoting the inflammatory process. The therapeutic implication was that if you could selectively inhibit COX-2 you could impair inflammation without damaging the integrity of the stomach. Two COX-2 specific inhibitors, celecoxib (Celebrex) and rofecoxib (Vioxx) were studied and available by

**TWO LONG-TERM ULCER TRIALS INDICATED THAT THE INCIDENCE OF BLEEDING OR PERFORATED ULCERS FOR ROFECOXIB AND CELECOXIB (WHILE NOT TAKING ASPIRIN) WAS REDUCED BY 50 PERCENT WHEN COMPARED TO THE USE OF TRADITIONAL NSAIDS NAPROSYN AND IBUPROFEN.**

1999. Two long-term ulcer trials indicated that the incidence of bleeding or perforated ulcers for rofecoxib and celecoxib (while not taking aspirin) was reduced by 50 percent when compared to the use of traditional NSAIDs Naprosyn and ibuprofen.

Within the past year a third COX-2 inhibitor — valdecoxib (Bextra) — has become available and there are others currently under investigation. Have we truly found a safer NSAID? It would appear so, at least from the point of view of treating ulcers. However, when these drugs are used, patients must be monitored for other possible side effects, including fluid retention and elevation of blood pressure. For patients at risk for stroke or heart attack, low-dose aspirin is still prescribed.

The American College of Rheumatology and the American Pain Society currently recommend the use of COX-2 specific inhibitors in all patients who have tried and failed a course of acetaminophen (Tylenol) for osteoarthritis. Though NSAIDs are the mainstay for treating arthritis, adjunctive nonpharmacologic interventions, such as exercise, physical therapy, glucosamine and injectable cortisone or hyaluronate (Synvisc/Hyalgen) are often helpful. Our search for safer therapeutics has been the paramount focus when using medicines intended to enhance the quality of life. In treating chronic inflammatory diseases, we intend to adhere to the adage "Doctor, do no harm."

## **Foundation Hosts German Surgeons**

### **Ormed Sponsors Two-Day Symposium on Surgical Techniques, Education and Research.**

Twenty-five physicians from Germany visited the Steadman♦Hawkins Sports Medicine Foundation in February to observe surgical techniques and learn more about Foundation research. Corporate partner Ormed, GmbH & Co. KG of Germany, a distributor of orthopaedic and sports medicine products, sponsored the educational session for leading German sports medicine physicians.





Ormed sponsored symposium for German physicians.

“Part of the Foundation’s mission,” says William G. Rodkey, D.V.M., director of Basic Science Research,” is to share the knowledge we generate from our research. That includes demonstrating recently developed procedures to visiting specialists. Our visitors, each of whom is a prominent orthopaedic surgeon, viewed knee procedures being performed by Drs. Steadman and Hawkins via a live television feed from the operating rooms to the conference room’s big screen. Later, they met to discuss the cases with Dr. Steadman. This kind of interface will undoubtedly improve international communication of these breakthrough procedures.” Among those viewed were Dr. Steadman’s microfracture procedure and an ACL repair by Dr. Hawkins.

Other topics presented in an academic session included functional knee bracing and high tibial osteotomy by Dr. Jason Folk, the collagen meniscus implant by Dr. Rodkey, and computer modeling by Dr. Michael Torry.

Frank Bömers, director of marketing and international sales for Ormed, believes the visit helped answer technical questions about these new techniques. Said Bömers, “There is no substitute for watching procedures live and then being able to discuss and ask questions of the man who pioneered the techniques.”

“Our plan,” he added, “is to bring surgeons annually to visit Steadman-Hawkins so that their cutting-edge procedures will become better known throughout Germany. We hope the visiting surgeons, many of whom are sports team doctors, will share their experience with colleagues at home.”

