

# RESEARCH

Division of Orthopaedics, Department of Surgery, Faculty of Medicine, University of Calgary

# UPDATE

APRIL 2006

The past year's research initiatives in the Division of Orthopaedic Surgery, in health economy, clinical pathways, clinical trials, epidemiology and applied laboratory research, have been as varied and productive as in previous years.

Within our division, many trainees – fellows, residents and graduate students – as well as faculty members contributed to the research efforts. The Research Committee of the Division of Orthopaedic Surgery reintroduced a competitive grant application in 2005, and four grants worth \$3,000 each were awarded to researchers in the division. The Research portfolio within the Division of Orthopaedic Surgery is grateful for the vision of the division members in directing funds to this endeavor.

In this publication, we highlight the recent research activity of certain members and trainees in our division, using as a selection frame work the research themes mentioned in the previous paragraph. Dr. Ken Thomas discusses a study on the results and cost effectiveness of treatments for metastatic spine disease. Dr. Jason Werle updates us on two important, high-profile projects for Bone and Joint Health relating to surgery and care pathways for osteoarthritis of the hip and knee, and the U of C Sport

Medicine Centre's Dr. Nick Mohtadi reviews multi-centre studies on shoulder surgery. In the field of laboratory research, Dr. Paul Salo poses an intriguing question as he outlines his work investigating the role of joint innervation in ligament healing.


The work of the featured trainees ranges from epidemiology to clinical to applied laboratory research. Dr. David Sheps, an orthopaedic surgeon originally from Winnipeg, talks about his Masters degree project that determined the elbow injury rate in the Calgary Health Region and the inter-rater reliability of elbow fracture classifications. Orthopaedic surgery resident Dr. Danny Goel describes a clinical trial he coordinated evaluating the incidence of blood clots following fractures of the leg and whether blood thinners given post-operatively decreased the incidence of the blood clots. Dr. Victor Valderrabano, an orthopaedic surgeon from Basel, Switzerland, discusses his work for a PhD degree from the University of Calgary characterizing



Dr. Kevin Hildebrand, Director, Research Portfolio

clinical and applied laboratory studies on total ankle replacement.

The individuals highlighted in this edition represent the commitment of our division members and trainees to research endeavors.

The research has many benefits: defining best clinical practices, evaluating costs of treatments and care pathways, and training the next generation of surgeons in the methods and benefits of research. The work of our division has added to the knowledge of orthopaedic surgery and most importantly, improved the care of our patients. 

# Hip Resurfacing as an Alternative to Total Hip Replacement

When word about the Birmingham Hip Resurfacing (BHR) procedure got around Calgary, individuals with arthritic hips started asking for it. It offers recipients a higher level of physical activity than total hip replacement (THR); running, and skiing, for example are usually allowed with the BHR. Added to that is lower risk of dislocation – 1/1000 for BHR compared to 1/100 for THR.

Dr. Jason Werle was one of several orthopaedic surgeons in Calgary who started doing the procedure, on a trial basis. In order for the BHR to be approved, however, it had to be formally evaluated, explains Dr. Werle. “So, with the CHR, the Alberta Bone and Joint Health Institute (ABJHI) and the interested surgeons we developed the Alberta Hip Improvement Project (HIP) to evaluate the Birmingham Hip Resurfacing compared to a total hip replacement in patients who are 55 or under. Our mandate is to prove it is as good as or better than the THR.”

The ten-year study, which started in Calgary and Edmonton in 2004, is not randomized. “With an educated patient

population, unwilling to be subjected to a randomized process, we had to set up a cohort study instead,” he notes. “You can still draw comparisons, although they may not be as accurate. We tried to assess the similarities and differences between the two groups with a large baseline questionnaire looking at demographics, quality of life and activity scores.”

“The patient and surgeon together make the decision as to which prosthesis will be used, based on the level of damage in the hip, the activity level of the patient, and the patient’s willingness to accept new technology. Patients must have good bone quality for a BHR. Osteoporosis, deformity, or cysts in the femoral neck may preclude the use of this new technology. And then some patients are more comfortable with the standard replacement with its longer history.”

