Western Orthopaedic Association

76th Annual Meeting

June 13–16, 2012

The Hilton Portland

Portland, Oregon

2012
Meeting Program

Chuck Freitag

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Please notify the WOA Central Office of any changes in your home or office address.

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons and the Western Orthopaedic Association.

The American Academy of Orthopaedic Surgeons is accredited by the ACCME to provide continuing medical education for physicians. The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 28.75 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Cover Design by Lauren Murphy.

President's Message

Dear Colleagues,

Peter J. Mandell, MD

Welcome to Portland for the 76th Annual Meeting of the Western Orthopaedic Association. Jeanne and I are honored to welcome you to The City of Roses. We hope you enjoy the diverse and educational academic program in combination with unique social activities planned for you and your family.

Brian Jewett and his Program Committee have put together 28.75 credits of cutting edge education while still allowing time in the afternoons to "smell the roses." With the London Summer Games starting shortly after our meeting ends, I'm sure there will be great interest in Rudolf Hoellrich, MD's symposium on Care of the Athlete, including views on concussions, stress fractures, and plasma-rich protein injections. Val Lewis, MD will moderate the Tumor Update Symposium, including the management of skeletal metastases. Bill Maloney, MD will oversee the Total Joints: Back to Basics Symposium, with discussions on infected joints, instability, and venous thrombo-embolism prevention. David Lowenberg, MD will lead the discussion at the Common Fractures in the Elderly: Current State of the Art symposium. David's panel will look at distal radius, proximal humeral, hip, and spinal compression fractures. Ken Butters, MD and his symposium colleagues will tell us about the Elbow — Cradle to Grave, including pediatric and adult fractures and advanced imaging. Last but not least, Steve Ross, MD and his expert panel will conclude our 2012 six-symposium cycle with the latest on the Foot and Ankle, including tendonopathies and midfoot injuries.

We're honored to have John Tongue, MD, AAOS President and a native Oregonian, to deliver the AAOS report at our meeting. I am delighted that my Presidential Guest Speaker Kevin Bozic, MD, the current Chair of the AAOS Council on Research and Quality, will be with us as well. Our Howard Steel lecturer is Bruce Paton, MD, who will tell us about Doctors in the Wilderness in the early days of America and Oregon.

In addition to our symposia, we have a wide selection of original research papers, young investigator award papers, resident award papers, and instructional course lectures. There will be scientific posters and multimedia education sessions.

We don't lack social events, either. Attendees will have an opportunity to take a tour of the Nike headquarters, sign up for an epicurean's walk to taste Portland's fine food and drink, and enjoy a half-day excursion to the Columbia Gorge and Waterfalls. Our Friday evening Gala dinner will feature entertainment from Dave Anderson, a nationally touring comedian who has appeared on numerous TV shows and written for Jay Leno.

Thank you for attending this year's meeting. We know you will have a great educational experience and enjoyable summer fun as well.

Peter Mandell

Peter J. Mandell, MD
President, Western Orthopaedic Association

Table of Contents

Meeting-at-a-Glance

Times and locations are subject to change.
Badges or wrist bands are required for admittance to all social events.

WEDNESDAY, JUNE 13, 2012

8:00am–5:00pm	**Industry Workshop — Acumed*** *(Meet in the Hilton lobby at 7:00am for transportation)* CME credit not available
12:00pm–5:00pm	**Meeting Registration** *(Grand Ballroom Foyer)*
12:00pm–5:00pm	**Exhibit Setup** *(Grand Ballroom I & Foyer)*
12:00pm–5:00pm	**Scientific Poster Setup** *(Galleria II & III)*
12:00pm–5:00pm	**Speaker Ready Room** *(Galleria I)*
1:00pm–5:00pm	**Board of Directors Meeting** *(Broadway III & IV)*

THURSDAY, JUNE 14, 2012

5:45am–1:15pm	**Meeting Registration** *(Grand Ballroom Foyer)*
5:45am–5:00pm	**Speaker Ready Room** *(Galleria I)*
6:00am–7:00am	**Scientific Poster Session** (CME Activity) *(Galleria II & III)*
6:00am–1:15pm	**Scientific Sessions and Symposia** (CME Activity) *(Grand Ballroom II)* *(See pages 6-7 for details.)*
6:00am–1:15pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** *(Grand Ballroom I & Foyer)*
7:00am–7:15am	**First Business Meeting** *(Grand Ballroom II)*
8:40am–9:35am	**Concurrent General Session** (CME Activity) *(Parlors A, B, & C)*
9:00am–10:30am	**Spouse/Children's Hospitality** *(Alexander's)*
9:35am–10:15am	**Howard Steel Lecture** *(Grand Ballroom II)*
12:50pm–4:00pm	**Nike Tour*** *(Meet in the Hilton lobby)*
1:00pm–4:30pm	**Epicurean Excursion Walking Tour*** *(Meet in the Hilton lobby)*
1:15pm –2:15pm	**Scientific Poster Session** (CME Activity) *(Galleria II & III)*
2:15pm–4:15pm	**Multimedia Education Session** (CME Activity) *(Galleria I)*
5:00pm–6:00pm	**Care of the Athlete & Tumor Update – Questions, Review, and Answers** (CME Activity) *(Parlors A, B, & C)*
5:30pm–6:30pm	**New Member Reception*** *(Alexander's on the 23rd floor)*
6:30pm–9:30pm	**Welcome Reception*** *(Meet in the Hilton lobby)*

FRIDAY, JUNE 15, 2012

5:45am–3:10pm	**Meeting Registration** *(Grand Ballroom Foyer)*
5:45am–5:00pm	**Speaker Ready Room** *(Galleria I)*
6:00am–7:00am	**Scientific Poster Session** (CME Activity) *(Galleria II & III)*
6:00am–7:00am	**Regional and AAOS President's Breakfast Meeting with State Presidents and Board of Councilors** *(Broadway I & II)*

* See Activities Information on pages 8-10 for more details.

6:00am–3:10pm	**Scientific Sessions and Symposia** (CME Activity) *(Grand Ballroom II)* *(See pages 6-7 for details.)*
6:00am–3:10pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** *(Grand Ballroom I & Foyer)*
11:30am–12:00pm	**Presidential Guest Speaker** *(Grand Ballroom II)*
12:00pm–12:55pm	**Industry Luncheon — Cadence Pharmaceuticals Inc. and ConvaTec*** *(Grand Ballroom II)* CME credit not available.
12:00pm–5:30pm	**Golf Outing*** *(Meet in the Hilton lobby)*
12:30pm–5:30pm	**Columbia Gorge & Waterfalls Motorcoach Tour*** *(Meet in the Hilton lobby)*
2:10pm–3:10pm	**Concurrent General Session** (CME Activity) *(Parlors A, B, & C)*
3:00pm–4:00pm	**Industry Workshop — Acumed*** *(Meet in the Hilton lobby at 2:00pm for transportation)* CME Credit not available.
3:10pm–4:10pm	**Scientific Poster Session** (CME Activity) *(Galleria II & III)* **Note:** Poster award selection during this session
4:00pm–6:00pm	**Industry Workshop — Acumed*** *(Meet in the Hilton lobby at 3:00pm for transportation)* CME Credit not available.
4:10pm–5:10pm	**Multimedia Education Session** (CME Activity) *(Galleria I)*
6:00pm–10:00pm	**Kids' Movie Night with Arts & Crafts and Dinner*** *(Parlors B & C)*
6:00pm–7:30pm	**Exhibitor and Poster Reception*** *(Grand Ballroom I & Foyer, Galleria II & III)*
7:30pm–10:00pm	**WOA Gala Dinner*** *(Pavilion East)*

SATURDAY, JUNE 16, 2012

5:45am–2:40pm	**Meeting Registration** *(Grand Ballroom Foyer)*
5:45am–1:40pm	**Speaker Ready Room** *(Galleria I)*
6:00am–6:55am	**WOA Board Meeting w/Breakfast** *(Broadway I & II)*
6:00am–7:00am	**Scientific Poster Session** (CME Activity) *(Galleria II & III)*
6:00am–1:40pm	**Scientific Sessions and Symposia** (CME Activity) *(Grand Ballroom II)* *(See pages 6-7 for details.)*
6:00am–1:40pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** *(Grand Ballroom I & Foyer)*
7:00am–7:15am	**Second Business Meeting** *(Grand Ballroom II)*
8:45am–1:40pm	**Concurrent General Session** (CME Activity) *(Parlors A, B, & C)*
11:45am–12:25pm	**WOA Presidential Address** *(Grand Ballroom II)*
1:40pm–2:40pm	**Total Joints: Back to Basics and Common Fractures in the Elderly: Current State of the Art; Elbow: Cradle to Grave; Foot & Ankle — Questions, Review, and Answers** *(Parlors A, B, & C)*
2:00pm–5:00pm	**Industry Workshop — Acumed*** *(Meet in the Hilton lobby at 1:00pm for transportation)* CME credit not available.
2:40pm–3:40pm	**Scientific Poster Session** (CME Activity) *(Galleria II & III)*
3:40pm–4:10pm	**Multimedia Education Session** (CME Activity) *(Galleria I)*

* See Activities Information on pages 8-10 for more details.

Scientific Program Agenda

Grand Ballroom II (unless otherwise specified)

Presenters and times are subject to change.

THURSDAY, JUNE 14, 2012

6:00am–7:00am	**Poster Session** *(Galleria II & III)* **Note:** Poster presenters will be available to answer questions.
6:00am–7:00am	**General Session I — Clinical Case Presentation Review**
7:00am–7:15am	**First Business Meeting**
7:20am–8:20am	**Symposium I — Care of the Athlete**
8:20am–8:40am	***Break — Please visit with exhibitors*** *(Grand Ballroom I & Foyer)*
8:40am–9:35am	**Concurrent General Session II — Tumor & Basic Science**
8:40am–9:35am	**Concurrent General Session III — Sports Medicine** *(Parlors A, B, & C)*
9:35am–10:15am	**General Session IV — Howard Steel Lecture**
10:15am–11:15am	**Symposium II — Tumor Update**
11:15am–11:35am	***Break — Please visit with exhibitors*** *(Grand Ballroom I & Foyer)* *Drawing will take place at the end of the break.
11:35am–12:44pm	**General Session V — Resident Award Papers**
12:45pm–1:15pm	**General Session VI — Recredentialing Updates: MOC and MOL & BOC Report**
1:15pm–2:15pm	**Poster Session** *(Galleria II & III)* **Note:** Poster presenters will be available to answer questions.
2:15pm–4:15pm	**Multimedia Education** *(Galleria I)*
5:00pm–6:00pm	**Care of the Athlete & Tumor Update — Questions, Review, and Answers** *(Parlors A, B, & C)*

FRIDAY, JUNE 15, 2012

6:00am–7:00am	**Poster Session** *(Galleria II & III)* **Note:** Poster presenters will be available to answer questions.
6:00am–7:00am	**General Session VII — Clinical Case Presentations Review**
7:00am–8:10am	**Symposium III — Total Joints: Back to Basics**
8:10am–8:30am	***Break — Please visit with exhibitors*** *(Grand Ballroom I & Foyer)*
8:30am–9:00am	**General Session VIII — Young Investigator Award Papers**
9:00am–9:25am	**General Session IX — Special Lecture** **Osteoporosis: Orthopedic Knowledge and Management**
9:25am–10:50am	**Symposium IV — Common Fractures in the Elderly: Current State of the Art**
10:50am–11:10am	***Break — Please visit with exhibitors*** *(Grand Ballroom I & Foyer)* *Drawing will take place at the end of the break.

11:10am–12:00pm	**General Session X — AAOS Report and Presidential Guest Speaker**
12:00pm–12:55pm	**Industry Luncheon — Cadence Pharmaceuticals Inc. and ConvaTec** *(Grand Ballroom II)* CME credit not available.
12:55pm–2:05pm	**Symposium V — Practice Management**
2:05pm–2:10pm	***Break — Change Rooms***
2:10pm–3:10pm	**Concurrent General Session XI — Trauma**
2:10pm–3:10pm	**Concurrent General Session XII — Total Joint** *(Parlors A, B, & C)*
3:10pm–4:10pm	**Poster Session** *(Galleria II & III)* **Note:** Poster presenters will be available to answer questions. (Poster award selection during this session.)
4:10pm–5:10pm	**Multimedia Education** *(Galleria I)*

SATURDAY, JUNE 16, 2012

6:00am–7:00am	**Poster Session** *(Galleria II & III)* **Note:** Poster presenters will be available to answer questions.
6:00am–7:00am	**General Session XIII — Clinical Case Presentations Review**
7:00am–7:15am	**Second Business Meeting**
7:15am–8:20am	**Symposium VI — Elbow: Cradle to Grave**
8:20am–8:40am	**General Session XIV — Advocacy Update II**
8:40am–8:45am	***Break — Change Rooms***
8:45am–9:50am	**Concurrent General Session XV — Upper Extremity**
8:45am–9:50am	**Concurrent General Session XVI — Foot & Ankle / Practice Management** *(Parlors A, B, & C)*
9:50am–10:25am	***Break — Please visit with exhibitors*** *(Grand Ballroom I & Foyer)* *Drawing will take place at the end of the break.
10:25am–11:35am	**Symposium VII — Foot & Ankle**
11:35am–12:25pm	**General Session XVII — OREF Update & Presidential Address**
12:25pm–12:40pm	***Refreshment Break/Change Rooms*** *(Foyer)*
12:40pm–1:40pm	**Concurrent General Session XVIII — Pediatrics**
12:40pm–1:40pm	**Concurrent General Session XIX — Spine** *(Parlors A, B, & C)*
1:40pm–2:40pm	**Total Joints: Back to Basics & Common Fractures in the Elderly: Current State of the Art; Elbow: Cradle to Grave; and Foot & Ankle — Questions, Review, and Answers** *(Parlors A, B, & C)*
2:40pm–3:40pm	**Poster Session** *(Galleria II & III)* **Note:** Poster presenters will be available to answer questions.
3:40pm–4:10pm	**Multimedia Education** *(Galleria I)*

Activities Information

Badges or wrist bands are required for admittance to all social events.

