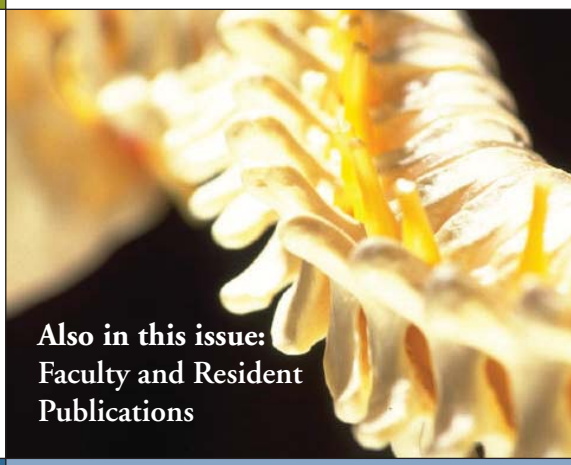
DEPARTMENT OF ORTHOPAEDICS & REHABILITATION



Also in this issue:
Faculty and Resident Publications

Winter 2005

Message from the Chairman

Jung Yoo, M.D.

It has been a year since I arrived at OHSU with the intention of building a world-class academic orthopaedic department – that commitment remains. The department is building a significant core of people and infrastructure to accomplish this goal. In the last year, we have added both clinical and basic science faculty. Our clinical faculty recruitments include a sports medicine surgeon and a traumatologist and our basic science faculty addition includes a molecular biologist. Presently, the department receives research support from the NIH, foundations and industry. Our federal funding level should be able to compete with the best departments in the country within the next two years.

My greatest satisfaction in the past year has been receiving permission from the Residency Review Committee of the ACGME to increase the number of residents from three to four per year. Currently, residents are spread thin and lack the critical mass necessary for the formation of effective teams. This situation made it more difficult for junior residents to learn from senior residents and has diminished the ability to discuss cases with colleagues.

We have been able to recruit some superb students to the program. Last year, we received nearly 400 applications for our three trainee spaces. This year, many students from other institutions have rotated through our program and have shown great interest in joining the department. I believe they sense the enthusiastic commitment of the institution and the faculty to their success and growth.

In the coming year we will continue to work on becoming an outstanding resource for education and patient care to the statewide orthopaedic community. We have begun implementing programs to promote closer cooperation with primary care physicians and other health care institutions. I look forward to hear-

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Update from Research Director Brian Johnstone, Ph.D.

A critical mass of expertise is crucial for the multi-disciplinary research that is needed to work on complex orthopaedic pathologies. You may be unaware of the other skeletal biology researchers at OHSU; in particular the research group at the Shriners Hospital, those associated with the OHSU Bone and Mineral Unit and the Biomechanics laboratory of Legacy Clinical Research & Technology Center. We have initiated several mechanisms to bring the OHSU skeletal biology community together, including joint seminars, involvement of expert faculty in teaching our residents and their input in assessing our potential basic science faculty candidates. We are planning to strengthen these ties further with joint grant funding ap-

continued on page 3

Radiation Therapy Shows Promise in Treatment of Soft Tissue Sarcoma

by James Hayden, M.D., Ph.D.

The treatment for soft tissue sarcomas has changed significantly in the past few years. Previously, surgical resection was the only treatment offered. Both radiation and chemotherapy were considered controversial. The addition of radiation therapy either as pre-or post operative has now been demonstrated to improve local control. Chemotherapy is slowly becoming accepted as a critical component. Several small studies and a large meta-analysis have demonstrated improved life expectancy with chemotherapy.

The OHSU Department of Orthopaedics & Rehabilitation recently completed a trial of adjuvant chemotherapy, preoperative radiation therapy and surgical resection. Ifosfamide and epirubicin are given as three cycles before surgery and three cycles after surgery. The radiation therapy is given preoperatively on a hypo-fractionated schedule. Limb sparing surgery has been accomplished in all cases.

The best prognostic indicator for soft tissue sarcomas is the percent of tumor killed by the preoperative therapy. Our original series demonstrated greater than 95 percent necrosis in 40 percent of our patients. This is a very significant improvement from previous therapy. Previous studies with preoperative radiation have demonstrated complication rates of 40 percent. Our hypo-fractionated schedule produced wound complication rates of only 23 percent. Although the adoption of a protocol is very early, these results are extremely promising.

Refinement of this protocol continues. One key component for its success is a close interaction of multiple specialties. Orthopaedic oncology works very closely with medical oncology and radiation oncology. Patients are discussed multiple times during the course of therapy at combined orthopaedic and hem-onc conferences. This close interaction between specialties is essential for providing optimal care for soft tissue sarcoma patients. ■

Novel Cartilage Surgical Repair Technology Completes FDA Phase I Study

Dennis Crawford, M.D., Ph.D., continues work as a principal investigator testing a unique treatment for cartilage injury to the knee. The goal of this clinical trial is to test an autologous cell based tissue bandage known as Neocart® produced by Histogenics corporation. After MRI diagnosis, patients undergo an arthroscopic examination and treatment of the cartilage damage. During the arthroscopy a small sample of the patient's normal cartilage tissue is used to prepare a Biologic patch. The patch is then implantated via a mini-arthrotomy of the knee. Crawford recently traveled to Washington to present his data to the FDA. "MRI findings show that the implant actually incorporates to the surrounding normal cartilage. This is very exciting." says Crawford. The current Phase I trial is closed to patient enrollment, but "I anticipate that we will begin enrolling patients for the Phase II component of this national trial by the beginning of 2006." ■

Orthopaedic Sports Medicine Expands Resident Education Through Community Service at Area High Schools

by Dennis Crawford, M.D., Ph.D.

For four consecutive years our residents have engaged in community service education by participating in the care of high school athletes at area sports events. Under the direction of Dennis Crawford, M.D., (member of the OSAA Medical Aspects of Sports Committee), residents have attended over 60 high school football events at Beaverton, Westview and most recently Riverdale High Schools. "This program has provided an opportunity for residents to experience an important role for pysicians in our communities, while learning management of athletic injury." With the recent arrival of Dr. Andrea Herzka, the program has expanded to three seasons of sports including football, soccer, women's volleyball, basketball and lacrosse. See you on the sidelines! ■

Andrea Herzka, M.D., Appointed Assistant Professor of Sports Medicine

The Department of Orthopaedics & Rehabilitation is pleased to announce the arrival of Andrea Herzka, M.D. Herzka earned her medical degree from the University of California, San Francisco, and completed her residency in Orthopaedic Surgery at Johns Hopkins Hospital. She completed a sports fellowship at the University of Pittsburgh Medical Center.