Recruiting THR patients to the study has been challenging, says Dr. Werle, since, unlike the BHR patients, they don’t have to be part of the study. “We have more than 250 patients in the BHR group, and 65 in the THR group. We’re hopeful we will enroll more



Dr. Jason Werle, Joint Reconstruction Section

THR patients, but it is more work. The patient must sign a consent, plus the surgeon must notify ABJHI – which is something beyond their normal routine.”

Even though it is early in the study, Dr. Werle sees positive results. “Though hip function may be somewhat higher in BHR patients before surgery, they certainly retain a higher level post-surgery, including the ability to do impact sports.”

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## University of Calgary Sport Medicine Centre Advances Shoulder Research



Dr. Nick Mohtadi, Sport Medicine Section

Since 1999, Canadian orthopaedic surgeons who treat shoulder injuries have been able to participate in multi-centre research studies through JOINTS-Canada, the Joint Orthopaedic Initiative for National Trials of the Shoulder. Dr. Nick Mohtadi, of the University of Calgary’s Sport Medicine Centre, was a founding member of the group, and is current president.

Dr. Mohtadi and the Sport Medicine Centre have participated in a number of long-term clinical trials through JOINTS-Canada. Most recently, JOINTS completed a randomized controlled trial (RCT) comparing open surgery to arthroscopic mini-open for full-thickness rotator cuff tears of the

shoulder, with 72 patients in three centres. “The gold standard was the open repair,” explains Dr. Mohtadi, “but a newer evolving procedure was to do some of the surgery arthroscopically and the remainder through a smaller incision.”

“Basically what we found was that the initial groups were comparable in all respects at baseline and the final outcome at two years was almost identical. The main finding of note is that at three months the mini-open patients were doing clinically and statistically better. This suggests patients get better sooner, have a better quality of life and less pain using the mini-open technique. This is one of the first

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# The Search for the Secrets of Healing

Is the human pain response obsolete? That unusual question has been in Dr. Paul Salo's mind for some time now. He is, of course, thinking of the pain that goes along with healing, not the pain response to injury. But he makes the point that our bodies evolved to pretty much where they are hundreds of thousands if not millions of years ago, when there were no fancy drugs, surgeries and hospitals.

Back then, if someone broke a bone or ruptured a ligament, the pain immobilized them, presumably to allow the healing process to take place. But if we can fix that injury in some other way, and get the patient moving, we don't really need that pain input any more. "So some parts of wound healing are possibly obsolete; maybe we can improve healing without so much pain," he suggests.

For some time now, Dr. Salo, an orthopaedic spine surgeon and Heritage Scholar, has focused his research on the role of nerves in ligament healing. "We had a hypothesis that if you cut the nerve supply to a joint, it wouldn't heal normally. The results of a study on rabbit ligaments showed that if you cut the nerves, the ligament will heal, but not very well. Since then we've been trying to figure out what nerves actually do to promote healing."

"Healing occurs in three stages: bleeding, painful inflammation followed by proliferation, where new cells are growing and making the initial somewhat disorganized scar; then remodelling of scar into something like normal. Nerves could be active anywhere in that continuum."

In a study funded by the Canadian Arthritis Society (CAS) he and his colleagues looked at the effects of certain neuropeptides on cellular production of molecules necessary to healing in ligament scar tissue. They found that when the nerves are cut, the production of everything increases. "That didn't fit with the picture that injuries weren't healing right. So we wonder if the effect of nerves is to regulate growth of cells or formation of new blood vessels."

A second CAS-funded study led by Dr. Salo is looking at the effects of thrombospondin-1 (TSP-1), which inhibits angiogenesis – new blood vessel formation. "It is now well accepted that angiogenesis is the key to wound healing," he says. "We think the main effect in denervation is an increase in TSP levels, which blocks new blood vessel formation, and that is why an injury is not healing." The study he did in 2002 found that there were more blood vessels and scars were stronger in wounds where there were nerves.

So then, he wonders, "could nerves stimulate the formation of new blood vessels?"

"We want to look more carefully at denervation and effects on blood vessels. Maybe we can figure out which is the missing signal from the nerves that allows TSP to go up. This would help to separate out the good parts of healing from the bad. If we can find a way to block out the pain part and still prevent the angiogenesis inhibiting actions of TSP that would be a good thing." ❧



Dr. Paul Salo, Spine Section

## Shoulder Research continued from page 2

trials to actually show specific benefits to an arthroscopic technique using the randomized clinical trial design."