Wednesday, June 13, 2012

Industry Workshop — Acumed®

8:00am–5:00pm *(Meet in the Hilton lobby at 7:00am for transportation)*

Resident's Skills Lab: Upper and Lower Extremity Fracture Managerment

Course Chair: Jesse McCarron, MD

Enhance your knowledge of upper and lower extremity fracture fixation at the Acumed® Resident's Skills Lab. Course attendees will refine their surgical skills by concentrating on contemporary surgical techniques and minimally invasive treatment options.

Located at the Acumed®Learning Center. A round trip chartered bus will be available to transport attendees to and from the Acumed® Learning Center. For those who wish to use their own transportation, complimentary parking is available onsite. Driving directions available at the Registration Desk.

To register, please visit www.acumed.net. For more information please email marketingevents@acumed.net.

Price: Included in Registration; breakfast, lunch, and breaks provided. (CME credit not available)

Thursday, June 14, 2012

Spouse/Children's Hospitality

9:00am–10:30am *(Alexander's)*

Join your friends and meet new spouses while enjoying a continental breakfast. There will be a presentation on "How to Fake Being a Portlander" — The insider's guide to living locally, including: a dozen or more words for rain, why a "couch" is not a sofa, why locals don't carry umbrellas, Portland's five "quadrants," and more!

Price: Included in Registration Fee

Nike Tour

12:50pm–4:00pm *(Meet in the Hilton lobby)*

Come to the Nike World Headquarters and main campus and receive a behind the scenes tour with a stop at the Nike Employee store with the employee discount for WOA members. No competitor apparel to be worn, box lunch included. (30 minute transfer each way)

Price: $53 per person (minimum 30 participants)

Epicurean Excursion Walking Tour

1:00pm–4:30pm *(Meet in the Hilton lobby)*

Enjoy a unique and delicious walking tour where you'll taste foods, sip drinks, and meet some artisans and vendors in their shops while exploring the lively Pearl District. If you watch the Food Network or consider yourself a "foodie," this is the adventure for you. The tour typically visits between 8 and 10 different local vendors and artisan producers. The tour highlights the F.L.O.S.S. philosophy —fresh, local, organic, seasonable, and sustainable. Examples of past items served include: finishing salts infused with imported black truffle and smoked chilies, hazelnut spiced rum, tomato-orange soup, Pinot Noir and Pinot Gris wines from the Willamette Valley, single origin chocolates, and much, much more. We recommend that you only have a light lunch before the tour!

Price: $58 per person (includes guide gratuity)

New Member Reception

5:30pm–6:30pm *(Alexander's on the 23rd floor)*

All WOA new members are invited to attend this reception. The WOA Board and leadership would like to take this opportunity to welcome you to WOA.

Price: Included in Registration Fee.

Welcome Reception

6:30pm–9:30pm *(Meet in the Hilton lobby)*

The World Forestry Center is a must see for people visiting the Portland area. Built in dramatic Cascadian style architecture, you'll marvel at the intricate hand carvings and grand entry outside, and delight in hands-on, one-of-a-kind exhibits inside. The museum focuses on forests of the Pacific Northwest and the role they play in providing habitat, water, recreation, wood, and a multitude of other benefits. The other sections of the museum explore art, history, and culture and forests from around the world. Savor food delicacies and drinks while chatting with friends and colleagues.

Attire: Resort Casual (no coat required)

Price: Included in Registration Fee or $75 per Unregistered Adult Guest

Friday, June 15, 2012

Columbia Gorge & Waterfalls Motorcoach Tour

12:30pm–5:30pm *(Meet in the Hilton lobby)*

On the Columbia Gorge step-on excursion you will

experience first-hand the beauty and grandeur of the Columbia River Gorge. One of America's most majestic waterways, our resident experts will be your guide to the rich history and breathtaking natural beauty of this area as we retrace a portion of Lewis and Clark's epic journey through the Columbia River Gorge atop Oregon's Historic Scenic Highway. We will visit the Vista House, perhaps the most beautiful travelers' rest station ever built, before descending down into the gorge to visit Multnomah Falls, the largest and most picturesque of the seventy-seven waterfalls lining the Oregon side of the gorge. These falls are truly one of the country's natural treasures, as is the adjacent Multnomah Falls Lodge. We then begin our return to Portland along the bottom of the gorge, providing not only a different, but equally spectacular, perspective on the natural splendor of the area, but also an opportunity to visit Bonneville Dam, one of the gorge's manmade wonders. There we will have the opportunity to tour the dam, see the massive locks that make the Columbia such an important shipping route, and learn about Oregon's efforts to save the endangered salmon by visiting the fish ladder.

Price: $99 per person (includes box lunch and guide gratuity)

Industry Luncheon — Cadence Pharmaceuticals Inc. and ConvaTec

12:00pm–12:55pm *(Grand Ballroom II)*

Advances in Peri-Operative Care of the Hip and Knee Patient: Management of Surgical Site Infection and Acute Pain

Presented by Sean Brimacombe, MD for Cadence Pharmaceuticals Inc. and Louis Kwong, MD, FACS for ConvaTec

This program will discuss recent advances in Perioperative Infection and Pain Management.

Price: Included in Registration; lunch provided.

Golf Outing

12:00pm–5:30pm *(Meet in the Hilton lobby)*

The golf outing will be held at two separate locations where we have arranged for tee times. The two sites are Eastmoreland Golf Course and Heron Lakes Golf Club. Transportation will be available at 12:00pm in the lobby. Lunch will be provided at the golf course upon arrival. If you have a preference, please let us know as we will assign the foursomes on a first-come, first-serve basis.

Price: $115 per person (includes greens fee, golf cart, transportation, lunch and beverage cart)

Industry Workshop — Acumed®

3:00pm–4:00pm *(Meet in the Hilton lobby at 2:00pm for transportation)*

Pearls and Pitfalls in Scaphoid Fracture Fixation

Course Chair: Robert Orfaly, MD

Explore the solutions provided through the utilization of a headless compression screw as a primary means of fracture repair or adjunct to hardware fixation. In this course, participants will receive hands-on training addressing scaphoid fractures and nonunions.

Located at the Acumed®Learning Center. A round trip chartered bus will be available to transport attendees to and from the Acumed® Learning Center. For those who wish to use their own transportation, complimentary parking is available onsite. Driving directions available at the Registration Desk.

To register, please visit www.acumed.net or onsite at the Acumed® Exhibit Booth. For more information please email marketingevents@acumed.net.

Price: Included in Registration (CME credit not available)

Industry Workshop — Acumed®

4:00pm–6:00pm *(Meet in the Hilton lobby at 3:00pm for transportation)*

Comprehensive Distal Radius Fracture Techniques

Course Chair: Robert Orfaly, MD

Learn about the management of complex distal radius fixation for intra-articular fractures, malunions and nonunions, and fractures of the intermediate and radial column. This course will allow participants to explore these challenging fractures through volar, dorsal and fragment specific plating approaches.

Located at the Acumed®Learning Center. A round trip chartered bus will be available to transport attendees to and from the Acumed® Learning Center. For those who wish to use their own transportation, complimentary parking is available onsite. Driving directions available at the Registration Desk.

To register, please visit www.acumed.net or onsite at the Acumed® Exhibit Booth. For more information please email marketingevents@acumed.net.

Price: Included in Registration (CME credit not available)

Exhibitor and Poster Presentation Reception

6:00pm–7:30pm *(Grand Ballroom I & Foyer, Galleria II & III)*

This is an opportunity to visit with the Exhibitors and view the Scientific Posters. Poster awards will be presented. Enjoy your favorite beverage!

Price: Included in Registration Fee or $75 per Unregistered Adult Guest

Kids' Movie Night with Arts & Crafts and Dinner

6:00pm–10:00pm *(Parlors B & C)*

Dinner and a movie—fun!!! Watch a great movie and nibble on snacks and treats with your friends! If younger than 5 years old, must be accompanied by an adult.

Price: Included in Registration Fee or $25 per Unregistered Child (5-17)

WOA Gala Dinner

7:30pm–10:00pm *(Pavilion East)*

Enjoy a wonderful dinner with your favorite beverage and enjoy comedian headliner Dave Anderson. Resident Awards will be presented.

Price: Included in Registration Fee

Saturday, June 16, 2012

Industry Workshop — Acumed®

2:00pm–5:00pm*(Meet in the Hilton lobby at 1:00pm for transportation)*

Fixation for Complex Elbow Fractures

Course Chair: Lisa Lattanza, MD

Featuring the latest philosophy in managing complex distal humerus fractures, a step-by-step lab will enable each participant to reconstruct a fracture using a Principle-Based Approach. This course will also cover olecranon and coronoid fractures with recommended treatment options.

Located at the Acumed®Learning Center. A round trip chartered bus will be available to transport attendees to and from the Acumed® Learning Center. For those who wish to use their own transportation, complimentary parking is available onsite. Driving directions available at the Registration Desk.

To register, please visit www.acumed.net or onsite at the Acumed® Exhibit Booth. For more information please email marketingevents@acumed.net.

Price: Included in Registration (CME credit not available)

Meeting Information

FORMAT

The educational sessions will be held Thursday, Friday, and Saturday, June 14–16, 2012, from approximately 6:00am until 2:00pm, at the Hilton Portland in Portland, Oregon.

TARGET AUDIENCE

The 76th Annual Meeting of the Western Orthopaedic Association has been developed primarily for orthopaedic and trauma surgeons and allied health professionals with a practice profile that is exclusively musculoskeletal.

SPEAKER READY ROOM

The Speaker Ready Room is available 24 hours a day. Please contact Hotel Security for access during unscheduled times.

BADGES/WRIST BANDS

Badges or wrist bands must be worn. They are proof of registration and are required for admittance to all functions and social events.

CME ACCREDITATION

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 28.75 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

* 22.25 CME credits for Scientific Program
* 3.5 CME credits for Multimedia Education Sessions
* 3 CME credits for Scientific Poster Sessions

To ensure correct CME credit is awarded, please complete the form in the back of this program, indicating the Sessions you attended or go online to www.woa-assn.org to complete the WOA 2012 Annual Meeting CME Credit Records. CME Certificates will be awarded to all registered participants.

PHYSICIAN REGISTRATION FEE

Registration covers the Scientific Program, Syllabus, Daily Continental Breakfasts and Coffee Breaks, General Meeting Expenses, Multimedia Educational Sessions, Poster Sessions, Welcome Reception, Exhibitor Reception, and Gala Dinner.

REGISTER FOR THE EXHIBITORS DRAWING

Registered physicians will receive a raffle ticket every day during the meeting to register with the exhibitors and sponsors. Place your ticket in the raffle box for a chance to win. Drawings will take place on Thursday and Friday at the end of the second break and on Saturday at the end of the first break in the Exhibit Area.

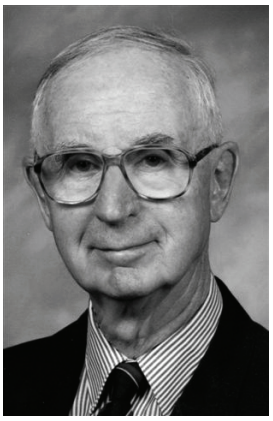
MANAGEMENT

The Western Orthopaedic Association is managed by Data Trace Management Services, a Data Trace Company, Towson, MD.

The meeting function areas, including the registration area and meeting rooms, are designated non-smoking throughout the course of the meeting. Smoking is limited to areas where not prohibited by fire department regulations.

Please be considerate and silence your cell phones during the Scientific Program.

2012 Howard Steel Orthopaedic Foundation Lecturer



Bruce C. Paton, MD

WOA is pleased to have Bruce Paton, MD as this year's Howard Steel Lecturer. Dr. Paton was born in India, where his father was a doctor in the Indian Medical Service, and lived there for six years. He was educated in Scotland and received his medical degree from the University of Edinburgh. He also served in the military as a Lieutenant in the Royal Marines, serving in the 41st and 45th Commandos in Europe and Hong Kong.