In Pittsburgh, she trained with Dr. Jim Bradley, the president of the NFL orthopaedic team physicians, and assisted in caring for the Pittsburgh Steelers. She also worked with the Robert Morris University division one ice hockey team as well as the Pittsburgh Passion, a professional women's football team. Sideline medicine, she says, is probably her favorite role as an orthopaedic sports physician.

In addition to sideline medicine, Herzka is eager to pursue research interests in cartilage injuries. "Current surgical treatment options for these injuries leave much room for improvement. As our basic science understanding of cartilage regeneration grows, the application of this new knowledge can eventually provide improved outcomes for our patients." she says.

Herzka's clinical interest is the management of adolescent and adult athletic injuries. She specializes in arthroscopic surgery and the treatment of shoulder, elbow, hip and knee injuries.

Herzka and her husband Joshua Schindler, M.D., assistant professor of otolaryngology, OHSU, are excited to be in living in Portland. They enjoy skiing, snowboarding, windsurfing, biking, rock-climbing and backpacking. "OHSU provides us the opportunity to fulfill our academic goals while Portland provides us a lifestyle that we have only dreamed of," says Herzka. ■

Research Update

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plications for training and research projects.

For this to succeed, the Department of Orthopaedics & Rehabilitation needs to increase the number of basic science faculty to make the department a strong partner in these endeavors. To this end, our first basic science faculty recruit, Jamie Fitzgerald, Ph.D., will join us in January 2006. Fitzgerald is presently group leader in the Cell and Matrix Biology Research Unit, Murdoch Children's Research Institute, Melbourne, Australia. Fitzgerald completed his predoctoral training in Australia and spent time as postdoctoral fellow at University of California at San Francisco, before returning to Australia in 1997. Jamie has over 20 publications and has been an independently funded investigator since 2001. He plans to continue his work on novel extracellular components present in cartilage and their involvement in skeletal dysplasias and to extend recent work on the involvement of genomic variations in skeletal diseases. Fitzgerald will move with his wife Robyn and their two children to Portland early in 2006.

By the time Fitzgerald arrives, we anticipate the move of the skeletal biology and biomechanics laboratories into our permanent research space. We are currently recruiting other basic science faculty to join us in that space and plan to have four to five faculty researchers and their groups working there by the end of 2006. Present clinical faculty with basic science interests are already being integrated into the research programs and we expect that integration to strengthen and encourage the success of all with basic science interests.

In a related initiative, we are seeking the growth of clinical science in the department. Clinical faculty members are being encouraged to develop existing research programs or create new ones. With the growth and funding of these programs, we will need to grow the infrastructure of the department to facilitate grant submission, administration of clinical testing and data analysis. This growth will allow integration of the new clinical faculty into the academic mission of the department, beyond the core mission of training residents. This ambitious expansion will hopefully provide academic opportunities for all our residents and faculty. You are welcome to visit our new laboratories when completed in 2006 and learn more about our research programs. ■

New Treatments for Foot and Ankle Pain Ease Discomfort

Burning and aching in the heel of the foot may be due to a heel spur, which is an inflammation of the plantar fascia. In 95 percent of cases this form of tendonitis can be successfully treated with taping, physical therapy and cortisone injections, providing total relief in six to eight months. For those who require surgery however, orthopaedic surgeons at OHSU use a minimally invasive technique to release the tendon that causes the pain. This procedure can be offered earlier to patients and recovery is quicker.

Wearing shoes that are too tight or too narrow often causes bunions and hammertoes. The most conservative treatment is to switch to wider and longer shoes that have a wider toe box. When surgery is necessary, the surgeon corrects both the bony and soft tissue deformities by cutting the bones and returning them to a normal position, and repairing the stretched and weakened ligaments.

— Michael Kennedy, M.D., assistant professor of orthopaedics and rehabilitation, OHSU School of Medicine

OHSU Foot and Ankle Services

The diagnosis and treatment of:

- Arthritic and joint deformities and disease
- Fractures, sprains and strains
- Diabetes and other neuropathic disorders
- Foot deformities
- Toe and tendon disorders
- Sports injuries
- Nerve disorders
- Developmental deformities such as bunion and hammertoe
- Foot or ankle problems related to vascular disease

Outpatient surgeries:

- Ankle arthroscopy
- Ankle fusion
- Trauma care for foot and ankle fractures
- Arthodesis for severe arthritis of deformity
- Open reduction and internal fixation for complex fractures
- Tendon repair or reconstruction for major tendon injury
- Tendon transfer for muscle imbalance or deformity
- Corrective osteotomies for malunion and deformity
- Bunion procedures and bone grafting for nonunions

The practice offers also offers:

- Early diagnosis for congenital conditions that often can be corrected with prescription footwear, orthotic devices and physical therapy.
- Referrals to microvascular and reconstructive plastic surgeons to help manage major trauma.
- Referrals to physical medicine and rehabilitative physicians, physical therapist, and pain management specialists.

Minimally Invasive Spinal Surgery

OHSU orthopaedic surgeons offer a minimally invasive procedure to treat lower back injuries. The surgery uses the Sextant Percutaneous Rod Insertion System, which features metal rods and titanium spinal screws to stabilize the lower spine. A specially designed mechanical device is used to implant the rods and screws. The procedure treats patients with painful degenerative or arthritic back problems, disc degeneration, recurrent disc herniation, misaligned vertebrae or a spinal fracture due to traumatic injury.

"The major benefit of this system is that it is minimally invasive," said Robert Hart, M.D., associate professor of orthopaedics and rehabilitation. "Instead of a traditional long midline incision, the screws and rods are placed through three one-inch incisions on either side of the spine. This allows us to limit the injury to overlying ligaments and muscles, which can occur with 'open' spine surgery." ■

Message from the Chairman

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ing physicians and patients ideas on ways we can better serve them. As the only orthopaedic training program in the state, our responsibility is to bring the orthopaedic surgeons together as a unique community of care providers.