"We have now gone from that trial to a multi-centre RCT, centred in Toronto under Dr. Richard Holtby, comparing the mini-open to an all-arthroscopy repair for the rotator cuff," says Dr. Mohtadi. "Our goal is to recruit 200 patients over five years including two-year follow-up." Four surgeons in Calgary are participating: Drs. Mohtadi, Hollinshead, Boorman and Lo, who is the local principle investigator.

For this study a different technique of randomization was used. "It has recently been coined 'expertise-based randomization'," says Dr. Mohtadi. "I came upon this idea serendipitously, based on another trial that we were doing locally, comparing open to arthroscopic shoulder procedures for recurrent anterior dislocators.

"Often procedures are randomized in the operating room, but this assumes that the surgeon can do either technique equally well, which is not always the case. In the current trial, two surgeons are doing the mini-open rotator cuff repair and two are doing the all arthroscopic technique. So patients are randomized to a surgeon who has a specific expertise."

This form of randomization is better for both patients and the surgeons, says Dr. Mohtadi. "Patients need to have confidence in the approach that is being taken. Since the surgeon is more comfortable with their own approach, the discussion and consenting process is clear and more specifically simulates typical clinical practice. In the expertise-based randomized design, if the outcome is that technique A is better than technique B, the results are clear."

Yet another serendipitous research outcome came from another intriguing

observation during a trial comparing surgical to non-surgical treatment of Achilles tendon ruptures. The patients were referred to the Sport Medicine Centre and randomized to surgical repair or conservative treatment. The patients who were randomized to surgery were treated as outpatients, rather than being admitted to hospital and waiting to have emergency surgery. "We are now examining whether or not we have reduced the costs of surgical treatment as a result of doing the trial," explains Dr. Mohtadi. "This is an unexpected outcome that had nothing to do with the primary question, but it may change the standard of care and to me that's really exciting. Every time we do a trial – doesn't matter what area, what procedure – we learn things that we didn't expect to learn and we change the delivery and standards of care, usually for the better." ❧

# A Cost-Effectiveness Analysis of Spine Surgery for Metastatic Tumors

Although we like to think no expense is spared when we are ill, it would be foolish to believe that health care costs are not controlled by budget constraints. And occasionally a medical researcher will step out of the lab or clinic to look at the cost/benefit ratio of a procedure or treatment.

In this case, Dr. Ken Thomas, an orthopaedic spine surgeon who also has a master's degree in epidemiology, chose to look at the cost-effectiveness of surgery plus radiation on patients with metastatic spine disease, above and beyond the previously accepted treatment protocol of radiation only.

Dr. Thomas used as the basis of his research a recently published study looking at the effectiveness of surgery and radiotherapy (SRT) versus radiotherapy (RT) alone for spinal metastatic epidural spinal cord compression (MESCC). "Metastatic epidural spinal cord compression, left untreated, has devastating physical and psychological consequences including loss of leg, bowel and bladder function," explains Dr. Thomas. "In fact the randomized trial stopped early when it showed that patients in the surgical group were walking much longer than the radiotherapy alone group, and there was a trend towards longer survival."



Dr. Ken Thomas, Spine Section

The difference in life expectancy and ambulation is significant – with SRT patients gaining on average an additional 220 days of ambulation and surviving an additional 156 days in comparison to RT patients. "In the past and to some extent today," he says, "MESCC was just treated with radiation, largely because tumour removal tended to destabilize the spine. What has changed over the last two or three decades is our ability to restabilize the spine with rods, screws and cages."

Dr. Thomas was assisted in his research by health economist Aslam Anis in finding and utilising various cost models for the many variables. "To determine how much this treatment cost beyond radiation, we took a similar group of patients and summed the resources they consumed: surgery, ICU stay, hospital ward, post-hospitalization care and complications. We applied costs to resources consumed using a hospital cost model. We also did the same for the radiation patients. All patients were followed to their deaths."

They were able to come up with an average incremental cost-effectiveness ratio. "In simplistic terms the cost estimate for each additional day of walking, afforded by SRT, was 60 dollars," says Dr. Thomas.