After graduating from medical school he spent a year at the Church of Scotland Hospital at Chogoria, Kenya, and during that time was the doctor on the first Outward Bound School course ever held in Africa. The main purpose of the course was to climb Mt. Kilimanjaro, which he successfully accomplished with his group.

Returning to Edinburgh, he trained first in cardiology, then in surgery, and finally immigrated to the United States in 1958 as a research fellow at the University of Colorado. During the next 21 years he rose through the academic ranks, becoming a professor and Chief of the Cardiac Surgical Service. During his last year at the school, he was the Acting Dean. Dr. Paton went into the private practice of cardiovascular surgery for the next 16 years and finally retired in 1995 as Emeritus Clinical Professor of Surgery.

His outside interests of climbing, bird-watching, painting, and photography began when he was a boy in Scotland and have continued ever since. These interests got him involved in the Colorado Outward Bound School, where he served as Chairman of the Board, and in the Denver Audubon Society, and the Wilderness Medical Society, where he was President of both organizations.

Dr. Paton has an extensive medical bibliography of 200 papers and contributions to 15 books. Apart from writing about heart surgery, he has done research and written about frostbite and hypothermia, two topics very pertinent to the Lewis and Clark expedition.

He has traveled in every continent of the world, and, except in Antarctica, he has usually hiked, climbed, and slept in tents rather than visited the capital cities and comfortable hotels. He was the doctor lecturer and leader on six trips for Mountain Travel to Africa, Chile, Alaska, the Alps, and Nepal. His fascination with expeditions and history got him interested in Lewis and Clark. His book, *Lewis and Clark: Doctors in the Wilderness*, was published in 2001 and has received complimentary reviews as a highly readable account of the medical problems encountered by the expedition and how they might be handled now. The book covers the medical preparations for the expedition, the state of medicine in 1800, and discusses such controversial subjects as the death of Sgt. Floyd, the illness of Sacagawea, and Lewis' gunshot wound.

2012 President

Peter J. Mandell, MD

Burlingame, California

WOA Past Presidents

1933	James T. Watkins, MD	San Francisco, CA
1934	Steele F. Stewart, MD	Honolulu, HI
1935	Lionel D. Prince, MD	San Francisco, CA
1936	Charles L. Lowman, MD	Los Angeles, CA
1937	Roger Anderson, MD	Seattle, WA
1938	Sylvan L. Haas, MD	San Francisco, CA
1939	John Dunlop, MD	Pasadena, CA
1940	Ernest W. Cleary, MD	San Mateo, CA
1941	Maynard C. Harding, MD	San Diego, CA
1942	Donald M. Meekison, MD	Vancouver, B.C.
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WOA Business Meetings

Western Orthopaedic Association

Grand Ballroom II
The Hilton Portland
Portland, Oregon

Thursday, June 14, 2012
7:00am–7:15am

First Business Meeting

Peter J. Mandell, MD, President, Presiding

AGENDA

I. Call to Order

II. Report of the President, Peter J. Mandell, MD

III. Report of the Secretary, Kim L. Furry, MD

IV. Report of the Treasurer/Historian, Jeffrey M. Nakano, MD
(Includes list of Deceased Members)

V. Report of the Membership Committee, Paul C. Collins, MD
(Includes list of New Members)

VI. Report of the 2012 Nominating Committee and Proposed Slate of Officers for 2012- 2013, Theodore L. Stringer, MD

VII. Election of the 2012-2013 Nominating Committee

Nominating Committee. The Nominating Committee shall be composed of seven (7) members. It shall consist of the outgoing members and Immediate Past-President of the Board of Directors and remaining members elected from the floor at the First Business Session of the Annual Meeting. Each nominee shall be present at the meeting. Members of the Association who serve on the Nominating Committee are ineligible for re-election to the Committee in the succeeding year.

2013 Committee - Ineligibles

- Theodore L. Stringer, MD
- James P. Duffey, MD
- Blair C. Filler, MD
- Richard J. Haynes, MD
- Brian A. Jewett, MD
- Linda J. Rasmussen, MD
- Marc J. Rosen, MD

2013 Committee

- Peter J. Mandell, MD - Chair
- Kim L. Furry, MD
- David D. Teuscher, MD
- Steven J. Morgan, MD
- 1. Nominee
- 2. Nominee
- 3. Nominee

VIII. Old Business

IX. New Business

X. Announcements

XI. Adjournment

Minutes of the 2011 First Business Meeting of the Western Orthopaedic Association

Sheraton Waikiki, Honolulu, Hawaii
Thursday, July 28, 2011

Theodore L. Stringer, MD, President, presiding

Call to Order and Report of the President

Dr. Stringer called the meeting to order at 6:16am. He welcomed the membership to the meeting and encouraged them to visit the sponsors. He expressed his appreciation to the Program Chairs, Drs. Dohm and Duffey and the Program Committee for developing an outstanding program and highlighted several of the activities to take place throughout the week.

Report of the Secretary

Dr. Furry reported that the Board of Directors is comprised of 17 physicians from several states throughout the western United States. She informed the membership that the Board met two times this year and held several conference calls. Minutes from all of these meetings are available upon request. She requested approval of the Minutes for the 2010 First and Second Business Meetings as distributed in the Meeting Program.

ACTION — It was moved and seconded that the Minutes for the 2010 First and Second Business Meetings be approved. The motion carried.

Report of the Treasurer/Historian

Dr. Lewis reported that financially, the WOA is in a very strong position. A slide presentation on the Statement of Financial Position accompanied this report. She stated that WOA will focus on growing membership in the coming year and that everyone is encouraged to recruit five new members for WOA. There was a moment of silence to honor those who have passed in 2011.

Report of the Membership Committee

Dr. Stringer reported on member statistics for WOA. He stated that membership is down this year and an emphasis will be made to grow membership. A slide of new members was presented.

Report of the 2011 Nominating Committee

Dr. McMaster thanked the 2011 Nominating Committee for their efforts and presented the proposed slate of Officers for 2011-2012.

President	Peter J. Mandell, MD
First Vice-President	Ellen M. Raney, MD
Second Vice-President	Valerae O. Lewis, MD
Secretary	Kim L. Furry, MD
Secretary-Elect	David D. Teuscher, MD
Treasurer	Jeffery M. Nakano, MD
Members at Large	William J. Maloney III, MD
	Richard Barry, MD
Junior Board Members:	Nitin Bhatia, MD
	Lisa A. Taitsman, MD
Membership Committee:	Michael Klassen, MD

Dr. McMaster asked if there were any nominations from the floor.

ACTION — It was moved and seconded that the nominations be closed. The motion carried.

Dr. McMaster stated that four members needed to be elected to the 2012 Nominating Committee. He reported the following members are designated to serve on the Committee:

Theodore L. Stringer, MD, Chair
Marc J. Rosen, MD
Brian Jewett, MD

There were five members nominated from the floor to serve on the 2012 Nominating Committee. A vote by ballot was held and the elected Committee members will be announced at the Second Business Meeting on Saturday.

Dr. Blair Filler from California
Dr. Linda Rasmussen from Hawaii
Dr. Cindy Kelly from Colorado
Dr. Dick Haynes from Arizona
Dr. Jim Duffey from Colorado

Announcements

Dr. Stringer encouraged everyone to attend the Welcome Reception this evening and to enjoy the meeting.

There being no other business to discuss, Dr. Stringer adjourned the meeting at 6:25am.

Western Orthopaedic Association

Grand Ballroom II
The Hilton Portland
Portland, Oregon

Saturday, June 16, 2012
7:00am–7:15am

Second Business Meeting

Peter J. Mandell, MD, President, Presiding

AGENDA

I. Call to Order
II. Presentation of the Proposed Slate of Officers for 2012-2013, Theodore L. Stringer, MD
III. Election of Officers, Peter J. Mandell, MD
IV. Old Business
V. New Business
VI. Announcements
VII. Installation of Ellen M. Raney, MD, 2012-2013 by President, Peter J. Mandell, MD
VIII. Adjournment

Minutes of the 2011 Second Business Meeting of the Western Orthopaedic Association

Sheraton Waikiki
Honolulu, Hawaii
July 30, 2011

Theodore L. Stringer, MD, President, presiding

Dr. Stringer called the meeting to order at 6:17am.

Dr. McMaster presented the proposed Slate of Officers for 2011-2012:

President	Peter J. Mandell, MD
First Vice-President	Ellen M. Raney, MD
Second Vice-President	Valerae O. Lewis, MD
Secretary	Kim L. Furry, MD
Secretary-Elect	David D. Teuscher, MD
Treasurer	Jeffery M. Nakano, MD
Members at Large	William J. Maloney, MD
	Richard Barry, MD
Junior Board Members:	Nitin N. Bhatia, MD
	Lisa A. Taitsman, MD
Membership Committee:	Michael Klassen, MD

Dr. Stringer called for a vote.

ACTION — It was moved and seconded to approve the slate for 2011-2012 as presented. The motion carried.

Dr. McMaster reported that the Nominating Committee for 2012 would include the following individuals:

Theodore L. Stringer, MD
Marc J. Rosen, MD
Brian Jewett, MD
James Duffey, MD
Dick Haynes, MD
Linda Rasmussen, MD
Blair Filler, MD

Dr. Stringer installed Peter J. Mandell as the 2011-2012 WOA President. He presented him with the President's Medal and wished him well for the coming year. Dr. Mandell thanked Dr. Stringer for his leadership and guidance during the past year and presented him with a WOA Past President's lapel pin.

With no new business to be addressed, the meeting adjourned at 6:24am.

Western Orthopaedic Association

Scientific Program

June 14-16, 2012

The Hilton Portland
Portland, Oregon

Please be considerate and silence your cell phones during the Scientific Program.

2012 Program Chairman

Brian A. Jewett, MD

Eugene, Oregon

WOA Past Program Chairs

1940	Wilbur C. Cox, MD	San Francisco, CA
1941	Harold E. Crowe, MD	Los Angeles, CA
1942	Delbert Hand, MD	San Francisco, CA
1943	UNKNOWN	
1944 – 1946	INACTIVE: WORLD WAR II	
1947	Alfred E. Gallant, MD	Los Angeles, CA
1948	Keene O. Haldeman, MD	San Francisco, CA
1949	Vernon P. Thompson, MD	Los Angeles, CA
1950	Eldon G. Chuinard, MD	Portland, OR
1951	Leonard Barnard, MD	Oakland, CA
1952	J. Vernon Luck, MD	Los Angeles, CA
1953	Ernest M. Burgess, MD	Seattle, WA
1954	Francis J. Cox, MD	San Francisco, CA
1955	Ivar J. Larsen, MD	Honolulu, CA
1956	John R. Schwartzmann, MD	Tucson, AZ
1957	Howard A. Mendelsohn, MD	Beverly Hills, CA
1958	Donald E. Moore, MD	Portland, OR
1959	Harry C. Hughes, MD	Denver, CO
1960	R. G. Lambert, MD	San Diego, CA
1961	Robert A. Murray, MD	Temple, TX
1962	Verne T. Inman, MD	San Francisco, CA
1963	Ernest M. Burgess, MD	Seattle, WA
1964	Homer C. Pheasant, MD	Los Angeles, CA
1965	Paul A. Pemberton, MD	Salt Lake City, UT
1966	Thomas H. Taber Jr., MD	Phoenix, AZ
1967	Lawrence H. Gordon, MD	Honolulu, HI
1968	John J. Niebauer, MD	San Francisco, CA
1969	William H. Keener, MD	Denver, CO
1970	Rodney K. Beals, MD	Denver, CO
1971	Leon L. Wiltse, MD	Long Beach, CA
1972	Michael M. Donovan, MD	Houston, TX
1973	Philip H. Dickinson, MD	San Diego, CA
1974	Donald A. Jones, MD	Honolulu, HI
1975	Taylor K. Smith, MD	Oakland, CA
1976	C. Harold Willingham, MD	Tucson, AZ
1977	William E. Gamble, MD	Denver, CO
1978	St. Elmo Newton III, MD	Seattle, WA
1979	Marvin H. Meyers, MD	Los Angeles, CA
1980	Donald A. Jones, MD	Honolulu, HI
1981	John A. Neufeld, MD	Portland, OR
1982	Robert S. Turner, MD	Albuquerque, NM
1983	Harold K. Dunn, MD	Salt Lake City, UT
1984	William C. McDade, MD	San Diego, CA
1985	John A. Murray, MD	Houston, TX
1986	W. Dilworth Cannon Jr., MD	San Francisco, CA
1987	Jerome D. Wiedel, MD	Denver, CO
1988	Thomas B. Grollman, MD	Honolulu, HI
1989	William C. McMaster, MD	Orange, CA
1990	James D. Heckman, MD	San Antonio, TX
1991	Lawrence R. Housman, MD	Tucson, AZ
1992	Daniel R. Benson, MD	Sacramento, CA
1993	Charles A. Peterson, MD	Seattle, WA
1994	Saul M. Bernstein, MD	Van Nuys, CA
1995	Thomas A. DeCoster, MD	Albuquerque, NM
1996	Morris Mitsunaga, MD	Honolulu, HI
1997	Paul C. Collins, MD	Boise, ID
1998	Robert Hunter, MD	Aspen, CO
1999	Richard Coutts, MD	San Diego, CA
2000	Christopher Beauchamp, MD	Scottsdale, AZ
2001	William A. McGann, MD	San Francisco, CA
2002	Gerard L. Glancy, MD	Denver, CO
2003	Linda J. Rasmussen, MD	Honolulu, HI
2004	Thomas Schmalzried, MD	Los Angeles, CA
2005	Robert R. Slater Jr., MD	Roseville, CA
2006	James B. Benjamin, MD	Tucson, AZ
2007	Jeffrey M. Nakano, MD	Grand Junction, CO
2008	Valerae O. Lewis, MD	Houston, TX
2009	Stuart K. Wakatsuki, MD	Kailua, HI
2010	Nitin N. Bhatia, MD, FACS	Orange, CA
2011	Michael P. Dohm, MD	Grand Junction, CO
	James P. Duffey, MD	Colorado Springs, CO

2012 Program Chairman

Brian A. Jewett, MD
Eugene, Oregon

Brian A. Jewett, MD practices orthopeadics at the Slocum Center in Eugene, Oregon. Dr. Jewett received his undergraduate education at Stanford University, and attended medical school at Vanderbilt University in Tennessee. He developed an interest in joint replacement under the guidance of Dr. Michael Christie while completing his residency at Vanderbilt and furthered his training in joint reconstruction during his fellowship at the Anderson Orthopedic Institute in Virginia. Guided by the passion and skill of Drs. Charles and Gerald Engh, he developed an interest in complex hip and knee reconstruction. He now enjoys a practice in complex hip and knee reconstruction at Slocum Orthopedics and is the Director of the Joint Replacement Center at Sacred Heart Medical Center in Eugene.