Founded in 1992, Ormed has three subsidiaries and 65 distribution centers throughout Germany. The company specializes in manufacturing and distributing passive-motion devices and other therapeutic systems, braces and splints, and medical breakthrough surgical technology in cartilage repair. The rental service team

organizes outpatient treatment, including instructions on care and treatment of therapeutic modalities following surgery. Ormed’s philosophy encompasses the development of innovative products, a carefully trained staff and sales force, and a well-established rental service throughout Germany. The company is a market leader in Germany for continuous passive-motion devices.

### Genzyme Biosurgery/Wyeth New Corporate Sponsors of the Steadman-Hawkins Sports Medicine Foundation

Genzyme Biosurgery, a division of Genzyme Corp., one of the leading businesses in the rapidly emerging field of sophisticated biotechnology products, and Wyeth, one of the world’s largest research-driven pharmaceutical and health-care-products firms, have joined forces as corporate sponsors of the Steadman-Hawkins Sports Medicine Foundation. Wyeth is considered a leader in the discovery, development, manufacturing and marketing of pharmaceuticals, vaccines, biotechnology products and nonprescription medicines.

“We’re excited about the relationship between Wyeth and the Foundation,” said John Johlfs, Wyeth Musculoskeletal Specialty District Manager, “and our mutual involvement in such activities as the annual Fellows Conference, a Public Education Speaker Series, and the shared goal of providing beneficial health care through research and education.

“Being involved in the continuing efforts to investigate the causes, prevention and medical intervention of osteoarthritis is a worthy and lofty goal, and we’re very proud to be a part of it.”

Genzyme Biosurgery produces two products for the treatment of damaged knee joints: Synvisc® (hylan G-F 20) and Carticel® (autologous cultured chondrocytes). Both products have made a significant contribution to clinical orthopaedics.

Synvisc is a biomaterial used in the treatment of pain caused by osteoarthritis of the knee. Carticel employs a patient’s own cartilage cells to treat knee cartilage defects.

“As a recognized leader in the biological management of cartilage injuries, Genzyme Biosurgery is proud to support the Steadman-Hawkins Sports Medicine Foundation in their efforts to further advance the science of orthopaedics in the world,” said Ron Wiesner, Western Regional Sales Director, Genzyme Biosurgery.

### (Cindy Nelson cont. from pg. 1)

“For me, there are a lot of similarities between golf and skiing,” says the former ski Olympian and eight-handicap golfer. “I read a putt the same way I read a line in a downhill course. There’s the pitch, the break, the grain, all those things I used to do at 60 miles an hour and now do in putting — but things are a lot safer on the green.”

It’s a unique way of looking at things. But then, Cindy Nelson is unique. She was the first American — woman *or* man — to win a World Cup downhill, she is a seven-time national champion, she was a member of four Winter Olympic teams and four World Championships teams (and medalled three times in those events), she is the first skier to win a World Cup Super G, and she is the first woman to serve as Chief of Course for a major alpine ski competition (1989 World Alpine Championships). But one of her most memorable firsts, she’ll tell you, was being the first elite athlete to come under the care of Dr. Richard Steadman. That was in 1973, at Dr. Steadman’s clinic at Lake Tahoe, Calif., and the two have been close friends, and mutual admirers, ever since. Eleven surgeries later (nine knees, two ankles), Cindy is now a



***(Cindy Nelson cont. from pg. 11)***

member of the board of the Steadman♦ Hawkins Sports Medicine Foundation.

“That,” says Cindy, “means a lot to me, because I’ve come to understand what it takes to get people back on their feet. The work that I’ve been privy to at the Foundation — the treatment as well as the prevention of injuries — has been enormously rewarding. And for me, as a board member, to be able to bring to the Foundation some of my experience as an athlete, as well as my knowledge of Dr. Steadman’s genius, has been equally rewarding.”

“Dr. Steadman has pioneered so many procedures and affected so many lives so positively. Creating the Foundation was a huge step and an important part of his dream. The Foundation has become an educational tool by which Dr. Steadman’s genius can be passed on to orthopaedists all over the world.”