— Jung Yoo, M.D., program director, professor and chairman, OHSU Department of Orthopaedics and Rehabilitation

We Need Your Support for Research and Education

by Ted Vigeland, M.D.

Philanthropy has become critical to academic medical centers in general and the OHSU Department of Orthopaedics and Rehabilitation in particular.

State support for OHSU is now less than four percent of the department's budget and that number continues to drop. The OHSU Medical Group, through taxes on clinical revenue, currently contributes more money in support of medical student education than comes from the state of Oregon.

The department continues to expand in order to provide better education to our residents and students. The pressure to produce more clinical revenue from our mission of "healing" continue to detract from the time necessary to fulfill the University's other missions of teaching and discovery.

In the past year, the Noall Fund helped to support the department's skills lab and allowed us to purchase a scanner for the Orthopaedics Library. These research and teaching efforts need your financial support. Contribution to the Beals Fund, the Noall Fund, the resident education fund or a fund or endowment in your name is critical to the future success of the department.

Thank you for your consideration.

OHSU
OREGON HEALTH & SCIENCE UNIVERSITY

CHARITABLE DONATIONS TO THE OHSU DEPARTMENT OF ORTHOPAEDICS & REHABILITATION

Your contribution to any of the funds listed below or a newly established fund in your name is critical to the training of skilled orthopaedic surgeons for Oregon.

The Rodney K. Beals Orthopaedic Resource Center Endowed Advised Fund assists physicians prepare and submit manuscripts to peer-reviewed journals, trains physicians in preparing computer-generated presentations and facilitates distribution of professional papers and reports to our resident alumni.

The Lawrence Noall Fund for Excellence in Orthopaedic Resident Education will fund a virtual reality simulator to assist residents in mastering arthroscopic surgery skills as well as other education projects.

Orthopaedic Research Fund will support the following and other projects:

- bone cancer research for children and adults
- innovations in fracture fixation, reconstruction and healing
- adult stem cell research for bone and cartilage repair
- the rapid prototyping system (life-size three-dimensional prototypes generated by computer)

Please make checks payable to: *OHSU Dept. of Orthopaedics & Rehabilitation, (fund name).*
Mail checks to:
Oregon Health & Science University
Department of Orthopaedics & Rehabilitation
3181 S.W. Sam Jackson Park Road, OP31
Portland, OR 97239-3098

To make a gift by credit card, call 800 462-6608 or 503 228-1730 or visit our secure server at www.ohsu.edu/about/ohsufoundation/foundation/makegift.html to make an online donation.

Donations are tax deductible in the year given. Questions? Please call 503 494-0723 or 800 462-6608 or E-mail ohsfweb@ohsu.edu.

Department Events

Annual Beals Lectureship
June 3-4, 2005

Richard Santore, M.D., clinical professor of Orthopaedic Surgery at University of California, San Diego, served as this year's Visiting Professor at the Eighth Annual Beals Lectureship. Dr. Santore is one of the world's leading experts in dysplasia of the hip and is a specialist in the field of hip and knee replacement surgery. His talks included, "The Current Role of Femoral and Acetabular Osteotomies in Adult Reconstructive Surgery" and "The Importance of Offset and Soft-tissue Balance in Primary Total Hip Reconstruction."

Other speakers at the Beals Lectureship included faculty members, community physicians and our chief residents.

One of the highlights at this year event was a dinner to celebrate Dr. Santore and our graduating residents. Dr. Corey Vande Zandschulp, one of our chief residents, received both the Resident Research Award and the Morris Hughes Award, awarded to the resident who best demonstrates concern for patients and education for the next generation of physicians. Faculty member Tom Ellis was the recipient of the Leo Lucas award, presented by the chief residents to the faculty member most instrumental in the development of future orthopaedic surgeons. ■

Visiting Professorship in Spinal Surgery
October 14, 2005

This year marked our third annual Visiting Professorship in Spinal Surgery. Charles Clark, M.D. from the Department of Orthopaedics and Bioengineering at the University of Iowa served as our visiting professor. Dr. Clark is the Michael Bonfiglio Professor of Orthopaedic Surgery at the University of Iowa and the former president of the Cervical Spine Research Society. His presentations on cervical spine degenerative disease were well-received and broadly attended." The educational program consisted of a day-long lecture series including talks from both our guest lecturer, Dr. Robert Hart, and Dr. Jung Yoo.

Next year's Spine Lectureship will be held on September 15, 2006 with guest professor Steven Garfin, M.D., from the Department of Orthopaedic Surgery, University of California, San Diego. Please mark your calendars for this event now. We are hoping that this annual event will be of interest to orthopaedic and neurosurgical colleagues across the state. For further information about next year's event, contact Ellen Sebastian at 503 494-8991. ■

Upcoming Events

Western Orthopaedic Trauma Update
April 8, 2006

Speakers for the second annual Western Orthopaedic Trauma Update will include 11 trauma specialists from around the country. This year's trauma update will focus on upper and lower extremity trauma for the community orthopedic surgeon. Please contact Pamela Feidelson at 503 494-5842 for more information.

Rodney Beals, M.D.: Celebrating 50 Years of Service
May 20, 2006

The Department of Orthopaedics & Rehabilitation will honor Dr. Rodney Beals for his contributions and dedication to patient care, and the education of students, residents and fellow physicians for the past 50 years.

The celebration will include an academic program in the morning and a dinner/dance event in the evening. Friends, colleagues and former students are welcome to attend. For further information, contact Ellen Sebastian at 503 494-8991. ■

Orthopaedic Rehabilitation Program

Rehabilitation medicine focuses on maximizing patients' ability to live full and satisfying lives by showing them how to effectively and independently manage their disability. The OHSU orthopaedic practice provides a full range of surgical and non-surgical inpatient and outpatient rehabilitation services for adults and children. Our rehab program offers intensive care for patients with degenerative bone or muscle conditions. We also help patients recovering from a fracture, joint replacement, trauma and/or amputation.