Dr. Jewett has served the WOA as a junior board member for 4 years. He is an active member of American Association of Hip and Knee Surgeons and the Association of Bone and Joint Surgeons.

2012 Presidential Guest Speaker

Kevin J. Bozic, MD, MBA

San Francisco, California

WOA Past Guest Speakers

1954	Jack W. Wickstrom, MD	New Orleans, LA
1955	Paul R. Lipscomb, MD	Davis, CA
1956	Carroll B. Larson, MD	Iowa City, IA
1957	John Saunders, MD	San Francisco, CA
	Rutherford S. Gilfillan, MD	San Francisco, CA
1961	George Eggers, MD	Galveston, TX
1964	D. L. Griffiths, FRCS	Manchester, England
1965	Don H. O'Donoghue, MD	Oklahoma City, OK
1966	George J. Garceau, MD	Indianapolis, IN
1967	H. Relton McCarroll, MD	St. Louis, MO
1968	William T. Green, MD	Boston, MA
1969	Leonard F. Peltier, MD	Tuscon, AZ
1970	James W. Harkess, MD	Louisville, KY
1971	Peter F. Williams, FRCS	Parkville, Australia
	O. Ross Nicholson, FRCS, FRACS	Auckland, New Zealand
1972	James A. Nicholas, MD	New York, NY
	Joseph A. Boyes, MD	Los Angeles, CA
1973	Lowell Peterson, MD	Rochester, MN
	Charles J. Sedgewick, DVM	San Diego, CA
1974	Gerald S. Laros, MD	Chicago, IL
1975	J. William Fielding, MD	New York, NY
1976	W. Robert Harris, MD	Toronto, Canada
1977	Federico Labbe, MD	Guatemala City, Guatemala
	Thomas E. Whitesides Jr., MD	Atlanta, GA
1978	Edward H. Simmons, MD	Toronto, Canada
1979	Ejnar Eriksson, MD	Stockholm, Sweden
1980	Ralph B. Cloward, MD	Honolulu, HI
	Cheng Hsu-His, MD	Beijing, China
1981	Wayne O. Southwick, MD	New Haven, CT
	Stanley W. Jacob, MD	Portland, OR
1982	Henry J. Mankin, MD	Boston, MA
	Richard J. Smith, MD	Boston, MA
1983	M. Freeman, MD, FRCS	London, England
	Stephen C. Jacobsen, PhD	Salt Lake City, UT
1984	Henry W. Apfelbach, MD	Lake Forest, IL
	William H. Harris, MD	Boston, MA
1985	C. McCollister Evarts, MD	Rochester, NY
	Harlan J. Spjut, MD	Houston, TX
1986	William R. Murray, MD	San Francisco, CA
	Clement B. Sledge, MD	Boston, MA
1987	Rocco A. Calandruccio, MD	Memphis, TN
	Maj. Gen. Maurice C. Padden, USAF	Colorado Springs, CO
1988	Quinn H. Becker, MD	Thurmont, MD
	Wu Shou-Yi, MD	Shanghai, Peoples Republic of China
1989	David L. Hamblen, PhD, FRCS	Glasgow, Scotland
	Hon. Justice Burton B. Roberts	Bronx, NY
1990	Benjamin E. Bierbaum, MD	Boston, MA
	Thomas Taylor, FRCS	Sydney, Australia
1991	Professor René K. Marti	Amsterdam, The Netherlands
1992	Ian D. Learmonth, FRCS	Cape Town, South Africa
1993	Christian Gerber, MD	Fribourg, Switzerland
1994	Ian G. Kelly, BSc, MD, FRCS	Glasgow, Scotland
1995	O. Ross Nicholson, FRCS	Auckland, New Zealand
1996	John Leong	Hong Kong, China
	M. Mark Hoffer, MD	Los Angeles, CA
1997	Anthony Pohl	Adelaide, Australia
	Harold K. Dunn, MD	Salt Lake City, UT
1998	Lars Engebretsen, MD	Oslo, Norway
1999	Donald Howie, MBBS	Adelaide, Australia
2000	Lennart Hovelius, MD	Gavle, Sweden
2001	Chitranjan S. Ranawat, MD	New York, NY
2002	Klaus Parsch, MD	Stuttgart, Germany
2003	Charles A. Rockwood Jr., MD	San Antonio, TX
2004	Joseph A. Buckwalter, MD	Iowa City, IA
2005	Robert H. Cofield, MD	Rochester, MN
2006	Marvin Tile, MD, BSc (Med), FRCS(C)	Toronto, Canada
2007	Robert E. Eilert, MD	Denver, CO
2008	Douglas W. Jackson, MD	Long Beach, CA
2009	Frederick A. Matsen III, MD	Seattle, WA
2010	James D. Heckman, MD	Needham, MA
2011	G. Paul DeRose, MD	Durham, NC

2012 Presidential Guest Speaker

Kevin J. Bozic, MD, MBA

It is a great pleasure for WOA to have Dr. Kevin J. Bozic as the Presidential Guest Speaker for the 2012 Annual Meeting. An orthopedic surgeon who specializes in complex hip and knee replacement with an emphasis on minimally invasive techniques, Dr. Bozic has extensive experience in all aspects of joint replacement and arthritis management. In research, his interests are in health care policy, health care technology assessment, cost-effectiveness analysis, and the impact of care delivery reform on cost and quality.

Dr. Bozic is a graduate of the University of California, San Francisco School of Medicine and the Harvard combined orthopedic residency program. He completed a fellowship in musculoskeletal traumatology at Massachusetts General Hospital, an affiliate of Harvard Medical School, as well as training in adult reconstructive surgery at Rush Medical College in Chicago. In addition, he earned a master's degree in business administration at Harvard Business School. He is the newly appointed Chair of the American Academy of Orthopaedic Surgeons' Council on Research and Quality and has been involved in numerous regional and national health policy initiatives, including the Medicare Evidence Development and Coverage Analysis Committee.

2012 WOA Award Winners

2012 WOA Resident/Fellow Award Recipients

Congratulations to the following 2012 WOA Resident/Fellow Award Recipients. The award papers will be presented during the Scientific Program on Thursday 11:35am–12:44pm.

Adam Bevevino, MD
Incidence and Morbidity of Concomitant Spine Fractures in Combat Related Amputees
12:29pm–12:37pm

Tom Chao, MD
Blockade of Matrix Metalloproteinase-3 After Traumatic Nerve Injury Offers a Novel Treatment for Improving Functional Recovery
11:35am–11:43am

Daniel G. Kang, MD
The Effect of Pedicle Screw Hubbing on Pullout Strength in the Thoracic Spine
12:11pm–12:19pm

Kevin D. Martin, DO
Arthroscopic Basic Task Performance in Shoulder Simulator Model Correlates with Clinical Shoulder Arthroscopy Experience
11:44am–11:52am

Jared A. Niska, MD
Daptomycin and Tigecycline Have a Broader Effective Dose Range than Vancomycinas Prophylaxis Against a Surgical Implant *Staphylococcus Aureus* Infection
11:53am–12:01pm

Joel C. Williams, MD
A Biomechanical Comparison of Plate Fixation and Calcium Phosphate Cement for Distal Femoral Metaphyseal Defects
12:02pm–12:10pm

Rosanna Wustrack, MD
Change in Physical Activity One Year after Lumbar Decompression With or Without Fusion — Is it Correlated to Self-Reported Outcome Scores?
12:20pm–12:28pm

2012 Young Investigator Award Recipients

WOA has added three new awards this year for Young Investigators. Congratulations to the following 2012 WOA Young Investigator Award Recipients. The award papers will be presented during the Scientific Program on Friday, 8:30am–9:00pm.

Ivan Cheng, MD
Functional Assessment of Acute Local Versus Distal Transplantation of Human Neural Stem Cells Following Spinal Cord Injury
8:30am–8:38am

Brian Feeley, MD
Evaluation of Akt/mTOR Activity in Muscle Atrophy and Fatty Infiltration After Rotator Cuff Tears in a Rat Model
8:48am–8:56am

Kenneth J. Hunt, MD
Surgical Treatment of Insertional Achilles Tendinopathy With or Without Flexor Hallucis Longus Tendon Transfer: A Prospective, Randomized, Controlled Trial
8:39am–8:47am

The Lloyd Taylor, Vernon Thompson, Harold and Nancy Willingham, Sanford and Darlene Anzel, and Resident Award Winners will be announced Friday evening.

Financial Disclosure Information

Western Orthopaedic Association has identified the options to disclose as follows.

The following participants have disclosed whether they or a member of their immediate family:

1. Receive royalties for any pharmaceutical, biomaterial, or orthopaedic product or device;
2. Within the past twelve months, served on a speakers' bureau or have been paid an honorarium to present by any pharmaceutical, biomaterial, or orthopaedic product or device company;

3a. Paid Employee for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;

3b. Paid Consultant for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;

3c. Unpaid Consultant for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;

4. Own stock or stock options in any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier (excluding mutual funds);
5. Receive research or institutional support as a principal investigator from any pharmaceutical, biomaterial, orthopaedic device and equipment company, or supplier;
6. Receive any other financial/material support from any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier.
7. Receive any royalties, financial/material support from any medical and/or orthopaedic publishers;
8. Serve on the editorial or governing board of any medical and/or orthopaedic publication;
9. Serve on any Board of Directors, as an owner, or as an officer on a relevant committee of any health care organization (e.g., hospital, surgery center, medical);

n. No conflicts to disclose.

The Academy does not view the existence of these disclosed interests or commitments as necessarily implying bias or decreasing the value of the author's participation in the meeting.

Geoffrey D. Abrams *(4. Merck, Pfizer, Amgen, Johnson & Johnson)*
Bryce Allen, MD *(n.)*
Derek F. Amanatullah, MD, PhD *(4. Stryker, Merck; 5. AO-North America, Synthes, TriMed; 7. Medscape)*
Matthew Anderson, MS *(n.)*
Robert B. Anderson, MD *(1. Medscape; 3b. Arthrex, Wright Medical, DJO; 5. Arthrex)*
Amarpal S. Arora, MD *(5. Arthrex; 6. Arthrex)*
Robert T. Arrigo *(n.)*
Brigham K. Au, MD *(n.)*
David J. Bailey, MS-3 *(n.)*
Navpreet K. Bains *(n.)*
Glen O. Baird, MD *(n.)*
Rahul Banerjee, MD *(8. American Academy of Orthopaedic Surgeons)*
Justin H. Barad, MD *(n.)*
David P. Barei, MD, FRCS(C) *(3b. Synthes, Zimmer)*
Anthony W. Behn, MS *(n.)*

Nicole M. K. Behnke, MD *(n.)*
Michael Bellino, MD *(n.)*
Philip J. Belmont Jr., MD *(7. SLACK, Inc.)*
Michael J. Beltran, MD *(n.)*
Stephen K. Benirschke, MD *(n.)*
Nicholas M. Bernthal, MD *(n.)*
Sigurd Berven, MD *(1. Medtronic; 2. Medtronic Sofamor Danek, Inc., Alphatec Spine, Biomet, DePuy, Osteotech, Stryker; 3b. Alphatec Spine, Biomet, DePuy, Medtronic Sofamor Danek, Inc.; 4. Baxano, Simpirica, Providence Medical, Axis, AccuLif; 5. OREF, AO Foundation, Medtronic Sofamor Danek, Inc.; 8. Journal of Bone and Joint Surgery – American, Orthopedics Today, Spine; 9. Bone and Joint Decade, U.S.A., North American Spine Society, Scoliosis Research Society)*
Adam Bevevino, MD *(n.)*
Nitin N. Bhatia, MD, FACS ***(1. Alphatec, Seaspine, Biomet; 2. Alphatec, Biomet, Seaspine, Zimmer, Integra; 3b. Alphatec, Biomet, Seaspine, Zimmer, Integra; 3c. DiFusion)***
Fabrizio Billi *(n.)*

Disclosures in bold indicate members of the WOA Program Committee and/or contributing staff.