What role do studies like this play? "Some would argue they are inappropriate for the doctor who needs to do the best they can for their patient. But in times when we don't have enough health care dollars to adopt all new technology or treat all ailments, ideally all interventions would be subject to cost-effectiveness evaluation, and in so doing be prioritized to maximize health care benefit, given a fixed budget"

Dr. Thomas' study was presented at the Canadian Spine Society meeting in March, 2005. ♣



Dr. David Sheps, Orthopaedic Fellow

## Establishing a Baseline for Elbow Injuries in Calgary

Dr. David Sheps, an orthopaedic surgeon who has completed a fellowship in upper extremity (shoulder elbow, wrist), is also completing his master's degree in epidemiology. He is in the final stages of his thesis, researching the epidemiology of elbow injuries – fractures and dislocations – in the city of Calgary.

What seemed a simple project at first became quite complex, said Dr. Sheps. "We were looking at the ways in which this data is collected in terms of how many injuries occur as well as how many are missed or wrongly classified, and what kinds of bias may exist in classification. We tried to develop a methodology to accommodate those issues".

"When we are finished, we will have estimated the incidence of the number of injuries that occur per 10,000 people

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# Is DVT Prophylaxis Necessary in Lower Leg Fractures?

Deep Vein Thrombosis (DVT) is a condition that occurs when a blood clot forms in a deep leg vein and can potentially travel to the lungs. This can result in chest pain or be fatal. The risk of DVT is unknown in individuals who have had surgery after a fractured leg (between the knee and ankle).

The risk of DVT is unknown in individuals who have had surgery after a fractured leg (between the knee and ankle). Third-year orthopaedic resident Dr. Danny Goel is completing a study, initiated by Dr. Richard Buckley and Dr. Gwyneth deVries, which is looking at the incidence of DVT in this population and the need for blood thinners.

"Isolated fractures below the knee (essentially the tibia and fibula) are very common, but the incidence of DVT after surgery in that population is unknown," says Dr. Goel. "The scientific literature reports a 2-40 percent incidence of developing a DVT." This study follows a pilot study done by Drs. Richard Buckley and Greg Abelseth in which they reported a 26 percent incidence of DVT in a lower leg fracture distal to the knee.

The standard of care related to potential clots is quite variable in the two weeks following the trauma/surgery, the period when there is the highest incidence of DVT. "There

is no consensus among orthopaedic trauma surgeons as to the need for DVT prophylaxis in patients treated for fractures below the knee," says Dr. Goel. "We don't know what the optimal treatment is."

The study has two purposes: to determine the incidence of DVT in this

specified population through a multi-centre randomized controlled double-blind trial, and to establish a standard of care. Admitted trauma patients are recruited to enrol in the study on a voluntary basis. It requires them to self-administer two weeks of injections, which are either a saline solution or the prophylactic, a blood-thinner called Fragmin®.

At two weeks the patient returns to the hospital to see the surgeon; after routine follow-up they are given bilateral venograms, as the incidence of DVT is as high in the unaffected leg as the affected one. Each venogram is read independently by three radiologists and an equivocal consensus as to whether there is any indication of DVT is reached. Statistical analysis is being done Dr. Gordon Fick.

He notes that the results of the study will have significant impact. "If we find that people don't need the blood thinner, it will be a considerable cost saving. If they do, we have potentially established a new standard of care." ❧



Dr. Danny Goel, Orthopaedic Resident

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*Elbow injuries continued from page 5*

per year in the city of Calgary, and we will have generalized the results to the Canadian population" he says. "We will also have a database of injuries in which we can identify subsets of patients that we can follow retrospectively in future research."

He suggests, for example, "Once we know the incidence of radial head fractures, we can look at how many individuals with this type of injury develop complications, and we can also compare outcomes between differently treated groups, such as those who are treated operatively and non-operatively.

One new study has already come out of this. "During our course of classifying injuries we were having difficulty choosing classification systems, which are not always that reliable. We studied the reliability of two of the most popular systems for classifying radial head fractures: the Hotchkiss modification of Mason Johnston System for radial head fractures and AO System for Proximal Radius and Ulna Fractures. We found the AO system was generally unreliable and the Hotchkiss only moderately reliable. This is in keeping with work done

on the AO system on other parts of the body, which has also been shown to be generally unreliable. We think there's enough of a body of work now to show this is not a reliable classification system."