A lot of what the Foundation has passed on to others has also been responsible for keeping Cindy Nelson in the game. Fourteen years with the U.S. Ski Team (she was named to the team at the age of 15), hers has been a remarkable career, which really took off after her defeat of Austrian downhill powerhouse Annemarie Moser-Proell in 1974. No American had ever won a World Cup downhill, and it proved to Cindy that she could compete with, and win against, the world’s best.

Cindy retired from racing in 1985 to become Ambassador of Skiing at Vail, Colo. Soon after, she was promoted to Director of Skiing for Vail and Beaver Creek. She enjoyed the do-everything nature of the position, working with the resorts’ marketing, real estate, ski school and mountain operations departments. It also provided her with an opportunity to take up something new in her life—the game of golf, an endeavor she calls “the most humbling, most frustrating, most rewarding game I’ve ever played.”

Today, Cindy has her own consulting business. She’ll also tell you that just as important as her downhill win was to her in 1974, the day she shot one under par on her home course at Eagle-Vail was equally a high point in her life. In fact, her fanatic devotion to golf sometimes worries her. Last year, she played 85 rounds of golf and logged 50 days of skiing. “I wasn’t skiing enough,” says Cindy, “so

I made an agreement with a couple of the girls who play in the same league that we adopt a ‘powder day’ rule to get out on skis more often. This past season I skied 78 days, so things are improving. I’m determined not to let either sport get out of balance.”

Keeping things in balance, of course, means being able to summon up those images of golf as skiing and skiing as golf that Cindy easily sees but others often don’t. “It’s more than being out in the elements,” she says. “In skiing, if you don’t think you can make a pre-jump, you take a different line. In golf, if you can’t make it to the green in one shot, you use different clubs. In both, you play for your strengths and protect against your weaknesses. Your strategy for how you go down the mountain should be the same as how you play the game of golf. You take into consideration sun, temperature, wind, your moods and all the distractions you have around you. In skiing, it’s tough to control the distractions — in golf, there’s an etiquette that takes care of that — but otherwise the sports are a lot alike.”

**Meet our Staff**

**John Welaj Chief Operating Officer**

John Welaj, who has lived in the Vail Valley for 14 years, was appointed COO of the Steadman♦ Hawkins Sports Medicine Foundation early in 2002. Prior to that, John served as CFO for the Steadman-

Hawkins Clinic, which experienced significant growth and expansion during his tenure. From 1997 to 2002 the Steadman-Hawkins Clinic added three full-time physicians, opened a satellite office in Breckenridge, and partnered with three clinics in Denver. During that period John had responsibility for managing the financial infrastructure, which needed to accommodate a 20 percent annual growth in revenues. John also spent six months as administrator of the Steadman-Hawkins Denver Clinic.



Photo: Karen Mehlhart

John’s most rewarding accomplishment, however, has been his impact on the Vail community. He has been instrumental in developing sports medicine outreach programs for local high schools, the Vail Recreational District, and many other local organizations.

John has always had a strong interest and talent in sports, inherited from his father, Lou Welaj. Lou played professional baseball in the Brooklyn Dodgers organization, where he was a teammate of legends Jackie Robinson, Duke Snider and Pee Wee Reese. Lou is also enshrined in the Seton Hall University Athletic Hall of Fame, where he played baseball and basketball.

Raised in Denver, John attended and played basketball at Mullen High School, where he was recruited by Hall of Fame basketball coach Pete Carril to attend Princeton University. At Princeton, he wrote his senior thesis on the harmful effects of performance drugs in sports. John graduated in 1988 and has maintained a lifelong interest in a career related to sports and medicine. After moving to Vail and working at Vail Valley Medical Center, he earned an MBA from Denver University in 1993.