Julius A. Bishop, MD *(2. Synthes; 5. Zimmer; 8. Journal of Orthopaedic Trauma, Journal of Shoulder and Elbow Surgery, Journal of Hand and Microsurgery)*
Hisham A. Bismar, DO *(n.)*
Bernd Bittersohl *(n.)*
Kathy Blanke *(n.)*
Benjamin Bluth, MD *(n.)*
James D. Bomar *(n.)*
Joseph Borrelli Jr., MD *(3b. RTI Biologics; 7. Elsevier — Injury, Springer)*
Kevin J. Bozic, MD, MBA *(9. AAOS, Agency for Healthcare Research and Quality (AHRQ), American Association of Hip and Knee Surgeons, American Joint Replacement Registry, American Orthopaedic Association, California Joint Replacement Registry Project, California Orthopaedic Association, Orthopaedic Research and Education Foundation)*
Grant Branam, BS *(n.)*
Kindyle Brennan *(n.)*
Michael L. Brennan, MD *(n.)*
Michael R. Briseño, MD *(n.)*
Chad Brockardt, MD *(n.)*
Dawson Brown, MD *(n.)*
Drew J. Brown IV, MD *(n.)*
Knute C. Buehler, MD *(2. Stryker, Medical Compression Systems; 3b. Stryker, Medical Compression Systems; 4. Stryker; 5. Stryker, Medical Compression Systems; 7. Stryker; 9. St. Charles Health System, Cascade Surgery Center)*
Susan V. Bukata, MD *(2. Amgen, Eli Lilly, Novartis; 3b. Amgen, Eli Lilly, Merck)*
Gregory M. Buncke, MD *(n.)*
Rudolf Buntic, MD *(4. Fluorostat; 8. Microsurgery; 9. Fluorostat)*
Shane Burch, MD *(n.)*
Raoul J. Burchette, MA, MS *(3b. Jaleva, Inc.)*
Robert L. Burkhart, PA *(n.)*
Benjamin T. Busfield, MD *(n.)*
Kenneth P. Butters, MD *(n.)*
Vincent J. Caiozzo *(n.)*
Kenneth L. Cameron, PhD *(3b. Musculoskeletal Transplant Foundation)*
Christopher P. Cannon, MD *(3b. Acumed)*
Clayton J. Carnahan, PA *(n.)*
Eugene J. Carragee, MD *(5. AOSpine, OREF; 8. European Spine Journal, Spine, The Spine Journal, The Journal of Spine Disorders, Journal of Orthopaedic Surgery)*
Alexandra Carrer *(n.)*
Paul M. Caskey, MD *(n.)*
Tiffany N. Castillo, MD *(n.)*
Tom Chao, MD *(n.)*
Lance W. Chapman, BS, MS III *(n.)*
Christopher T. Chen, PhD *(n.)*
Ivan Cheng, MD *(1. Nuvasive; 2. Stryker Spine, Nuvasive; 3a. Stryker Spine; 3b. Stryker Spine; 4. Nuvasive; 8. Spine, The Spine Journal)*
James Chesnutt, MD *(5. Histogenics Corp.)*
Emilie Cheung, MD *(3b. Exactech)*
Alexander C. Ching, MD *(3b. DePuy, Atlas Spine)*
Blaine A. Christiansen, PhD *(n.)*
Randy Clark, MD *(n.)*

Bruce E. Cohen, MD *(1. Wright Medical Technology, Arthrex, DJ Ortho; 2. Wright Medical, Anthrax; 3b. Wright Medical, Arthrex, RTI; 5. Arthrex; 7. Lippincott; 8. Techniques in Foot and Ankle Surgery; 9. AOFAS)*
Cory Collinge, MD *(1. Biomet, Smith & Nephew, Synthes, Advanced Orthopedic Systems; 3b. Biomet, Smith & Nephew; 8. J Orthopedic Trauma*
Garet Comer, MD *(n.)*
Jon R. Cook, PT, DPT *(n.)*
Ian Corcoran-Schwartz, BS *(n.)*
Alejandro Cortes *(n.)*
John Costouros, MD *(2b. Zimmer, Arthrex, Tornier)*
Michael J. Coughlin, MD *(1. Integra, Tornier, Stryker; 2. Integra, Tornier, Arthrex; 3b. Stryker, Integra, Arthrex, Tornier; 4. Tornier; 7. Elsevier)*
Dennis C. Crawford, MD, PhD *(3b. Histogencis Corp.; 4. Histogencis Corp.; 5. Histogenics Corp., Community Tissue Services)*
William W. Cross III, MD *(1. Synthes/AONA 3b. Innovative Medical Device Solutions, Inc.)*
Shane Curtiss, AS *(n.)*
W. Hodges Davis, MD *(1. Wright Medical, DJO, Arthrex; 2. Wright Medical, DJO; 3b. Wright Medical, Arthrex; 5. Biomimetic, Wright Medical, Arthrex; 7. Lippencott)*
Thomas M. DeBerardino, MD *(5. Histogenics Corp.)*
Amalia de Comas, MD *(n.)*
Alex DeHaan, MD *(n.)*
Vedat Deviren *(3b. NuVasive, Medtronic, Stryker, Guidepoint)*
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MISSION

The Western Orthopaedic Association (WOA) is a physician organization composed of orthopaedic surgeons in practice in the western region of the United States. Its mission is to help ensure that people in the western region of the United States receive high quality ethical care by providing orthopaedists with educational programs, opportunities to foster collegiality and ways to influence health policy.

PURPOSE

Exchange of scientific information is vital to continuing professional development; therefore the Program Committee of the WOA has selected multiple research papers and invited nationally respected speakers to present practice-related techniques and findings in orthopaedic surgery that cover a variety of topics in all orthopaedic specially areas.

WOA OBJECTIVES

Educational objectives in Basic Science, Pediatrics, Total Joint Arthroplasty, Foot and Ankle, Spine, Trauma, Infection, Sports Medicine, Tumors, and Upper Extremity areas will be addressed through a combination of general scientific sessions and symposia offering discussions, guest lectures and paper presentations. After reviewing the needs assessment and the 2011 program critique, the program committee of the WOA has created a program for 2012 that will afford orthopaedic physicians the opportunity to:

- Recognize, accurately diagnose, and treat athletic related concussion syndrome and understand current treatment guidelines and return to play applications;
- Understand the risk factors for high risk stress fractures and discuss timely diagnosis techniques and treatment algorithms for stress fractures;
- Obtain knowledge about the appropriate utilization of plasma-rich protein injections in the treatment of acute and chronic conditions of the musculoskeletal system;
- Discuss the current treatment of ankle arthritis and the indications for ankle fusion and ankle replacement;
- Recognize ankle tendon pathology and increase awareness of current diagnostics and treatments available for these common ankle maladies;
- Review the current best practice treatment for ligament and boney injuries around the elbow in both the adult and pediatric populations;
- Discuss the outcomes of elbow replacement and review the appropriate indications for current elbow replacement devices;
- Discuss the current trends in orthopaedic oncology and understand the current diagnosis and treatment protocols for metastatic diseases affecting the skeletal system;
- Review the current treatment for osteoporotic fractures of the distal radius, shoulder, spine and hip;
- Increase the diagnostic awareness and treatment potential of the orthopaedic surgeon in the medical management of osteoporosis in elderly patients;
- Discuss the current trends in managing orthopaedic infections in total joint replacement patients;
- Review the current problems in total implant wear debris and how they affect patients and how to both avoid these problems and accurately diagnose and treat patients who are having problems with wear debris;
- Review practice management topics related to outcomes research, hospital and physician partnerships, and developing healthcare reform concepts such as ACOs and CCOs;
- Discuss the role of the orthopaedic surgeon in the diagnosis and treatment of metastatic disease to the skeleton;
- Describe and utilize appropriate treatments for orthopaedic maladies affecting the pediatric population;
- Exchange ideas between the presenters, the faculty, and the participants through paper presentations, instructional courses, guest lectureships, symposia, multimedia educational sessions and poster exhibits.

SCIENTIFIC POSTER PRESENTATIONS

Scientific Posters are an important feature of the WOA Annual Meeting. Posters will be on display along with their presenters each day of the Scientific Program. Poster Presenters will also be available to answer questions before and after the Scientific Program on Thursday, Friday, and Saturday, June 14-16. Please plan to visit the Scientific Posters.

MULTIMEDIA EDUCATION

Multimedia education materials will be offered on Thursday, Friday, and Saturday, June 14-16. A comprehensive selection of AAOS DVDs will be available for your individual education.

CME ACCREDITATION

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons and the Western Orthopaedic Association.

The American Academy of Orthopaedic Surgeons is accredited by the ACCME to sponsor continuing medical education for physicians.

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 28.75 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

* 22.25 CME credits for Scientific Program
* 3.5 CME credits for Multimedia Education Sessions
* 3 CME credits for Scientific Poster Sessions

To ensure correct CME credit is awarded, please complete the form in the back of this program, indicating the Sessions you attended or go online to www.woa-assn.org to complete the WOA 2012 Annual Meeting CME Credit Records. CME Certificates will be awarded to all registered participants.

CEC CREDIT

Physicians Assistants can receive up to 28.75 credit hours toward Continuing Education Credits. AAPA accepts American Medical Association Category I, Level 1 CME credit for the Physician's Recognition Award from organizations accredited by the ACCME.

CME NOTE

To receive CME credit, you are required to turn in your completed CME Record Form at the end of your participation in the Sessions; otherwise your CME credits cannot be certified. **(CME Credit Record, Needs Assessment, and Course Evaluation Forms are in the back of this program.)**

Attendees are requested to complete a course evaluation for use in developing future WOA Annual Meeting Scientific Programs and to meet the unique educational requirements of orthopaedic surgeons.

This program design is based on participants' responses from the last Annual Meeting and expressed educational goals of the WOA. This program is designed specifically for the educational needs of the practicing orthopaedist. Others in the medical profession (such as Physician Assistants) or with an interest in orthopaedics will benefit from the program.

DISCLAIMER

The material presented at the WOA Annual Meeting has been made available by the Western Orthopaedic Association for educational purposes only. This material is not intended to represent the only, nor necessarily best, method or procedure appropriate for the medical situations discussed, but rather is intended to present an approach, view, statement, or opinion of the faculty which may be helpful to others who face similar situations.

The WOA disclaims any and all liability for injury or other damages resulting to any individuals attending a session for all claims, which may arise out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by a physician or any other person.

No reproductions of any kind may be made of the presentations at the WOA Annual Meeting. The WOA reserves all of its rights to such material, and commercial reproduction is specifically prohibited.

FDA STATEMENT

Some pharmaceuticals or medical devices demonstrated at the WOA Annual Meeting have not been cleared by the FDA or have been cleared by the FDA for specific purposes only. The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of the pharmaceutical or medical device he or she wishes to use in clinical practice.

Academy policy provides that "off label" uses of a pharmaceutical or medical device may be described in the Academy's CME activities so long as the "off label" use of the pharmaceutical or medical device is also specifically disclosed (*i.e.*, it must be disclosed that the FDA has not cleared the pharmaceutical or device for the described purpose). Any pharmaceutical or medical device is being used "off label" if the described use is not set forth on the product's approval label.

2012 Scientific Program

Thursday, June 14, 2012

(Presenters and times are subject to change)
Disclosure Information listed on pages 33-37.