Judging from the research opportunities Dr. Sheps has identified, the results of this epidemiology study will be far-ranging. "We think this is going to be very useful information," he says. "We're actually just as interested in the method as the outcome, because it can act as a framework for any trauma data collection." ❧

# The Eighth Annual Orthopaedic Research Symposium

The eighth annual Research Symposium sponsored by the Calgary Orthopaedic Research and Education Fund was an opportunity for basic and clinical researchers to share their diverse activities and findings with their colleagues in an informal atmosphere.

This year, Dr. Cy Frank, Alberta Bone and Joint Health Institute, told the gathering that two of the presenters, Dr. Walter Herzog and Dr. Bob Bray, were "the best in the world" in terms of the research they were presenting.

Dr. Herzog, who holds the Canada Research Chair in Molecular and Cellular Biomechanics and is Associate Dean Research, Kinesiology at the U of C, has been trying to discover the cause of osteoarthritis in previously damaged joints, focusing on joint mechanics, in vivo joint loading and muscle weakness. Using animal models that have had their ACL removed, he has determined that, although the external mechanics may be normal at six months post-injury, it is quite clear that joint disease is progressing.

He has also found that knee cartilage increases in thickness post-injury, and that the way the force goes through the joint is completely different than pre-injury. This seems to correlate with findings in humans that the muscles do not return quickly to their previous strength, even after extensive physiotherapy and hard training. "All the muscles around the joint seem to change function, especially the flexors," he said.

Dr. Herzog's laboratory has developed an animal model for muscle weakness which is reproducible, and he reported that first indications are that muscle weakness seems to contribute to the onset of joint degeneration. He suspects that the secret may lie at least partially in what happens immediately after an injury, and suggests that "muscles are very, very important."

While Dr. Herzog was working in the lab, Dr. Jason Werle and 12 of his colleagues were busy creating a clinical model for treating patients requiring hip and knee arthroplasty. In a three-city randomized controlled trial, enrolled patients were directed either to the 'normal' or control arm of the study, or to the new model, or intervention arm. Those in the control arm were treated as any other patient might be, with waits of up to 35 weeks to see

a surgeon and a further 50 or more weeks for surgery, while those in the intervention arm were assessed at less than six weeks, and those who needed surgery were operated on less than five weeks later. The difference? For the control patients it is what Dr. Werle describes as "the burden of waiting: increased pain and stiffness. Loss of work time. More visits to primary and alternate health care providers." The study is now closed, with a total of 1,200 patients enrolled in Calgary, Edmonton, and Red Deer, and according to Dr. Werle, "The preliminary results look positive."

Hips and knees may have a higher profile, but shoulders often need replacing too. "Many of you are familiar with the Birmingham hip saga," said Dr. Bob Hollinshead as he introduced the Copeland Shoulder Replacement. "This is somewhat similar." The Copeland prosthesis has a much shorter stem than a traditional shoulder replacement, requires minimal bone removal, and uses cementless fixation. Surgeons have found that this technology offers improved range of motion and outcomes. Since 2003, twelve patients in Calgary have received the Copeland prosthesis, and are being followed at 3, 6 and 12 months. A new study comparing the Copeland to traditional stemmed arthroplasty is being developed. "We're going to start with a prospective trial at all centres, and we may expand it to a full randomized controlled trial," said Dr. Hollinshead. "If things go as planned, we could contribute significantly to the literature on shoulder arthroplasty."

One man who has added considerably to the literature in his field is Dr. Jim Harder, a paediatric orthopaedic surgeon who has made the spinal deformity idiopathic scoliosis the focus of more than a decade of research. Until now, the spine's curvature has been recorded on x-ray and determined by a 2-dimensional measurement called the Cobb Angle measurement. But, said Dr. Harder, "Scoliosis is three-dimensional. The Cobb

Angle is not relevant. I hope we can leave it with the Model T."