Our practice includes an interdisciplinary rehabilitation team led by two fellowship-trained and board-certified physiatrists, Hans Carlson, M.D., and Nels Carlson, M.D. The team includes physical and occupational therapists, prosthetic and orthotic specialist and nurses. We evaluate patients' functional deficits; recommend goals for movement and self-care; prescribe physical therapy, orthotic and prosthetic devices; and coordinate disability management.

Patients may require follow-up outpatient therapy and support after they leave the hospital. The rehab team coordinates with referring physicians to ensure personalized and coordinated care for each patient. We work with you and your patient to develop realistic and meaningful goals and help patients reach their maximum potential for restoring functions. ■

OHSU Orthopaedics and Rehabilitation Online Resources

Learn more about OHSU's orthopaedics and rehabilitation services. Online resources include information for referring providers and their patients, including exercise programs, faculty bios, videos, news updates and training opportunities. A few of the resources are listed below or go to www.OHSUHealth.com/consult and click on "Physicians and Services."

OHSU Department of Orthopaedics & Rehabilitation:
www.ohsu.edu/orthopaedics/

Home exercise programs:
www.ohsu.edu/orthopaedics/education_home.htm

Adult orthopaedic services:
www.ohsuhealth.com/htaz/ortho/

Pediatric orthopaedic services:
www.ohsuhealth.com/dch/health/orthopaedics

Map/directions to OHSU:
www.ohsu.edu/about/directions.shtml

OHSU Rehabilition Services

- Orthopaedic injury, arthritis, acute or chronic pain
- Lymphedema and Parkinson's Disease
- Sports injuries
- Neuromuscular symptoms (neuropathy, myopathy, nerve or muscle disorders), incuding acute or chronic weakness and sensory loss
- Overuse syndrome, entrapment neuropathies (carpal-tunne of ulnar, radial, medial, tibial; peroneal neuropathy)
- Post stroke care, spinal cord injuries, head injuries
- Low back pain
- Diagnostic workups for braces
- Electrodiagnosis (EMG/nerve conduction study), spasticity Botox, orthotics/prosthetics

Welcome New Residents

Greg Byrd, M.D., is happy to be returning to the "wonders of the Northwest." Byrd was born in Portland, Ore., and grew up in Hillsboro. He graduated from the University of Oregon with a B.S. in biology and biochemistry. Byrd completed medical school at Washington University in St. Louis, Mo., while also earning a master's degree in biology and biomedical sciences.

While in Saint Louis, Byrd was actively involved in multiple research projects. He spent one year in a cardiothoracic research laboratory examining the electrophysiological reasons for the failure of the cardiac maze procedure. This research culminated in oral presentations at the American College of Surgeons and the American Heart Association with an article recently published in *Circulation.* Towards the end of his research year he became involved with a total joint research project analyzing the predictive variables for patient follow-up after surgery. Byrd presented this research at the A.A.O.S.'s annual meeting in Washington, D.C., last February.

Other Residency News

The Department of Orthopaedics & Rehabilitation is pleased to announce that we have received approval from the ACGME to increase the resident complement from three to four residents per year. Beginning in the 2006-2007 academic year, four residents will begin their PGY1 year at OHSU. In addition, a fourth PGY2 resident will be added for the 2006-2007 year only.

Graduating Residents News

Patrick Dawson, M.D., is currently doing a sports medicine fellowship at Huntington Memorial Hospital in Pasadena, Calif. Following his fellowship, Dawson will complete a six month general fellowship at Auckland Memorial Hospital in New Zealand.

Suresh Kasaraneni, M.D., is practicing general orthopaedics at Providence Milwaukie Hospital in Milwaukie, Ore.

Christopher Untch: Chris Untch, M.D., is a major in the United States Air Force. He is currently practicing general orthopaedics at Davis-Monthan Air Force Base in Tucson, Arizona. After serving in the Air Force, Untch hopes to do a fellowship in joint reconstruction or sports medicine, and to eventually enter private practice.

Corey Vande Zandschulp, M.D., is completing an orthopaedic trauma fellowship working with the OrthoIndy group at Methodist Hospital in Indianapolis, Ind. ■

Patrick Denard, M.D., another native Oregonian, was born in Zig Zag and grew up in The Dalles, Ore. He and his wife, who is also from the Northwest, are excited about returning home.

Denard received his B.S. in biology at the University of Puget Sound in Tacoma, Wash., and graduated from Dartmouth Medical School. While at Dartmouth, Denard was the primary author on a review paper written with Dr. Ken Koval. *"Managment of Midshaft Clavicle Fractures,"* which was published in the November 2005 issue of the *American Journal of Orthopaedics.*

Patrick's interests include running (having just completed the 2005 Portland Marathon), hiking and traveling. He hopes to one day participate in international work.

Gary Kegel, M.D., graduated cum laude from Amherst College in Mass., with a B.A. in neuroscience. He earned his medical degree from Jefferson Medical College of Thomas Jefferson University in Philadelphia, Pa.

During medical school, he was involved with a research project evaluating two different brands of total hip arthroplasty implants

(the Taperloc system and the Accolade system). He explains, "The Accolade system was developed with the intention that it allows for more flexibility in restoring the original hip anatomy more precisely. We hypothesized that this would lead to better function and outcome. The research is still being conducted by the lab to see what the long term differences are between the two hip implants."

Kegel's interests include playing soccer (he's been playing since he was six!) and travel. Through his involvement with soccer, he has had the opportunity to explore many different countries and continents. Originally from Seattle, Kegel is happy to be returning to the Northwest.

Joe Schenck, M.D., joined the department this year as a fourth year resident. He transferred from Maricopa Medical Center in Tucson, Ariz., due to that program's closing. Joe has been a welcome addition to the program.

Schenck graduated with a B.S. in chemistry from Northern Arizona University and attended medical school at the University of Arizona College of Medicine in Tucson.

The department is pleased to welcome Schenck to the program. ■

Department of Orthopaedics and Rehabilitation Grand Rounds 2005-2006

1st Monday of the month
7:30 - 8:30 a.m.
3rd Monday of the month
7:30 – 8:30 a.m.
OPC4248

July

July 4 Holiday

July 18 Volunteerism in Orthopaedics
R. Turker, M.D.