Long impressed with the Steadman-Hawkins culture, philosophy and family atmosphere, John joined the Clinic in 1995 and has managed most of its financial operations. “I’m very thankful to Steadman-Hawkins’ physicians for keeping me active. I can say I’ve personally experienced the healing effects of microfracture and several other knee procedures.” John continues to stay very active year-round in skiing, beach volleyball, mountain biking, and fly-fishing.

***(Tendon, Ligament and Cartilage Repair cont. from pg. 1)***

Articular cartilage lines the end of bones at joints, serving to transmit loads and provide near-frictionless movement of joints. Cartilage does not have a blood supply and has an extremely limited ability to heal. While cartilage injury does not occur as commonly as tendon or ligament injuries, the defects can lead to arthritis. While many procedures have been developed to treat cartilage damage, none returns a joint to its original state. Since such injuries are common and often lead to



arthritis in young, healthy patients, cartilage repair is an area of intense investigation.

Three biological factors are required for the repair of a tissue, whether it is cartilage, ligaments or tendons: (1) cells, (2) cytokines (growth and differentiation factors), and (3) a scaffold or matrix to support the cells. All tissue repair strategies, directly or indirectly, include these components. Microfracture, for instance, relies on the formation of a blood clot at the site of injured cartilage. This "super-clot" is thought to provide growth factors as well as a scaffold for cells from the bone marrow cavity to fill and repair the chondral (cartilage) injury. In this case, the body provides all three components for formation of repair tissue.

Cells are the key component in the repair process. In the right environment, cells are capable of synthesizing both the cytokines and scaffolds required to create a functional tissue. The two classes of cells used for cartilage repair are chondrocytes (cartilage cells) and mesenchymal stem cells. The two classes of cells used for tendon or ligament repair are fibroblasts and mesenchymal stem cells. Chondrocytes may be used to repair an injured joint by taking a plug of cartilage from an uninjured site and transplanting it to the damaged area (mosaicplasty). Similarly, tendons can be transferred to deficient ligament defects. In this case, the cells are moved with their pre-existing scaffold and factors. Alternatively, cells from a harvested area of cartilage may be isolated, multiplied in the laboratory, and then reinserted into a chondral defect (autologous chondrocyte implantation). Using chondrocytes has the advantage of providing cells that are capable of forming authentic cartilage. The obvious disadvantages of these techniques are that a tendon or an uninjured area of cartilage must be damaged to provide chondrocytes and fibroblasts, and there is a limited supply of these cells.

To circumvent these problems, many researchers are focusing on mesenchymal stem cells. These cells are progenitor cells that can develop into a variety of tissue types, including bone, tendon and cartilage. Under the right laboratory conditions, stem cells isolated from bone marrow, muscle, skin and even fat take on the appearance of the cells needed in the defect. In contrast to the harvest of chondrocytes, harvest of these tissues can occur with minimal morbidity to a patient. For example, a tablespoon of fat could be taken from the waist or buttock without harm. However, it remains to be seen whether they can develop into functional repair tissue.