Dr. Harder has been working on a new and better way to quantify the deformity and a safer way to visualize it than the twice-yearly x-rays that have been the standard. These twin goals are within sight, as Dr. Harder and his colleagues Dr. Janet Ronsky (U of C) and Dr. Hubert Labelle of Montreal fine-tune a system using neural networks, fuzzy logic and red light laser technology. They are teaching a computer to predict the progress of any case of scoliosis based on the external shape of the torso, and thereby allow them to determine whether the patient will be fine left untreated or whether they will need bracing or surgery. "By the fall we hope to decrease the use of x-rays dramatically," said Dr. Harder. "After ten years, we're finally starting to make progress."

Dr. Bob Bray is another dedicated researcher, with well over a decade of work and publications to bring laser speckle imaging (LSI) to the point where it is an 'overnight success'. The new technology, which appears to have myriads of applications for measuring blood flow intraoperatively, is the outcome of Dr. Bray's long-standing interest in circulatory physiology, and in particular, blood flow in ligaments.

Although existing laser Doppler is effective for checking blood flow, it is slow and produces low resolution images. Dr. Bray's LSI is, in his words, "very fast, high resolution and non-invasive, and adaptable for endoscopy." It has been used to measure blood flow during osteotomy and ACL reconstruction, and to determine the effectiveness of epinephrine dosages, and tourniquets during surgery. Before LSI, said Dr. Bray, "we didn't have any rationale for how much epinephrine was appropriate [to reduce intraoperative bleeding]. Now we do." And that is not all. "LSI can also predict the levels of scarring in burns," he said, and added that there were likely to be many other uses for the LSI. ☞

# Osteoarthritis and Total Ankle Replacement

As osteoarthritis (OA) has reached a level of great epidemiological and health-care importance, and is expected to increase in the next decades, it is of significant interest to Dr. Victor Valderrabano, an orthopaedic surgeon specializing in sports injuries.

**A** 2004/2005 musculoskeletal researcher, Dr. Valderrabano completed a Ph.D in Biomechanics at the Human Performance Laboratory, before returning to his home in Switzerland. While in Calgary, he analyzed the etiology, orthopaedic treatment, and biomechanical effect of OA on human




**Dr. Victor Valderrabano, Musculoskeletal Research**

lower extremities, the ankle in particular. The main purposes of these investigations were to provide clinical information about ankle OA and total ankle replacement (TAR), to provide in vivo biomechanical data in order to quantify lower leg muscle atrophy in ankle OA, to quantify muscle rehabilitation after TAR and to quantify gait characteristics of patients with ankle OA before and after TAR.

Dr. Valderrabano's results showed that post-traumatic ankle OA represents the major etiology group in ankle OA and generally results in a varus ankle alignment. In normal subjects, a lower leg muscle asymmetry was found for electromyography (EMG) and torque measurements. Ankle OA was associated with atrophy of the lower leg muscles, characterized by a torque decrease and a reduction of EMG intensity and frequency.

Ankle OA patients also showed a pathological gait pattern that was different from normal healthy subjects. Three months after TAR surgery, torque, EMG and gait

results reached the highest difference to the results of normal healthy subjects. One year after surgery, TAR patients showed joint torques and EMG intensities for the affected leg that were closer to the results of normal healthy subjects, even though the preoperatively lower EMG frequency did not change during rehabilitation. The gait characteristics of TAR patients were closer to normal one year after surgery than preoperatively. Most importantly, noted Dr. Valderrabano, "TAR improved the clinical, daily and sports function of ankle OA patients."

Dr. Valderrabano is a staff member in the Lower Limb Unit of the Orthopaedic Department of the University of Basel in Switzerland. In the next few years, Dr. Valderrabano will be collaborating on a scientific basis with Dr. Cyril Frank, Dr. Benno Nigg, Dr. Vincent von Tscharnar, and Dr. Walter Herzog at the U of C and will try to build up a continuous fellow and resident exchange between the Orthopaedic Departments of the U of C and Basel. 