August

Aug. 1 Spondyloarthropathy
Stephen Campbell, M.D.

Aug. 15 Elbow Instability
D.Singh, M.D.

September

Sept. 5 Holiday

Sept. 19 The Road Toward Cartilage Regeneration
Akiyama, M.D., Ph.D.

October

Oct. 3 Osteoporosis and Lumbar Fusion
R. Hart, M.D.

Oct. 17 Reconstructive Microsurgery
M. Buehler, M.D.

November

Nov. 7 Basic Science of Osteosarcoma
J. Hayden, M.D.

Nov. 21 Peri-operative Analgesia in Opioid Tolerant Patients

December

Dec. 5 Controversies in the Management of Open Pelvic Fractures
R. Mullins, M.D.

Dec. 19 Joint Formation
B. Johnstone, Ph.D.

January

Jan. 2 Holiday

Jan. 16 Holiday

February

Feb. 6 Soft Tissue Allografts in Orthopaedics
D. Crawford, M.D., Ph.D.

Feb. 20 Holiday

March

March 6 Evaluation and Treatment of Impingment of the Hip
T. Ellis, M.D.

March 20 Sports: Peripheral Nerve Injuries
N. Carlson, M.D.

April

April 3 TBD
K. Gunson, M.D.

April 17 Hand Surgery
B. Polzin, M.D.

May

May 1 Tribology Update
T. Vigeland, M.D.

May 15 Lumbar Spinal Stenosis
J. Yoo, M.D.

June

June 5 Insurance
G. Broock, M.D.

June 19 TBD

Selected Faculty and Resident Publications 2004-2005

Rodney Beals, M.D.

Beals R, Weleber R, **Distal Arthrogryposis 5.** *American Journal of Medical Genetics*. 131A:67-70 (2004)

Abstract: A four-generation family with distal arthrogryposis 5 is described. All affected members had limitations of ocular motility and some had ptosis. Restrictive lung disease is a feature in most affected patients in this family. It is possible that this syndrome may be due to a muscle abnormality.

Beals, R. **The Distal Arthogryposes.** *Clinical Orthopaedics and Related Research.* Number 435: 203-210 (2005)

Distal arthrogryposes are a group of syndromes with congenital contractures primarily involving the hands and feet, which often are associated with abnormal facies, and are transmitted by autosomal dominant inheritance. Many affected individuals present in an orthopaedic setting. The features of these syndromes are described to allow diagnosis, establish prognosis, provide family counseling, and treatment. Increased recognition will lead to improved knowledge of the natural history.

Beals R, Bryant R. **The Treatment of Chronic Open Osteomyelitis of the Tibia in Adults**. *Clinical Orthopaedics and Related Research.* Number 433, 212-217 (2005)

The treatment of 30 consecutive adult patients with chronic draining osteomyelitis of the tibia was reviewed. There were four treatment patterns. Eight patients had local debridement with or without soft tissue coverage procedures or bone graft. Three patients had radical debridement and bone transport using a circular frame. Eight patients were treated by the Papineau grafting technique after debridement. Eleven patients had debridement and circular frame fixation to correct associated nonunion, malunion, or shortening. All patients received long-term antibiotic therapy. At an average of 6 years' followup (minimum, 2 years), two patients had persistent drainage and one patient had an aseptic nonunion. This experience affirms the value of the circular frame, of the Papineau graft, of bone transport, and of long-term antibiotics for treatment of chronic osteomyelitis of the tibia. There was successful limb salvage in all of the patients and successful treatment (fracture healing without drainage) in 27 of 30 patients.

Level of Evidence: Therapeutic study, Level III-1 (case-control study). See the Guidelines for Authors for a complete description of levels of evidence.

Thomas Ellis, M.D.

Humphrey CA, Dirschl DR, Ellis T. **Interobserver reliability of a CT-based Classification System.** *Journal of Orthopaedic Trauma*, 2005 Oct;19(9):616-622.

Objectives: This study was designed to determine whether the interobserver reliability of a fracture classification scheme applied based on a single, carefully defined, computed tomography (CT) cut is greater than those previously reported for systems designed for use with plain radiographs. **Design:** Observer review of selected cases. **Setting:** Four, level one, trauma centers. **Patients:** Pretreatment CT scans of patients with calcaneus fractures were screened by the authors. Thirty cases were selected that had an appropriate semicoronal CT image. Ten orthopaedic traumatologists who were members of the Orthopaedic Trauma Association and had a minimum of 5 years postresidency experience were selected as reviewers. **Intervention:** The reviewers were provided with a digital CT image for each case as well as written and diagrammatic representations of the Sanders classification system. The observers then classified each fracture according to the Sanders classi-

fication. **Results:** The mean kappa value for interobserver reliability for fracture types I-IV was 0.41 +/- 0.02 (mean +/- standard error of the mean; range, 0.07-0.64). Observers disagreed by more than 1 fracture type (ie, I vs. III or II vs. IV) in 10% of the cases. Observers agreed on the location of the fracture lines (A, B, C) in 90% of type II fractures and 52% of type III fractures. **Conclusions:** The results indicate that in a carefully controlled paradigm, the interobserver reliability with a classification system based on interpretation of a single, carefully defined CT image was no better than the results reported for the same classification system used with full CT data or for other classification systems used for various fractures in the skeleton. Agreement in identifying the location of the fracture lines was very good for simple fractures but much worse for complex injuries. Additional study may determine whether the use of a full complement of CT images can improve reliability in classification of complex injuries.

Kim JH, Rosenthal EL, Ellis T, Wax MK. **Radial Forearm Osteocutaneous Free Flapin Maxillofacial and Oromandibular Recontructions.** *Laryngoscope*. 2005 Sep;115(9):1697-701.