## Tissue Engineering

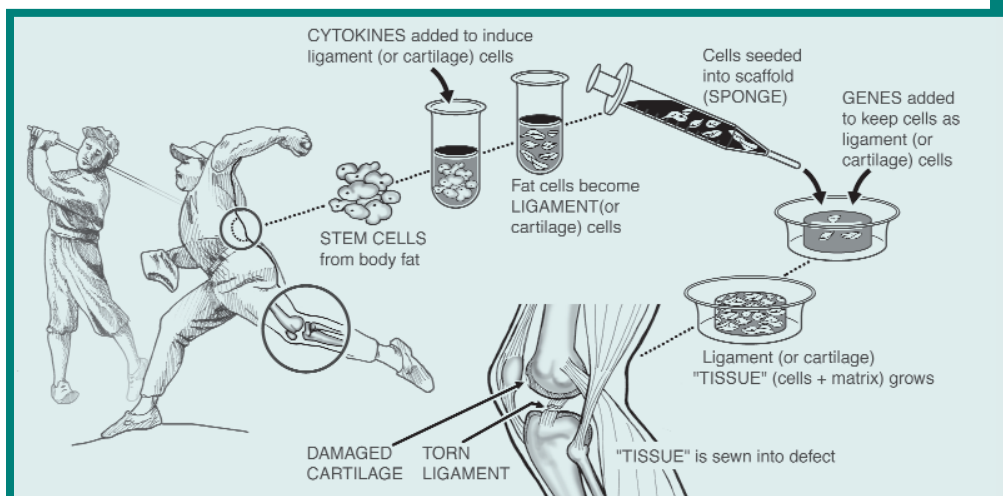


Figure 1. Stem cells are isolated from fat.

Cytokines will also play a key role in repairing tissue defects. These protein factors can enhance both the growth and metabolism of the repair cell. In addition, they can direct stem cells to express some of the characteristics of the repair cell. Cytokines can be produced in the laboratory using recombinant DNA technology. These recombinant proteins can be injected directly into joints, and they may enhance the healing of cartilage injuries. The disadvantage of injecting cytokines is that the injected proteins often are diluted or degraded, thereby necessitating multiple injections. Therefore, new, longer-lasting formulations of these factors are being developed.

An alternative to using recombinant cytokines is to provide them using gene therapy. As Dr. McIlwraith discussed previously (see Fall/Winter 2001 Newsletter), gene therapy is a technique in which the gene for a specific protein (such as a cytokine) is introduced into a cell. This in turn provides the instructions for the cell to manufacture this protein. Compared with protein injections, gene therapy provides a longer action, since the treated cells are able to continuously make the desired gene product. On the downside, the viruses used to introduce new genes may damage cells, induce immune reactions, or change the genetic make-up of cells.

Scaffolds are the final component of tissue repair. These provide an environment for cells to develop into repair tissue. Many scaffolds are being developed and tested in cartilage repair, including natural molecules such as collagen and hyaluronic acid (both of which are components of cartilage, tendons and liga-

ments) as well as biodegradable synthetic materials.

Tissue engineering is the science of creating living tissue to replace, repair or augment diseased tissue. Using a combination of cells, factors and scaffolds, researchers seek to develop tissues that can be surgically implanted to replace injured cartilage or ligaments. Such tissues are still in the developmental stage and have not yet been approved for clinical use.

In one possible strategy for engineering replacement of damaged tissue (Figure 1), stem cells would be isolated from an expendable site such as fat. These stem cells would be grown in the laboratory. During this time, cytokine treatment would be used to first induce these cells to multiply, and then to assume a fibroblast or chondrocyte. These cytokines could be provided by either adding recombinant protein or by using gene therapy. The cells would then be seeded onto a scaffold (sponge), which would further stimulate them to take on cartilage-like or ligament-like characteristics. Genes would be added to the cells at this point as well. Following a period of growth under appropriate mechanical and biological conditions, the cell-seeded matrix would then be surgically implanted in a tissue defect, thereby restoring the function of the injured structure.

While the best solution to cartilage or ligament repair remains to be determined, it is clear that biologic approaches such as cell therapy, cytokine therapy and gene therapy will play a significant role in this important research.

## New Technology Enables Totally Arthroscopic Rotator Cuff Repair

By Paul Williams  
MediaLine Communications

For 41-year-old Denver software engineer Scott Sartin, physical activity has always been a way of life — biking, skiing, piloting small aircraft and exercising in general are among his passions. But a nasty skiing injury in December of 2001, which tore his left rotator cuff, left Scott unable to do many of the activities he enjoys.

“I’m left-handed,” he says, “so being unable to move my left arm more than six inches out from my body without excruciating pain was a big deal. I found myself using my right arm to literally lift my left hand up to the desk to work on the computer. It was awful.”