6:00am–7:00am **Poster Session** (Poster Presenters Available)
(Galleria II & III)

General Session I — Clinical Case Presentation Review *(Grand Ballroom II)*

Moderator: Brian A. Jewett, MD

6:00am–7:00am Sports Medicine — Return to Play
Michael C. Koester, MD, Slocum Center, Eugene, OR
Rudolf G. Hoellrich, MD, Slocum Center, Eugene, OR
Stanley L. James, MD, Slocum Center, Eugene, OR

7:00am–7:15am **First Business Meeting**

7:15am–7:20am **Welcome**
Peter J. Mandell, MD, President WOA
Brian A. Jewett, MD, Program Chair

Symposium I — Care of the Athlete *(Grand Ballroom II)*

Moderator: Rudolf G. Hoellrich MD

7:20am–7:38am Plasma Rich Platelet Injections — Use and Abuse
Alan M. Hirahara, MD, FRCSC, Sutter Medical Center, Sacramento, CA

7:38am–7:56am High Risk Stress Fractures
Stanley L. James, MD, Slocum Center, Eugene,OR

7:57am–8:15am Concussions
Michael C. Koester, MD, Slocum Center, Eugene, OR

8:15am–8:20am Questions/Discussion

8:20am–8:40am ***Break — Please visit exhibitors***

Concurrent General Session II — Tumor & Basic Science *(Grand Ballroom II)*

Moderator: Amalia de Comas, MD

8:40am–8:46am Total Humeral Endoprosthetic Replacement Following Excision of Malignant Bone Tumors
Suhel Kotwal, MD, MD Anderson Cancer Center, Houston, TX

8:47am–8:53am Distal Femoral Allograft Composite Reconstruction for Short Proximal Femur Segments Following Sarcoma Resection
Bryan S. Moon, MD, MD Anderson Cancer Center, HoustonTX

8:54am–9:00am Properties of Distal Femoral Defects with a Cortical Breach
Derek F. Amanatullah, MD, PhD,UC Davis Medical Center, Sacramento, CA
**Presented by Joel C. Williams, MD*

Concurrent General Session III — Sports Medicine *(Parlors A, B, & C)*

Moderator: Rudolf G. Hoellrich, MD

8:40am–8:46am The Effect of Graft Tissue on ACL Outcomes: A Multi-Center Prospective Randomized Control Trial Comparing Autograft Hamstrings to Fresh Frozen Anterior Tibialis Allograft
Steven M. Traina, MD, Western Orthopaedics, PC, Denver, CO

8:47am–8:53am Subacromial Pain Pump and Chondrolysis with Minimum 2-Year Follow-Up After Arthroscopic
Benjamin T. Busfield, MD, Kerlan Jobe Orthopedic Clinic, Los Angeles, CA

(Location listed by an author's name indicates the institution where the research took place.)

Thursday, June 14, 2012

(Presenters and times are subject to change)
Disclosure Information listed on pages 33-37.

9:01am–9:07am Skeletal and Extraskeletal Mesenchymal Chondrosarcoma: A Review of 42 Cases
Satoshi Kawaguchi, MD, MD Anderson Cancer Center, Houston, TX

9:08am–9:14am Induction of Bone Regeneration by BMP-7 in Critical Sized Defects Using a Novel Internal Fixator
Joel C. Williams, MD, UC Davis Medical Center, Sacramento, CA

9:15am–9:21am An Autologous Cartilage Tissue Implant (ACTI) for Treating Grade III Chondral Injuries to the Femur: Intermediate Term Results from Initial FDA Trials
Dennis C. Crawford, MD, PhD, Oregon Health and Science University, Portland, OR

9:22am–9:28am The Role of G-Protein Coupled Estrogen Receptor 1 in Fracture Healing
Rahul Banerjee, MD, University of Texas Southwestern Medical Center, Dallas, TX
**Presented by Brigham K. Au, MD*

9:28am–9:35am **Discussion**

8:54am–9:00am Osseous Augmentation for Bony Bankart Lesions: Best Fit Based on the Radius of Curvature
Alex DeHaan, MD, OHSU, Portland, OR

9:01am–9:07am Collagen Stuffed Sutures Enhance Healing of Full-Thickness Rotator Cuff Tears
Alan M. Hirahara, MD, FRCSC, Sutter Medical Center, Sacramento, CA

9:08am–9:14am Graft Jacket Allograft Rotator Cuff Reconstruction Shoulder Scores and MRI Outcomes at Two Years
Randy Clark, MD, Southern California Orthopedic Institute, Van Nuys, CA

9:15am–9:21am Cadaveric Study of the Effect of In-Situ Biceps Tenodesis on Glenohumeral Range of Motion
Patrick J. McGahan, MD, St. Mary's Medical Center, San Francisco, CA

9:22am–9:28am Arthroscopic Hip Labral Reconstruction with Gracilis Autograft: 2-Year Minimum Outcomes
Dean K. Matsuda, MD, Kaiser West Los Angeles Medical Center, Los Angeles, CA

9:28am–9:35am **Discussion**

General Session IV — Howard Steel Lecture *(Grand Ballroom II)*

Moderator: Theodore L. Stringer, MD

9:35am–10:15am **Howard Steel Lecture**
Lewis and Clark: Better than Most Doctors
Bruce C. Paton, MD, Denver, CO

Symposium II — Tumor Update *(Grand Ballroom II)*

Moderator: Valerae O. Lewis, MD

10:15am–10:33am Surgical Management of Skeletal Metastases
Bryan S. Moon, MD, MD Anderson Cancer Center, Houston, TX

10:33am–10:51am Bone Tumors — What to Look for
Cindy M. Kelly, MD, Denver Clinic, Denver, CO

10:51am–11:09am Soft Tissue Tumors
Jeffrey E. Krygier, MD, Santa Clara Medical, Santa Clara, CA

11:09am–11:15am Questions / Discussion

11:15am–11:35am ***Break — Please visit exhibitors***

(Location listed by an author's name indicates the institution where the research took place.)

Thursday, June 14, 2012

(Presenters and times are subject to change)
Disclosure Information listed on pages 33-37.

General Session V — Resident Award Papers *(Grand Ballroom II)*

Moderator: Brian A. Jewett, MD

11:35am–11:43am Blockade of Matrix Metalloproteinase-3 After Traumatic Nerve Injury Offers a Novel Treatment for Improving Functional Recovery
Tom Chao, MD, University of California, Irvine, Irvine, CA

11:44am–11:52am Arthroscopic Basic Task Performance in Shoulder Simulator Model Correlates with Clinical Shoulder Arthroscopy Experience
Kevin D. Martin, DO, William Beaumont Army Medical Center, El Paso, TX

11:53am–12:01pm Daptomycin and Tigecycline Have a Broader Effective Dose Range than Vancomycin as Prophylaxis Against a Surgical Implant *Staphylococcus Aureus* Infection
Jared A. Niska, MD,University of California at Los Angeles, Los Angeles, CA

12:02pm–12:10pm A Biomechanical Comparison of Plate Fixation and Calcium Phosphate Cement for Distal Femoral Metaphyseal Defects
Joel C. Williams, MD, UC Davis Medical Center, Sacramento, CA

12:11pm–12:19pm The Effect of Pedicle Screw Hubbing on Pullout Strength in the Thoracic Spine
Daniel G. Kang, MD, Walter Reed National Military Medical Center, Bethesda, MD

12:20pm–12:28pm Change in Physical Activity One Year After Lumbar Decompression with or Without Fusion: Is It Correlated to Self-Reported Outcome Scores?
Rosanna Wustrack, MD, University of California at San Francisco, San Francisco, CA

12:29pm–12:37pm Incidence and Morbidity of Concominant Spine Fractures in Combat Related Amputees
Adam Bevevino, MD, Walter Reed National Military Medical Center, Bethesda, MD

12:38pm–12:44pm **Discussion**

General Session VI — Recredentialing Updates: MOC and MOL & BOC Report *(Grand Ballroom II)*

Moderator: Brian A. Jewett, MD

12:45pm–1:05pm **Recredentialing Updates: MOC and MOL**
David D. Teuscher, MD, Beaumont, TX

1:05pm–1:15pm **BOC Report**
Robert R. Slater Jr., MD, WOA/BOC Representative, Folsom, CA

1:15pm–2:15pm **Poster Session** (Poster Presenters Available)
(Galleria II & III)

2:15pm–4:15pm **Multimedia Education Session**
(Galleria I)

5:00pm–6:00pm **Care of the Athlete & Tumor Update — Questions, Review, and Answers**
(Parlors A, B, & C)
Brian A. Jewett, MD, Slocum Center, Eugene, OR
Rudolf G. Hoellrich, MD, Slocum Center, Eugene, OR
Bryan S. Moon, MD, MD Anderson Cancer Center, Houston, TX

(Location listed by an author's name indicates the institution where the research took place.)

Friday, June 15, 2012

(Presenters and times are subject to change.)
Disclosure Information listed on pages 33-37.

6:00am–7:00am **Poster Session** (Poster Presenters Available)
(Galleria II & III)

General Session VII — Clinical Case Presentations Review *(Grand Ballroom II)*

Moderator: Brian A. Jewett, MD

6:00am–7:00am **Difficult Joint Replacement Cases**
William J. Maloney III, MD, Stanford University, Stanford, CA
Brian A. Jewett, MD, Slocum Center, Eugene, OR
James I. Huddleston, MD, Stanford University, Stanford, CA

Symposium III — Total Joints: Back to Basics *(Grand Ballroom II)*

Moderator: William J. Maloney III, MD

7:00am–7:15am The Infected Joint Replacement
Nicholas J. Giori, MD, Stanford University, Stanford, CA

7:15am–7:30am Instability: Evaluation and Surgical Management
James I. Huddleston, MD, Stanford University, Stanford, CA

7:30am–7:45am Venous Thrombo-embolism: Controversies in Prophylaxis
Alfred C. Kuo, MD, University of California at San Francisco, San Francisco, CA

7:45am–8:00am Complications with Modern Bearings
Matthew D. Miller, MD, Stanford University, Stanford, CA

8:00am–8:10am **Case Presentation / Discussion**

8:10am–8:30am ***Break — Please visit exhibitors***

General Session VIII — Young Investigator Award Papers *(Grand Ballroom II)*

Moderator: Peter J. Mandell, MD

8:30am–8:38am Functional Assessment of Acute Local Versus Distal Transplantation of Human Neural Stem Cells Following Spinal Cord Injury
Ivan Cheng, MD, Stanford University, Stanford, CA

8:39am–8:47am Surgical Treatment of Insertional Achilles Tendinopathy with or Without Flexor Hallucis Longus Tendon Transfer: A Prospective, Randomized, Controlled Trial
Kenneth J. Hunt, MD, Stanford University Medical Center, Palo Alto, CA / OrthoCarolina, Charlotte, NC

8:48am–8:56am Evaluation of Akt/mTOR Activity in Muscle Atrophy and Fatty Infiltration After Rotator Cuff Tears in a Rat Model
Brian Feeley, MD, San Francisco Veterans Affairs Medical Center/University of California at San Francisco, San Francisco, CA

8:56am–9:00am **Discussion**

General Session IX — Special Lecture *(Grand Ballroom II)*

Moderator: Brian A. Jewett, MD

9:00am–9:25am **Osteoporosis: Orthopedic Knowledge and Management**
Susan V. Bukata, MD, University of California at Los Angeles, Los Angeles, CA

Symposium IV — Common Fractures in the Elderly: Current State of the Art *(Grand Ballroom II)*

Moderator: David W. Lowenberg, MD

9:25am–9:40am Operating on the Osteoporotic Patient: Pitfalls and Pearls in Fracture Fixation
Amir Matityahu, MD, University of California at San Francisco, San Francisco, CA

(Location listed by an author's name indicates the institution where the research took place.)

Friday, June 15, 2012

(Presenters and times are subject to change.)
Disclosure Information listed on pages 33-37.

9:40am–9:55am Distal Radius Fractures
Jeffrey Yao, MD, Stanford University, Stanford, CA

9:55am–10:10am Proximal Humerus Fractures
Julius A. Bishop, MD, Stanford University, Stanford, CA

10:10am–10:25am Hip Fractures: Fix or Replace
Eric G. Meinberg, MD, University of California at San Francisco, San Francisco, CA

10:25am–10:40am Compression Fractures of the Spine
Ivan Cheng, MD, Stanford University, Stanford, CA

10:40am–10:50am **Case Presentation / Discussion**

10:50am–11:10am ***Break — Please visit exhibitors***

General Session X — AAOS Report and Presidential Guest Speaker *(Grand Ballroom II)*

Moderator: Peter J. Mandell, MD

11:10am–11:30am AAOS Report
John R. Tongue, MD, *President, American Academy of Orthopaedic Surgeons, Portland, OR*

11:30am–12:00pm **Presidential Guest Speaker**
Health Care Reform: Implications and Opportunities for Orthopaedic Surgeons
Kevin J. Bozic MD, MBA, University of California at San Francisco, San Francisco, CA

12:00pm–12:55pm **Industry Luncheon — Cadence Pharmaceuticals Inc. and ConvaTec**
CME credit not available

Symposium V — Practice Management *(Grand Ballroom II)*

Moderator: David J. Jacofsky, MD

12:55pm–1:15pm A Real Life Example of Hospital and Physician Partnership
David J. Jacofsky, MD, The CORE Institute, Phoenix, AZ

1:15pm–1:35pm New Alignment Strategies for Physicians and Hospitals in a New Environment
Geoffrey B. Walton, Comprehensive Care Solutions, New York, NY

1:35pm–1:55pm The Role of Orthopaedics Surgeons in ACO's: AAOS Perspective
Kevin J. Bozic, MD, MBA,University of California at San Francisco, San Francisco, CA

1:55pm–2:05pm **Discussion**

2:05pm–2:10pm ***Break — Change Rooms***

Concurrent General Session XI — Trauma *(Grand Ballroom II)*

Moderator: Julius A. Bishop, MD

2:10pm–2:16pm Evaluation of Patient and Hospital Outcomes Before, During, and After Implementation of a Comprehensive, Multidisciplinary Geriatric Hip Program
Cory Collinge, MD, Harris Methodist Fort Worth Hospital, Fort Worth, TX

2:17pm–2:23pm The Modified Posterior Approach to Posterior Pelvic Ring Injuries: A Technique for Minimizing Soft Tissue Complications
Ty Fowler, MD, Stanford University Medical Center, Palo Alto, CA

Concurrent General Session XII — Total Joint *(Parlors A, B, & C)*

Moderator: James I. Huddleston, MD

2:10pm–2:16pm Defining the Indications for Modularity in Primary Total Hip Arthroplasty: Modular vs. Non-Modular Femoral Implants
Paul J. Duwelius, MD, OHSU, Portland, OR
**Presented by Laura Matsen-Ko, MD*

2:17pm–2:23pm Injectable Calcium Phosphate Cement for Retroacetabular Osteolysis During Revision THA
Andrew I. Spitzer, MD, Cedars-Sinai Medical Center, Los Angeles, CA
**Presented by Nicole M. K. Behnke, MD*

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Friday, June 15, 2012

(Presenters and times are subject to change.)
Disclosure Information listed on pages 33-37.