Objectives/Hypothesis: The radial forearm osteocutaneous free flap is an excellent reconstructive modality for oromandibular and maxillofacial reconstruction in certain well-defined circumstances. The initial concern over donor site morbidity and the ability of the bone to reconstruct mandibular defects have led to only a few published series. **Study Design:** Retrospective study of the experience of two tertiary medical centers with radial forearm osteocutaneous free flap. **Methods:** Retrospectively, 52 patients were studied who underwent radial forearm osteocutaneous free flap reconstruction for cancer (49 cases) and trauma (3 cases). Bone length and skin paddle harvested, general morbidity (hematoma, wound infection, and dehiscence), recipient site morbidity (nonunion of neomandible, flap failure, and bone or plate exposure), and donor site morbidity (radius bone fracture, plate exposure, and skin graft failure) were reviewed. **Results:** The average skin paddle size was 55.1 cm (range, 15-112 cm). The average radius bone harvest length was 6.3 cm (range, 2.5-11 cm). Donor site complications included tendon exposure (3 cases), radius bone fracture (1 case), and exposure of the plate (0). Recipient site complications included nonunion of the mandible (4), exposed mandible (1), exposed mandibular plates (2), exposed maxillary plates or bone (0), venous compromise (1), and flap failure (1). Two patients had perioperative deaths. **Conclusion:** Radial forearm osteocutaneous free flap is a valuable and viable option for oromandibular and maxillofacial reconstruction.

Kyle R, Ellis T, Templeman D**. Surgical Treatment of Intertrochanteric Hip Fractures with Associated Femoral Neck Fractures Using a Sliding Hip Screw.** *Journal of Orthopaedic Trauma*, 2005 Jan;19(1):1-4.

Objective: The purpose of this study was to report the results of surgical treatment of a subset of intertrochanteric fractures with posteromedial comminution and extension of the fracture line into the femoral neck using a sliding hip screw. **Design:** Retrospective review. **Setting:** Level I county trauma center. **Patients:** Twenty-nine fractures (8%) with this pattern were identified from 381 intertrochanteric hip fractures treated at a single institution over a 10-year period. Nine patients were excluded (2 died, 7 had incomplete radiographic follow-up), leaving 20 patients for assessment. **Intervention:** All fractures were treated with a sliding hip screw. **Main Outcome Measurements:** Radiographs at a mean follow-up of 17 months were recorded as demonstrating: 1) fixation failure; 2) fracture union; or 3) fracture nonunion. The tip-apex distance, amount of lag screw collapse, screw position in the femoral head, and adequacy of reduction were determined. **Results:** Treatment failed according to these radiographic measures in 5 of 20 (25%) fractures. Failures included fracture nonunion (1 case), lag screw cutout (2 cases), and combined nonunion/lag screw cutout (2 cases). All 5 failures had complete collapse of the lag screw, whereas 4 of the 15 successfully treated fractures had complete collapse. The amount of collapse was significantly greater for the treatment failures (mean, 38 mm) than in the successfully treated hips (mean, 20 mm). There was no significant association between treatment success or failure and tip-apex distance, lag screw position, and adequacy of reduction. **Conclusion:** We conclude that intertrochanteric hip fractures with associated femoral neck fractures should not be managed with a standard sliding hip screw.

Robert Hart, MD

Hart, R.A., Hansen, B.L., Hsu, F., and Anderson, G.J., **Pedicle Screw Placement in the Thoracic Spine: A Comparison of Image Guided and Manual Techniques in Cadavers**, Spine, 30(12):E326-331, 2005.

While use of pedicle screws in the thoracic spine has been increasing, its adoption has been slower than for the lumbar spine, reflecting concern regarding possible vascular or spinal cord injury due to screw mal-placement. This study compares image guidance technology to fluoroscopic guidance as a means of pedicle screw placement in the thoracic spine. While no significant differences in the overall exit rates were found between the two techniques, image guidance may increase the accuracy of thoracic pedicle screw placement for surgeons with limited experience in this technique. Successful placement of screws within the pedicle varies with the anatomic diameter of the pedicle itself. Concerns regarding accuracy of screw placement should be greatest in the middle thoracic vertebrae (T4-T7), where pedicle diameters are smallest.

Irwin, Z., Hilibrand, A., Gustavel, M., McLain, R., Shafer, W., Myers, M., Glaser, J., Hart, R.A., **Variation in Surgical Decision Making for Degenerative Spinal Disorders. Part II: Cervical Spine**, Spine, 30(19): 2214-2219, 2005.

Geographic variations in rates of cervical spine surgery are significant within the United States. While surgeon density correlates with rates of spinal surgery, other reasons for variation such as surgeon specific factors are poorly understood. This study found strong agreement in treatment approach to single-level disc herniation, although significant variation was seen for the other degenerative conditions of the cervical spine. While differences in recommendation for fusion were not clearly associated with surgeon age, there was a trend toward greater use of instrumentation by younger surgeons. Previously documented geographic variation may result in part from a lack of consensus regarding appropriate treatment techniques for certain degenerative conditions of the cervical spine, as well as surgeon-specific factors.

Irwin, Z., Hilibrand, A., Gustavel, M., McLain, R., Shafer, W., Myers, M., Glaser, J., Hart, R.A., **Variation in Surgical Decision Making for Degenerative Spinal Disorders. Part I: Lumbar Spine**, Spine, 30(19):2208-2213, 2005.

Geographic variations in rates of lumbar spine surgery are significant within the United States. While surgeon density correlates with rates of spine surgery, other reasons for variation such as surgeon age and training background are poorly understood. This study found strong agreement in approach to lytic spondylolisthesis, but significant variation for other degenerative conditions of the lumbar spine. In addition, recommendation for fusion and instrumentation varied with surgeon age and training background. Previously documented geographic variations may result in part from a lack of consensus on appropriate treatment techniques for specific lumbar degenerative conditions, as well as surgeon-specific factors.

Hart, R.A., Gillard, J., Prem, S., Shea, M., Kitchel, S., **Comparison of Stiffness and Failure Load of Two Cervical Spine Fixation Techniques in an In-Vitro Human Model**, J Spinal Disord & Tech, 18 Suppl: S115-S118, 2005.

Recently an unpaired threaded cage has been introduced as a fusion device for the cervical spine. No biomechanical comparison of a stand-alone single interbody threaded cage to a standard plated Smith-Robinson construct has been reported. This study demonstrates that a plated Smith-Robinson cervical diskectomy and fusion construct provides greater stiffness and failure load and reduced range of motion across operated levels compared to a single interbody cage construct. While clinical success may not directly correlate with biomechanical data, these results raise concern regarding the use of a single threaded interbody cage as a stand-alone device for cervical interbody fusion.