Aided by over-the-counter pain medication, Scott left the injury untreated for four months — thinking it was just a severe strain.

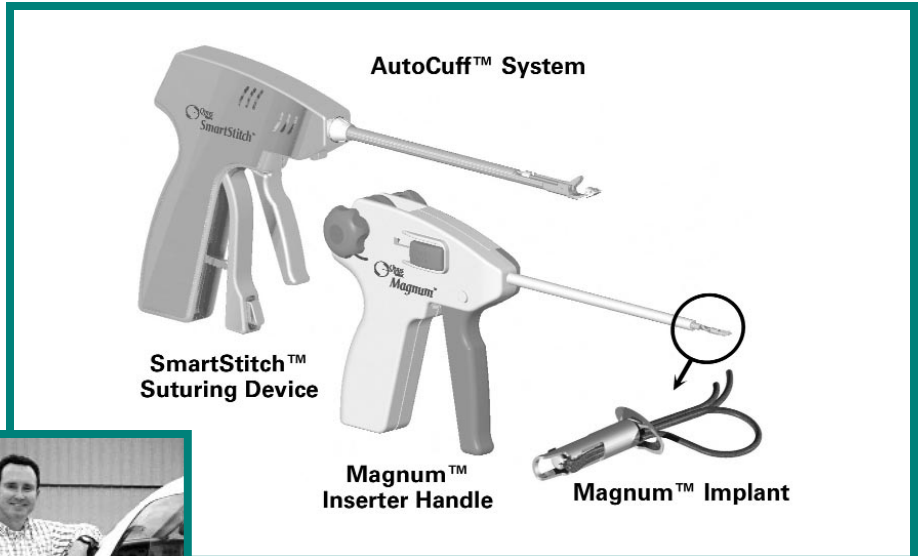
“With no increased mobility in sight and no end to the pain, I knew I needed to have something done if I was going to pilot a plane or ski again,” he says. “I was hoping I wouldn’t have to have major, open surgery, and amazingly, Dr. Ted Schlegel at the Steadman-Hawkins Clinic in Denver introduced me to something new that was minimally invasive — and effective.”

Each year, an estimated four million people in the United States seek medical attention for shoulder injuries. Of those, nearly 300,000 undergo surgical repair of the rotator cuff. The vast majority of these surgeries are performed by open surgical techniques. Less-invasive arthroscopic rotator cuff repair has shown promise as an alternative to invasive procedures, but it has not become commonplace, largely because it is technically difficult to perform — visibility is difficult and the complex knot-tying procedures involved leave many surgeons frustrated.

Indeed, Dr. Richard Hawkins of the Steadman-Hawkins Clinic in Vail reports that surgeons have long sought a means to perform minimally invasive, arthroscopic surgery to repair torn rotator cuffs without having to tie knots at all. “Having to tie knots during arthroscopic rotator cuff repairs has been a recurring obstacle for many surgeons,” he says. “We’ve mastered certain arthroscopic techniques, but they are not for every surgeon



Scott Sartin



and it is a difficult procedure to teach. All orthopaedic surgeons perform better cuff repairs with open procedures than with arthroscopic procedures. That simple fact has basically prevented the more difficult, less effective arthroscopic option from becoming more widely used.”

However, thanks to a series of groundbreaking biomedical innovations and animal studies, a handful of shoulder experts across the country, including Drs. Hawkins and Schlegel, are pioneering a system that helps simplify minimally invasive, totally arthroscopic rotator cuff repair while aiming to match the outcomes of open procedures.

Working with Southern California-based Opus Medical, the AutoCuff™ System was developed, animal studies with Colorado State University were commissioned, and a new arthroscopic technique is now being used to repair torn rotator cuffs at the Steadman-Hawkins clinics. The just-launched, FDA-approved technology enables surgeons to perform rotator cuff repair without open surgery or knot-tying of any kind.