## Upcoming Events

**33rd Annual Alberta Orthopaedic Resident Research Day**  
Dana Soltes Auditorium, Red Deer Hospital, Red Deer, Alberta  
*April 21st, 2006*

**Canadian Orthopaedic Foundation Hip Hip Hooray**  
National Annual Walk, Calgary Location: Bowness Park  
*May 28th, 2006*

**Canadian Orthopaedic Association Annual Meeting and  
Canadian Orthopaedic Research Society Annual Meeting**  
Sheraton Centre Toronto Hotel, Toronto, Ontario  
*June 2nd – 4th, 2006*

**24th Annual Surgeons' Day**  
Libin Lecture Theatre, Health Sciences Centre  
*June 23rd, 2006*

**Orthopaedic Research Golf and Scientific Meeting Annual Event**  
Glencoe Golf and Country Club  
*September 11th, 2006*

**34th Annual Paediatric Townsend Day**  
Alberta Children's Hospital  
*October 13th, 2006*

**9th Annual Orthopaedic Research Symposium**  
La Chaumière Restaurant  
*February 7th, 2007*

**Orthopaedic Research Society Annual Meeting**  
San Diego, CA  
*February 11th – 14th, 2007*

**American Academy of Orthopaedic Surgeons  
Annual Meeting**  
San Diego, CA  
*February 14th – 18th, 2007*

**34th Annual Alberta Orthopaedic Resident  
Research Day**  
*April 20th, 2007*

## RESEARCH KUDOS

**Dr. Ibrahim Assiri:** 2005 COREF Research Award – The Correlation Between the Length of Waiting Time Before ACL Reconstruction and the Occurrence of Meniscal Injury Requiring Surgery: A 3-Year Retrospective Database Study in Alberta (2002–2005)

**Dr. Shane Barwood:** 2005 COREF Research Award – A Cyclical Loading Comparison of Two Rotator Cuff Repair Techniques: “Double-Row” Suture Anchor Versus “Tongue In Groove” Transosseous Suture

**Dr. Gurpreet Dhaliwal:** 2005 COREF Research Award – The Effectiveness of Post Operative Knee Immobilization on Pain Reduction Following Primary ACL Reconstruction

**Dr. Cy Frank:** Fellow member of the Canadian Academy of Health Sciences (2005); Chair, Musculoskeletal Biology and Bioengineering Gordon Research Conference (July 2006) “Controversies in Joint Repair and Regeneration”; Member, Gairdner Foundation Awards Committee (2006)

**Dr. Arun Gupta:** 2005 COREF Research Award – A Prospective Comparison of the Swimmer’s and Shoulder “Pull Down” Views for Lateral C–Spine Radiographs in Trauma Patients

**Dr. David Hart:** Received the John E. Boezi Distinguished Alumni Award for Research Excellence from the Department of Biochemistry and Molecular Biology at Michigan State University (2005)

**Dr. Ian Le:** Award recipient at the 2005 Annual Alberta Orthopaedic Resident Research Day: 1st Place Linvatec Clinical Research Paper

**Dr. Kristopher Lundine:** CanMEDS Research and Development Grant from the Royal College of Physicians and Surgeons of Canada (July 2005)

**Drs. Nigel Shrive, Janet Ronsky, David Hart, Cy Frank –** Excellence Award from the Alberta Ingenuity Fund – 2005 APEGGA Summit Award for Research Excellence awarded to the Joint Injury and Arthritis Research Group

**Dr. Adam Sidky:** Awarded the Calgary Surgical Research & Development Grant (2005).

**Dr. Ron Zernicke:** Delsys Award for EMG Research Innovation, Joint Congress of International and American Societies of Biomechanics, Cleveland, Ohio (2005); Faculty of Kinesiology, Award of Excellence – Research, University of Calgary (2005)

## ACKNOWLEDGEMENTS

Alberta Bone and Joint Health Institute (ABJHI) – Alberta Heritage Foundation for Medical Research (AHFMR) – Alberta Ingenuity – Calgary Orthopaedic Research and Education Fund (COREF) – Calgary Health Region (CHR) – Canadian Arthritis Network (CAN) – Canadian Foundation for Innovation (CFI) – Canadian Institutes of Health Research (CIHR) – Canadian Orthopaedic Foundation (COF) – Department of National Defense – Faculty of Medicine, University of Calgary – Hip Hip Hooray – Institute of Musculoskeletal Health and Arthritis (IMHA) – Joint Injury and Arthritis Research Group (JIARG) – National Sciences and Engineering Research Council (NSERC) – The Arthritis Society (TAS)

## ORTHOPAEDIC FACULTY

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## FELLOWS

S Aleissa, T Almalki, H Al Tunaiji, I Assiri, B Benson, J Martinez, P Punsalan, G Swamy, J Xie

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