Bafus, T., Shea, M., and Hart, R.A., **Impairment of Perineal Care Functions after Long Fusions of the Lumbar Spine.** Clinical Orthopaedics & Rel Res, 433:111-114, 2005.

The purpose of this study was to investigate the incidence of perineal care impairment after extended thoracolumbar and thoracolumbosacral spinal fusions. Fourteen adult patients with fusions from the thoracic spine to L5 or the sacrum completed a questionnaire regarding their ability to perform perineal care. The mean number of vertebral levels fused was 9.5 (range 6-16) with five patients fused to L5 and nine fused to the sacrum. 36 percent (5/14) of patients reported difficulty performing perineal care following fusion. Maintenance of L5-S1 segmental motion did not appear to reduce occurrence of perineal care problems. The authors concluded that extended thoracolumbar fusion and thoracolumbosacral fusion can produce post-operative difficulty performing perineal care.

Brian Johnstone, Ph.D.

Huang JI, Kazmi N, Durbhakula MM, Hering TM, Yoo JU, Johnstone B. **Chondrogenic potential of progenitor cells derived from human bone marrow and adipose tissue: A patient-matched comparison.** *Journal of Orthopaedic Research*. 2005 23(6):1383-9

Purpose: Stem cell-based tissue engineering represents a possible alternative for the repair of cartilage defects. Both bone marrow and adipose tissue contain pluripotential cells capable of chondrogenesis. This study was a qualitative and quantitative comparison of the chondrogenic potential of progenitor cells isolated from bone marrow aspirates and adipose tissue. **Methods:** Bone marrow aspirates (BM) and matching adipose tissue (AD) overlying the posterior superior iliac crest were obtained from patients undergoing elective spine surgery. Chondrogenesis was induced using an established aggregate culture technique. Qualitative analysis was performed by histology and immunohistochemistry. DNA and glycosaminoglycan (GAG) quantitative assays were performed. Quantitative RT-PCR analysis was performed to compare expression of type II collagen between BM and AD aggregates. Osteogenic and adipogenic assays were also performed to confirm pluripotentiality of both AD-derived progenitor cells (ADPC) and BM-derived progenitor cells (BMPC). **Results:** Toluidine blue metachromasia and type II collagen immunohistochemical staining were more extensive in the aggregates formed by BMPC. Quantitative RT-PCR showed a 500-5000 fold higher expression of type II collagen in the BMPC aggregates. The DNA content was 68% higher in the AD aggregates ($p<0.02$) but proteoglycan deposition per cell was 120% greater for BM-derived cell aggregates as measured by GAG assays ($p<0.05$). **Conclusions:** The tissue formed by the aggregate culture of the expanded ADPC population was less cartilaginous. It is unclear whether this is because there are fewer chondroprogenitor cells or if the monolayer expansion culture favors cells with higher proliferative rates but without differentiation potential. Under the conditions described in this study, BMPCs may represent a better choice for progenitor cell-based strategies for cartilage repair.

Palmer GD, Steinert A, Pascher A, Gouze E, Gouze JN, Betz O, Johnstone B, Evans CH, Ghivizzani SC. **Gene-induced chondrogenesis of primary mesenchymal stem cells in vitro** *Molecular Therapy*. 2005 12(2):219-28.

Adult mesenchymal stem cells (MSCs) have the capacity to differentiate into various connective tissues such as cartilage and bone following stimulation with certain growth factors. However, less is known about the capacity of these cells to undergo chondrogenesis when these proteins are delivered via gene transfer. In this study, we investigated chondrogenesis of primary, bone marrow-derived MSCs in aggregate cultures following genetic modification with adenoviral vectors encoding chondrogenic growth factors. We found that adenoviral-mediated expression of TGF-beta1 and BMP-2, but not IGF-1, induced chondrogenesis of MSCs as evidenced by toluidine blue metachromasia and immunohistochemical detection of type II collagen. Chondrogenesis correlated with the level and duration of expressed protein and was strongest in aggregates expressing 10-100 ng/ml transgene product. Transgene expression in all aggregates was highly transient, showing a marked decrease after 7 days. Chondrogenesis was inhibited in aggregates modified to express >100 ng/ml

TGF-beta1 or BMP-2; however, this was found to be partly due to the inhibitory effect of exposure to high adenoviral loads. Our findings indicate that parameters such as these are important functional considerations for adapting gene transfer technologies to induce chond

Hering TM, Kazmi NH, Huynh TD, Kollar J, Xu L, Hunyady AB, Johnstone B. **Characterization and chondrocyte differentiation stage-specific expression of KRAB zinc-finger protein gene ZNF470.** *Experimental Cell Research*. 2004 10;299(1):137-47.

As part of a study to identify novel transcriptional regulators of chondrogenesis-related gene expression, we have cloned and characterized cDNA for zinc-finger protein 470 (ZNF470), the human ortholog of which encodes a 717 amino acid residue protein containing 17 Cys(2)His(2) zinc-finger domains, as well as KRAB-A and KRAB-B motifs. The cDNA library used to isolate the initial ZNF470 clone was prepared from human bone marrow-derived mesenchymal progenitor cells at an intermediate stage of chondrogenic differentiation. We have determined the intron-exon structure of the human ZNF470 gene, which has been mapped to a zinc-finger cluster in a known imprinted region of human chromosome 19q13.4. ZNF470 is expressed at high levels in human testis and is expressed at low or undetectible levels in other adult tissues. Human ZNF470 expressed in mammalian cells as an EGFP fusion protein localizes predominantly to the nucleus, consistent with a role in transcriptional regulation. ZNF470, analyzed by quantitative real time PCR, was transiently expressed before the maximal expression of COL2A1 during chondrogenic differentiation in vitro. We have also characterized the bovine ortholog of human ZNF470, which encodes a 508 amino acid residue protein having 10 zinc-finger domains. A bovine ZNF470 cDNA clone was used to examine expression of ZNF470 in bovine articular chondrocytes treated with retinoic acid to stimulate dedifferentiation. Bovine ZNF470 expression was undetectable in freshly isolated bovine articular chondrocytes, but was dramatically upregulated in dedifferentiated retinoic acid-treated chondrocytes. These results, in two model systems, suggest a possible role for ZNF470 in the regulation of chondrogenesis-specific gene expression.