Working with Dr. Simon Turner, professor of Clinical Sciences at Colorado State University, Drs. Hawkins and Schlegel conducted a healing study on sheep with simulated torn rotator cuff repairs conducted using the AutoCuff System. The study culminated with positive results.

“The animal studies we performed at Colorado State University were invaluable,” says Dr. Schlegel. “From these studies it was

possible to determine the specific capabilities of the instrumentation used for our proposed arthroscopic procedures. This research provided us the confidence that we needed to assure us that the technique was safe and effective for patients.”

“The results of the animal study were encouraging,” says Dr. Hawkins. “We realized we now had a technology that enabled us to perform a repair on the rotator cuff that was equal in result to an open procedure, but performed arthroscopically.

The system itself is comprised of two instruments, the SmartStitch™ Suturing Device and the Magnum™ Knotless Fixation Implant. When used together, they eliminate the shortcomings of current shoulder repair devices. The SmartStitch Suturing Device delivers a unique “incline” mattress stitch directly into the tissue in a matter of seconds. The surgeon then loads and deploys the Magnum Implant, a device containing an internal mechanism that provides cinchable and reversible suture tension to achieve an excellent tissue-to-bone interface result — without knots.

When Opus performed demonstrations of the AutoCuff System at the American Academy of Orthopaedic Surgeons in February, their booth was literally swarmed by interested surgeons. Officially launched that same month, the AutoCuff System has now been utilized by over 25 surgeons in more than 200 patients nationwide. Dr. Hawkins says that Steadman-Hawkins Fellows are now all being taught the system and that the outlook is good for more



surgeons to adopt the technique nationwide.

“The very nature of this device encourages increased usage of the arthroscopic technique,” says Dr. Hawkins. “In my opinion, many surgeons previously resigned to open surgery will try arthroscopic procedures as a result of enabling technology being made available to them.”

After an arthroscopic procedure performed by Dr. Schlegel and utilizing the Opus AutoCuff system, Scott Sartin, who is once again piloting planes, biking and, yes, skiing, is among the early success stories.

“It’s hard to believe that Dr. Schlegel was able to return my left arm to full mobility without performing an open procedure,” he says. “I’m even weightlifting again — and I can tell you that my left arm is now stronger than my right!”

Dr. Schlegel explains that most rotator cuff injuries are in fact not caused by accidents like Scott’s. “More often they result from over-use injuries,” he says. “Rotator cuff injuries are prevalent because, as we age, structures such as the rotator cuff become more susceptible to injury. It’s our hope that as arthroscopic rotator cuff repairs become more common, individuals will seek treatment for their torn rotator cuff rather than live with chronic pain.”

“To match the result of an open procedure,” says Dr. Hawkins, “we’ve been faced with developing a system that enables us to easily place a good stitch, provide strong fixation, and avoid knot-tying. The AutoCuff System meets those criteria. The good news for patients is that, thanks to the advent of this technology and the highly positive results of the animal studies performed with Simon Turner at Colorado State University, it looks like this option is about to become more commonplace.”

## Long-Term Results

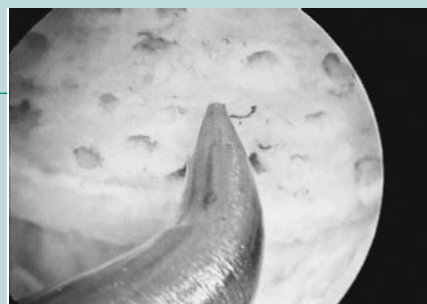
### Microfracture Knee Repair: Less Pain, More Gain

Bruce Jancin  
Denver Bureau, *Family Practice News*

TORONTO — The microfracture technique for the repair of articular damage in the knee shows impressive benefits in a series of athletes followed for 11-plus years, Dr. J. Richard Steadman reported at a symposium of the International Cartilage Repair Society.



Microfracture holes are 3-4 mm apart. A fat droplet is released from the marrow.