2:24pm–2:30pm Optimal Management of Isolated Closed Humeral Shaft Fractures: A Decision Analysis Model
Julius A. Bishop, MD, Stanford University Medical Center, Palo Alto, CA
**Presented by Lauren Klak*

2:31pm–2:37pm Long Term Results and Costs of Free Flap Coverage & Ilizarov Bone Transport in Lower Limb Salvage
David W. Lowenberg, MD, Stanford University Medical Center, Palo Alto, CA/California Pacific Medical Center, San Francisco, CA

2:38pm–2:44pm Does Modern Nail Geometry Affect Nail Positioning in the Distal Femur of Elderly Hip Fracture Patients? A Radiographic Comparison of Otherwise Identical Hip Nails with 200cm vs. 150cm Radius of Curvature
Cory Collinge, MD, Harris Methodist Fort Worth Hospital, Fort Worth, TX

2:45pm–2:51pm Medial Plantar Wounds Associated with Calcaneal Fractures
Reza Firoozabadi, MD, MA, Harborview Medical Center, Seattle, WA

2:52pm–2:58pm Antegrade Femoral Nailing in the Setting of Acetabular Fracture Requiring a Kocher-Langenbeck Approach
Julius A. Bishop, MD, Harborview Medical Center, Seattle, WA/Stanford University Medical Center, Palo Alto, CA

2:58pm–3:10pm **Discussion**

3:10pm–4:10pm **Poster Session** (Poster Presenters Available) Poster Award selection during this session *(Galleria II & III)*

4:10pm–5:10pm **Multimedia Education Session**
(Galleria I)

2:24pm–2:30pm Hemoglobin A1C as a Predictor of Complications After Total Knee Arthroplasty
Joshua Griffin, MD, Scott and White Hospital, Temple, TX

2:31pm–2:37pm Outpatient UKA — Is It Safe?
Mark McBride, MD, Mission Valley Heights Surgery Center, San Diego, CA

2:38pm–2:44pm Patient Factors Predict Functional Outcomes After TKA
Justin Roth, DO, The Center Orthopaedic & Neurosurgical Care & Research, Bend, OR/ Kaleida Health, Buffalo General Hospital, Buffalo, NY/ Aurora Advanced Healthcare, Milwaukee, WI/Physicians Clinic of Iowa PC, Cedar Rapids, IA/Cleveland Clinic, Cleveland, OH/Summa Health System, Akron, OH/Arizona Institute for Bone and Joint Disorders, Phoenix, AZ/Knoxville Orthopaedic Clinic, Knoxville, TN/ Scott and White Clinic, Temple, TX

2:45pm–2:51pm Analysis of the Addition of Femoral-Sciatic Block and CPM to the Pain Management Protocol of our Joint Replacement Program
Paul Prefontaine, PT, Verde Valley Medical Center, Cottonwood, AZ
**Presented by Jack C. Wylie, MD*

2:52pm–2:58pm Identification of Landmark Registration Safe Zones in CA-TKA
Derek F. Amanatullah, MD, PhD, UC Davis Medical Center, Sacramento, CA

2:59pm–3:06pm Early Experience with a High Flexion Mobile Bearing Knee: Technique and Complications During the Learning Curve
Andrew I. Spitzer, MD, Cedars-Sinai Medical Center, Los Angeles, CA
**Presented by Nicole M. K. Behnke, MD*

3:06pm–3:10pm **Discussion**

3:10pm–4:10pm **Poster Session** (Poster Presenters Available) Poster Award selection during this session *(Galleria II & III)*

4:10pm–5:10pm **Multimedia Education Session**
(Galleria I)

(Location listed by an author's name indicates the institution where the research took place.)

Saturday, June 16, 2012

(Presenters and times are subject to change.)
Disclosure Information listed on pages 33-37.

6:00am–7:00am **Poster Session** (Poster Presenters Available)
(Galleria II & III)

General Session XIII — Clinical Case Presentations Review *(Grand Ballroom II)*

Moderator: Brian A. Jewett, MD

6:00am–7:00am Elbow Injuries
Kenneth P. Butters, MD, Slocum Center, Eugene, OR
Daniel C. Fitzpatrick, MD, Slocum Center, Eugene, OR
Gregory H. Rafijah, MD, UC Irvine, Irvine, CA

7:00am–7:15am **Second Business Meeting**

Symposium VI — Elbow: Cradle to Grave *(Grand Ballroom II)*

Moderator: Kenneth P. Butters, MD

7:15am–7:35am Pediatric Elbow Fractures
Gregory H. Rafijah, MD, UC Irvine, Irvine, CA

7:35am–7:55am Advanced Imaging of the Elbow
Richard Rhee, MD, UC Irvine, Irvine, CA

7:55am–8:15am Adult Elbow Fracture Treatment
Daniel C. Fitzpatrick, MD, Slocum Center, Eugene, OR

8:15am–8:20am **Discussion**

General Session XIV — Advocacy Update II *(Grand Ballroom II)*

Moderator: Brian A. Jewett, MD

8:20am–8:40am DC Update
Peter J. Mandell, MD, Burlingame, CA

8:40am–8:45am ***Break — Change Rooms***

Concurrent General Session XV — Upper Extremity *(Grand Ballroom II)*

Moderator: Kevin L. Smith, MD

8:45am–8:51am Biomechanical Effect of Scapular Notching in the Reverse Total Shoulder Prosthesis
Barth B. Riedel, MD, Loma Linda University, Loma Linda, CA

8:52am–8:58am Biomechanical Study of ECRL Tenodesis for Scaphoid Rotatory Instability
Hisham A. Bismar, DO, The Hand and Shoulder Center of Western New York/The State University of New York at Buffalo, Buffalo, NY

8:59am–9:05am Technical Tip: Provisional Mini-Fragment Plate Fixation in Clavicle Shaft Fractures
Tiffany N. Castillo, MD, Stanford Hospital and Clinics, Stanford, CA

Concurrent General Session XVI — Foot & Ankle / Practice Management *(Parlors A, B, & C)*

Moderator: Michael P. Kennedy, MD

8:45am–8:51am A CT Study Characterizing the Anatomy of the Uninjured Ankle Syndesmosis
Elliot S. Mendelsohn, MD, Harbor-UCLA Medical Center, Torrance, CA
** Presented by Thomas G. Harris, MD*

8:52am–8:58am Ankle Fusion in Patients with Hemophilia
Benjamin Bluth, MD, David Geffen School of Medicine at UCLA, Los Angeles, CA

8:59am–9:05am The Three Axis Spherical Total Ankle Replacement (TAR) Concept Revisited: Maximum 5-Year Experience with a Custom Two-Part Non-Cemented Hard-on-Hard Horizontally Impacted Press Fit Design
Richard C. Smith, MD, Providence Little Company of Mary Medical Center, San Pedro, CA

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Saturday, June 16, 2012

(Presenters and times are subject to change.)
Disclosure Information listed on pages 33-37.

9:06am–9:12am Radiographic Characteriztation of Capitate Morphology
Timothy Niacaris, MD, PhD, Curtis National Hand Center —Union Memorial Hospital, Baltimore, MD

9:12am–9:17am **Discussion**

9:17am–9:23am Risk Factors for Development of Heterotopic Ossification of the Elbow After Fracture Fixation
Emilie Cheung, MD, Stanford University Medical Center, Stanford, CA

9:24am–9:30am Reverse Total Shoulder Arthroplasty: A Review of Revision and Complication Rates in 265 Consecutive Cases
John Costouros, MD, Stanford University, Redwood City, CA

9:31am–9:37am A Clinical Evaluation of a New Arthroscopic Biceps Tenodesis Technique
Alan M. Hirahara, MD, FRCSC, Sutter Medical Center, Sacramento, CA

9:38am–9:44am Bone Mineral Density of the Lumbar Spine and Femoral Neck Do Not Correlate with Loss of Reduction in Elderly Distal Radius Fractures
Brett N. Robin, MD,Scott and White Memorial Hospital, Temple, TX

9:44am–9:50am **Discussion**

9:50am–10:25am ***Break — Please visit exhibitors***

9:05am–9:13am **Discussion**

9:13am–9:19am Talus and Fibula Kinematics After Syndesmosis Injury: Implications for Optimizing the Surgical Treatment Algorithm
Kenneth J. Hunt, MD, Stanford University Orthopaedic Biomechanics Laboratory/VAMC Palo Alto Joint Center of Excellence, Palo Alto, CA

9:20am–9:26am Talar Body and Head Fractures in Snowboarders
Nancy M. Luger, MD, Barton Lake Tahoe Orthopaedic Sports Medicine Fellowship Program, South Lake Tahoe, CA

9:27am–9:33am Musculoskeletal Proficiency of Emergency Medicine Physicians
Garet Comer, MD, Stanford University Medical Center, Stanford, CA

9:34am–9:40am MRI Utilization in a Six Man Orthopedic Practice Before and After Acquisition of a .3T Open MRI
John Finkenberg, MD, AOMG, San Diego, CA

9:40am–9:50am **Discussion**

9:50am–10:25am ***Break — Please visit exhibitors***

Symposium VII — Foot &Ankle *(Grand Ballroom II)*

Moderator: Steven Ross, MD

10:25am–10:45am Peroneal Tendonopathies — Diagnosis and Treatment
Michael J. Coughlin, MD, Saint Alphonsus, Boise, ID

10:45am–11:05am Achilles Tenonopathies — Current Treatments
Donald C. Jones, MD, Slocum Center, Eugene, OR

11:05am–11:25am Midfoot Injuries — Fixations and Fusions
Michael P. Kennedy, MD, OHSU, Portland, OR

11:25am–11:35am **Discussion**

(Location listed by an author's name indicates the institution where the research took place.)

Saturday, June 16, 2012

(Presenters and times are subject to change.)
Disclosure Information listed on pages 33-37.

General Session XVII — OREF Update & Presidential Address *(Grand Ballroom II)*

Moderator: Brian A. Jewett, MD

11:35am–11:45am OREF Update
Ramon L. Jimenez, MD, Monterey, CA

11:45am–12:25pm WOA Presidential Address
Peter J. Mandell, MD, Burlingame, CA

12:25pm–12:40pm ***Refreshment Break/Change Rooms***

Concurrent General Session XVIII — Pediatrics *(Grand Ballroom II)*

Moderator: Ellen M. Raney, MD

12:40pm–12:46pm Range of Motion of the Healthy Pediatric Elbow: Cross-Sectional Study of a Large Population
Mauricio Silva, MD, Orthopaedic Hospital, Los Angeles, CA
**Presented by Justin H. Barad, MD*

12:47pm–12:53 pm Return to Sports After Surgery to Correct Adolescent Idiopathic Scoliosis: A Survey of the Spinal Deformity Study Group
Daniel G. Kang, MD, Walter Reed National Military Medical Center, Bethesda, MD

12:54pm–1:00pm The Outcome of Non-Operative Treatment of Medial Epicondyle Fractures in the Pediatric Population
Juliann Kwak, MD, Los Angeles Orthopaedic Hospital Medical Center, Los Angeles, CA

1:01pm–1:07pm Short Leg Casting for Toddler's Fractures
Drew Brown IV, MD, Children's Orthopaedics of Hawaii, Honolulu, Hawaii/ Kapiolani Medical Center for Women and Children, Honolulu, HI

1:08pm–1:14pm Plain Radiography Versus 3-Dimensional CT Scan in Assessing Cobb Angle for Complex Spinal Deformities
Meghan Imrie, MD, Lucile Packard Children's Hospital at Stanford, Stanford, CA

Concurrent General Session XIX — Spine *(Parlors A, B, & C)*

Moderator: Robert A. Hart, MD

12:40pm–12:46pm Incidence of Venous Thromboembolism (VTE) Following Lumbar Decompression and Fusion: Results from the California Hospital Discharge Database (317,301 Procedures)
John Martino, MD, UC Davis Medical Center, Sacramento, CA
**Presented by Rolando F. Roberto, MD*

12:47pm–12:53pm Surgical Salvage of Failed Lateral Access Interbody Spinal Fusion (XLIF)
Kim R. Driftmier, MD, University of Hawaii at Manoa, John A. Burns School of Medicine, Honolulu, HI

12:54pm–1:00pm Results of Three Different Techniques Using the Lateral Approach for Lumbar Interbody Arthrodesis
Michael R. Briseño, MD, Stanford University, Redwood City, CA

1:01pm–1:07pm An Algorithm to Identify 90-Day Readmissions After Fusion Surgery for Adult Thoracolumbar Spinal Deformity
Steven Takemoto, PhD, University of California San Francisco, San Francisco, CA

1:08pm–1:14pm Meta-Analysis of Fusion Rates for Minimally Invasive TLIF Performed Without Posterolateral Bone Grafting and Fusion
Adam Bevevino, MD, Walter Reed National Military Medical Center, Bethesda, MD

(Location listed by an author's name indicates the institution where the research took place.)