Michael Kennedy, MD

Coughlin, M., C. Jones, R. Villadot, P. Galano, B. Grebbing, M. Kennedy, P. Shurnas, F. Alvarez. **Hallux valgus and first ray mobility: A cadavaric study.** *Foot Ankle International*. 25(8): 537-544, 2004.

Background: Several studies have demonstrated that patients with hallux valgus (HV) deformities have increased first ray sagittal mobility. However, the change in mobility that occurs after surgical correction of HV deformities has not been extensively evaluated. This study was done to determine if surgical realignment of the first ray in cadaver specimens with a proximal crescentic osteotomy and distal soft tissue reconstruction (DSTR) would reduce the first ray sagittal motion as measured with an external-type micrometer (the Klaue device). **Methods:** Twelve fresh-frozen below-knee cadaver specimens with an HV deformity (HV angle > 15 degrees, 1-2 IM angle > 9 degrees) were used for the study. Standardized simulated weightbearing radiographs were obtained before and after the surgical correction of the deformity. The first ray sagittal motion was measured with an external micrometer (Klaue device) before correction of the HV deformity and after the procedure. All specimens had correction of the hallux valgus deformity with a DSTR and proximal crescentic osteotomy. Internal fixation was applied to secure the osteotomy site. **Results:** The HV angle was corrected from a mean of 28.6 degrees to a mean of 11.0 degrees. The 1-2 IM angle was corrected from a mean of 12.9 degrees to a mean of 6.8 degrees. The average preoperative first ray sagittal motion was 11.0 mm (range, 8.5 mm to 13.5 mm). After the surgical repair, the mean sagittal first ray motion was significantly decreased ($p < .0005$) to a mean of 5.2 mm (range, 3.5 mm to 7.5 mm). **Conclusion:** After correction of HV deformities with a DSTR and a proximal crescentic osteotomy, first ray mobility in cadaver specimens was significantly reduced. The stabilization of first ray mobility that occurred immediately after surgical correction despite leaving the capsule of the first metatarsocuneiform (MC) joint undisturbed suggests that extrinsic anatomic features may play a role in first ray mobility. Additionally, stability of the first ray may be restored with a bunion procedure that does not sacrifice the first MC joint.

Jones, CP, BR Grebbing, MJ Coughlin, MP Kennedy, PS Shurnas, R Viladot. **First metatarsophalangeal joint motion after hallux valgus correction: A cadaver study.** *Foot Ankle International*. 26(8), 2005

Background: Surgical correction of hallux valgus deformities often results in decreased first metatarsophalangeal joint (MTPJ) range of motion. Loss of motion has been shown to affect patient satisfaction. The purpose of this study was to evaluate the immediate change in MTPJ range of motion that occurs after a distal soft-tissue reconstruction (DSTR) and proximal metatarsal osteotomy (PMO). **Methods:** DSTR and PMO were done on 16 below-knee cadaver specimens with clinically apparent hallux valgus deformities. Two examiners assessed preoperative and postoperative dorsiflexion (DF), plantarflexion (PF), and the total range of motion of the first MTPJ. The hallux valgus angle (HVA) and 1-2 intermetatarsal angle (1-2 IMA) were measured on simulated weightbearing radiographs before and after operative correction. Changes in motion were analyzed and correlated with the angular measurements. **Results:** The mean total range of motion preoperatively was 85.4 degrees (DF 70.5 degrees, PF 14.9 degrees) and significantly decreased ($p < 0.005$) 23.2 degrees to a postoperative value of 62.2 degrees (DF 47.9 degrees, PF 14.3 degrees). There was a significant ($p < 0.005$) decrease in DF (22.6 degrees) with the operative correction, but the loss of PF (0.6 degrees) was not significant ($p = 0.7$). There was no correlation between the magnitude of correction (HVA, 1-2 IMA) and the change in PF, DF, or total motion. **Conclusions:** Correction of a hallux valgus deformity with a DSTR and PMO is associated with an immediate loss of range of motion that primarily affects the DF arc of the first MTPJ. The selective loss of DF may be related to a nonisometric capsular repair or tight intrinsic musculature, although there was no correlation with the magnitude of angular correction. The immediate decrease in motion observed in this cadaver study underscores the importance of early postoperative joint mobilization to prevent long-term stiffness after bunion surgery.

Jones, CP, MJ Coughlin, R Viladot, P Golano, MP Kennedy, PS Shurnas, BR Grebbing, L. Teachout. **The validity and reliability of the Klaue device.** *Foot Ankle International*. 26(11) 951-956, 2005

Background: Excessive first ray mobility has been implicated as the cause of many forefoot abnormalities. The association between hypermobility and forefoot pathology is controversial, and this is largely related to the difficulty in quantifying first ray motion. Manual examinations have been shown to be unreliable. Klaue etal. developed a device consisting of a modified ankle-foot orthosis with an attached micrometer to objectively measure first ray mobility. The purpose of this study was to evaluate the validity and reliability of this device. **Methods:** Sixteen fresh-frozen, below-knee amputation specimens with hallux valgus were used for the study. The study was divided into two parts. Part I was an analysis of the validity of the Klaue device; first ray dorsal displacement was measured on lateral radiographs following manual manipulation, and values were statistically compared to the Klaue device measurements. Part II of the study was an evaluation of intraobserver and interobserver agreement. Two clinicians used the Klaue device on each of the cadaver limbs, and values of first ray sagittal mobility were recorded and compared. **Results:** The mean value of first ray mobility measured with the Klaue device was 7.5 mm and the average displacement measured from the lateral radiographs was 7.4 mm. Paired t-testing showed no significant difference between the Klaue and radiographic measurements ($p = 0.83$). The mean first ray mobility by examiners 1 and 2 with the Klaue device were identical (10.5 mm), and statistical analysis showed no significant interobserver or intraobserver differences. **Conclusions:** The results confirm the validity of the Klaue device and limited variability of measurements between experienced users.

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