Procedure is finished as sclerotic bone is removed, leaving punctate bleeding.

Photos courtesy Dr. J. Steadman

The 71 patients underwent microfracture for acute severe symptomatic traumatic chondral defects without degenerative joint disease or anterior cruciate ligament injury. At a mean of 11.3 years after surgery, they continued to show marked functional improvement and reduced pain, said Dr. Steadman, director of the Steadman-Hawkins Clinic and Sports Medicine Foundation in Vail, Colo.

The group’s mean score on a 10-point activities-of-daily-living scale went from 5.3 preoperatively to 8.1 at 11.3 years. The patients’ ability to perform strenuous work rose from 5.2 to 7.9, and their ability to compete in strenuous sports rose from 4.2 to 7.1. The patients’ Lysholm score, a widely used measure of functional outcome, rose from 59 to 89.

Most importantly, no functional deterioration was noted between the 2- and 11-year follow-ups. Three-quarters of patients today describe their surgical knee as feeling normal, as if it had never been operated on.

“It seems to be a tough, durable repair process that lasts over time,” said Dr. Steadman.

Dr. Steadman also presented another study involving 14 National Football League players, in whom he performed microfracture. The players were followed for a mean of 6.5 years and a maximum of 14 years afterward.

Preoperatively, the players’ mean Lysholm score was 54, climbing to 92 at follow-up. But the most important outcome measure in this group of pro athletes was this: Thirteen of the 14 were able to return to the NFL, where they averaged another six seasons and 74 games of play.

“We felt that this was a validation of the procedure. These are supersized athletes — their average weight was about 275 pounds — and we felt that this must be pretty durable tissue if it’s holding up as well as it did for them,” Dr. Steadman said.

The microfracture procedure, which is also effective in patients with degenerative

joint disease, is done arthroscopically.

First, it entails shaving away all unstable cartilage at the lesion site to create a circumferentially stable rim to the defect.

Next, the calcified cartilage at the base of the lesion is completely removed. Any underlying sclerotic bone is burred off.

Finally, an arthroscopic pick or awl is employed to create a series of 2mm- to 4mm-deep microfractures 3-4mm apart in the subchondral bone.

“If you don’t get punctate bleeding,” said Dr. Steadman, “you need to go a little deeper.”

A slow rehabilitation making early and extensive use of continuous passive motion and eight weeks without weight bearing is critical to success, he added.

The concept is that the microfractures allow release of mesenchymal stem cells from the bone marrow, which under the influence of synovial fluid and the subchondral bone become chondrocytes capable of forming collagen-rich cartilage.

Dr. Steadman developed the microfracture procedure and has done more than 2,000 cases.

“It’s technically not complicated. It’s something that virtually any experienced orthopaedic surgeon should be able to perform equally as well as perhaps more skilled surgeons. And it doesn’t burn any bridges in terms of follow-up procedures if it doesn’t work satisfactorily,” the surgeon commented.

Dr. Steadman added that he is convinced that long-term outcomes in patients undergoing microfracture today will be significantly better than in the series he is now reporting involving patients operated upon more than a decade ago. Studies in horses during the last several years have led to technical improvements in the procedure, the most important of which is a new emphasis upon meticulous preparation of the lesion bed.

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*The Steadman♦Hawkins Sports Medicine 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 prevention.*

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**Mark Your Calendar**

**Summer 2004**

Steadman-Hawkins Colorado Classic, Celebrating a Lifetime of Excellence. The Steadman♦Hawkins Sports Medicine Foundation presents an evening of Vail Valley cuisine, music, golf and the opportunity to bid on dreams of a lifetime. For more information, contact Rachele Palmer at (970) 479-5809; E-mail to: rachele.palmer@shsmf.org, coloradoclassic.org

**August 2004**

Third Vail Cartilage Symposium. For more information, call Greta Campanale, (970) 479-5782; E-mail to: greta.campanale@shsmf.org

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