Saturday, June 16, 2012

(Presenters and times are subject to change.)
Disclosure Information listed on pages 33-37.

1:15pm–1:21pm Suture Augmentation of Plated Pediatric Clavicle Fractures
Nicholas R. Scarcella, MD, Children's Orthopaedics of Hawaii/Kapiolani Medical Center for Women and Children, Honolulu, HI

1:22pm–1:28pm Lateral Spurring Following Pediatric Lateral Condyle Fractures
Jonathan R. Pribaz, MD, Los Angeles Orthopaedic Hospital, Los Angeles, CA

1:29pm–1:35pm Outcomes of Rectus Femoris Transfers in Children with Cerebral Palsy: Effect of Transfer Site
William F. Scully, MD, Walter E. Griffin & Agnes M. Griffin Motion Analysis Lab Shriners Hospitals for Children, Spokane, WA

1:35pm–1:40pm **Discussion**

1:15pm–1:21pm Decrease in Airway Complications Following Enhanced Fluid and ICU Protocol in Patients Undergoing Cervical Decompression and Fusion Crossing the Cervico-Thoracic Junction
John P. Dupaix, BS, Oregon Health and Science University, Portland, OR
**Presented by Robert A. Hart, MD*

1:22pm–1:28pm Patient Perception of Lumbar Spinal Stiffness After Posterior Instrumented Lumbar Fusions
Jayme Hiratzka, MD, Oregon Health & Science University, Portland, OR

1:29pm–1:35pm The Ventral Lamina and Superior Facet Rule: A Morphometric Analysis for Ideal Thoracic Pedicle Screw Start Point
Daniel G. Kang, MD, Walter Reed National Military Medical Center, Bethesda, MD

1:35pm–1:40pm **Discussion**

1:40pm–2:40pm **Total Joints: Back to Basics & Common Fractures in the Elderly: Current State of the Art; Elbow: Cradle to Grave, and Foot & Ankle — Questions, Review, and Answers** ***(Parlors A, B, & C)***
Brian A. Jewett, MD, Slocum Center, Eugene, OR
Donald C. Jones, MD, Slocum Center, Eugene, OR
Daniel C. Fitzpatrick, MD, Slocum Center, Eugene, OR
Kenneth P. Butters, MD, Slocum Center, Eugene, OR
James I. Huddleston, MD, Stanford University, Stanford, CA
David W. Lowenberg, MD, Stanford University, Stanford, CA

2:40pm–3:40pm **Poster Session** (Poster Presenters Available)
(Galleria II & III)

3:40pm–4:10pm **Multimedia Education Session**
(Galleria I)

(Location listed by an author's name indicates the institution where the research took place.)

2012 WOA Presenters and Moderators

Page(s)	
55	Brigham K. Au, MD
72	Derek F. Amanatullah, MD, PhD
70, 73	Nicole M. K. Behnke, MD
82	Justin H. Barad, MD
68	Michael J. Beltran, MD
63, 89	Adam Bevevino, MD
65, 69	Julius A. Bishop, MD
74	Hisham A. Bismar, DO
79	Benjamin Bluth, MD
44	Kevin J. Bozic, MD, MBA
88	Michael R. Briseño, MD
84	Drew J. Brown IV, MD
43	Susan V. Bukata, MD
56	Benjamin T. Busfield, MD
46, 49	Kenneth P. Butters, MD
75	Tiffany N. Castillo, MD
60	Tom Chao, MD
44, 64	Ivan Cheng, MD
76	Emilie Cheung, MD
58	Randy Clark, MD
65	Cory Collinge, MD
81	Garet Comer, MD
76	John Costouros, MD
47	Michael J. Coughlin, MD
55	Dennis C. Crawford, MD, PhD
52	Amalia de Comas, MD
57	Alex DeHaan, MD
87	Kim R. Driftmier, MD
65	Brian Feeley, MD
81	John Finkenberg, MD
68	Reza Firoozabadi, MD, MA
46, 49	Daniel C. Fitzpatrick, MD
66	Ty Fowler, MD
43	Nicholas J. Giori, MD
70	Joshua Griffin, MD
78	Thomas G. Harris, MD
48, 86, 89	Robert A. Hart, MD
57, 77	Alan M. Hirahara, MD, FRCSC
90	Jayme Hiratzka, MD
40, 42, 56	Rudolf G. Hoellrich, MD

Page(s)	
69	James I. Huddleston, MD
64, 80	Kenneth J. Hunt, MD
84	Meghan Imrie, MD
44	David J. Jacofsky, MD
40	Stanley L. James, MD
60, 86	Brian A. Jewett, MD
47, 49	Donald C. Jones, MD
62, 82, 90	Daniel G. Kang, MD
53	Satoshi Kawaguchi, MD
41	Cindy M. Kelly, MD
78	Michael P. Kennedy, MD
67	Lauren Klak
40	Michael C. Koester, MD
52	Suhel Kotwal, MD
41	Jeffrey E. Krygier, MD
43	Alfred C. Kuo, MD
83	Juliann Kwak, MD
67	David W. Lowenberg, MD
80	Nancy M. Luger, MD
43	William J. Maloney III, MD
40, 43, 44, 46, 48	Peter J. Mandell, MD
60	Kevin D. Martin, DO
43	Amir Matityahu, MD
69	Laura Matsen-Ko, MD
59	Dean K. Matsuda, MD
71	Mark McBride, MD
58	Patrick J. McGahan, MD
44	Eric G. Meinberg, MD
43	Matthew D. Miller, MD
52	Bryan S. Moon, MD
75	Timothy Niacaris, MD, PhD
61	Jared A. Niska, MD
41	Bruce C. Paton, MD
85	Jonathan R. Pribaz, MD
46	Gregory H. Rafijah, MD
82	Ellen M. Raney, MD
46	Richard Rhee, MD
74	Barth B. Riedel, MD
86	Rolando F. Roberto, MD
77	Brett N. Robin, MD

Page(s)	
47	Steven Ross, MD
71	Justin Roth, DO
85	Nicholas R. Scarcella, MD
86	William F. Scully, MD
42	Robert R. Slater Jr., MD
74	Kevin L. Smith, MD
79	Richard C. Smith, MD
41	Theodore L. Stringer, MD
88	Steven Takemoto, PhD

Page(s)	
42	David D. Teuscher, MD
44	John R. Tongue, MD
56	Steven M. Traina, MD
44	Geoffrey B. Walton
53, 54, 62	Joel C. Williams, MD
63	Rosanna Wustrack, MD
72	Jack W. Wylie, MD
44	Jeffrey Yao, MD

2012 Scientific Program Abstracts — Thursday

(An asterisk (*) by an author's name indicates the presenter.)

Thursday, June 14, 2012

Concurrent General Session II — Tumor & Basic Science

Moderator: Amalia de Comas, MD

8:40am–8:46am

Total Humeral Endoprosthetic Replacement Following Excision of Malignant Bone Tumors

Suhel Kotwal, MD
Robert L. Satcher, MD, PhD
Bryan S. Moon, MD
Patrick P. Lin, MD
Valerae O. Lewis, MD

Introduction: The humerus is a common site for malignant musculoskeletal tumors. Advances in adjuvant therapies and reconstructive methods have provided the opportunity for limb salvage techniques with improved functional and oncological outcomes. Osteo-articular allografts, allo-prosthetic composites and endoprosthetic replacements following segmental resection of humerus are well described; however, reports of limb salvage with total humeral endoprosthetic replacement are sparse in the literature.

Methods: We performed a retrospective study of 20 patients who underwent total humeral resection and endoprosthetic replacement for the treatment of malignant tumors of the humerus from 1990 to 2011. Ten patients had primary sarcomas of bone and 10 had metastatic disease. Fourteen patients were adults and 6 were pediatric. The mean age was 40.9 yrs. Average follow-up was 42.8 mos (range, 1-172). Ten patients were still alive at the time of review, while 10 died of malignant disease. Functional and oncological outcomes were analyzed.

Results: Five patients had extra-articular shoulder resection with prosthesis anchored to the acromion process. The rotator-cuff was salvaged in remaining 15 patients. Mean estimated blood loss was 1077.5ml (range, 250-6050) and mean surgery length was 299 minutes (range, 57-653). Mean active shoulder abduction was 12.5o and active forward flexion was 15o. Mean elbow flexion was 106o with a 30.5o flexion contracture in 10 patients. Hand function was normal in all patients. Musculoskeletal Tumor Society Score (MSTS) functional score was good to excellent. Complication rate was 25%. Deep prosthetic infection was encountered in 1 patient. Mechanical loosening of ulnar component was identified in one patient and symptomatic subluxation of prosthetic humeral head was noted in 3 patients.

Discussion and Conclusion: Total humeral endoprosthetic replacement is a reliable reconstructive option in patients that require total humeral resection. It affords a durable oncologic outcome while providing functional use of the extremity. It is a preferable alternative to shoulder disarticulation.

Notes:

8:47am–8:53am

Distal Femoral Allograft Composite Reconstruction for Short Proximal Femur Segments Following Sarcoma Resection

Bryan S. Moon, MD
Nathan F. Gilbert, MD
Christopher P. Cannon, MD
Patrick P. Lin, MD
Valerae O. Lewis, MD

Introduction: Short proximal femur segments remaining after distal femoral sarcoma resection pose a unique challenge. Limb sparing options include total endoproshthetic replacement, cross-pin fixation to a custom implant, and allograft prosthetic composite reconstruction (APC). APC has the potential advantage of restoration of bone stock and increased intraoperative flexibility. A series of patients with APC reconstruction of the distal femur were evaluated to determine clinical outcome and complication rates.

Methods: Ten consecutive patients were retrospectively identified who had distal femoral APC reconstruction between

1994 and 2006. Following radical resection of the distal femur, the remaining proximal femur segment was less than 20 centimeters in all patients.

Results: Sixteen APC reconstructions were performed in ten patients. Seven were primary procedures and nine were revision procedures. Average f/u was 88 months. Eleven APC reconstructions (69%) united and five (31%) were persistent nonunions. At final follow-up eight patients (80%) had a healed APC which allowed WBAT. One pt (10%) had an amputation and one pt (10%) died prior to union. Average time to union was 24 months. Seven pts (70%) or nine APC reconstructions (56%) required further surgery to obtain a united construct.

Discussion/Conclusion: Although distal femoral APC reconstruction has a high complication rate, a stable construct was obtained in 80% of patients. Further study will be required to determine if these results are comparable to custom implants or total endoprosthetic replacements.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation. (Refer to page 39.)*

Notes:

8:54am–9:00am

Properties of Distal Femoral Defects with a Cortical Breach

Derek F. Amanatullah, MD, PhD
*Joel C. Williams, MD
Robert M. Tamurian, MD

Introduction: The optimal management of pathologic long bone lesions remains a significant challenge in orthopaedic surgery. A clear objective set of clinical or radiographic guidelines for predicting the fracture risk of a bone defect has yet to be described. The goal of the current study is to investigate the role of defect depth and percent of bone loss on the mechanical properties of the distal femur.

Methods: A laterally placed distal metaphyseal cylindrical defect was milled in the cortex of the distal femur in 20 composite models. The proximal extent of the defects was constant and by decreasing the radius of the cylinder that intersected this predefined cord, four different radii defining four different depths of resection of the distal femur were created for testing, 17%, 33%, 50%, and 67% femoral defects, when normalized to the width of the femur at the level of resection. Each femur was mounted into a hydraulic axial/torsion materials testing machine and each specimen underwent torsional stiffness testing and torsional failure in external rotation.

Results: The specimens with less than a 33% femoral width defect consistently demonstrated a superiorly oriented spiral fracture pattern, while the specimens with greater than a 50% femoral width defect consistently demonstrated an inferiorly oriented transverse fracture pattern. The 17%, 33%, 50%, and 67% femoral width defects were all statistically less stiff in torsion as the defect grew larger. There was a strong sigmoidal correlation between the mean torsional stiffness and defect size ($r2 = 0.992$).

Discussion: It is clear that the amount of femur remaining at a defect site is crucial to stability. Our biomechical analysis predicts a critical loss of torsional integrity when a femoral defect approaches 50% of the width of the femur in the setting of a cortical breach. Additionally, 80% of the femoral torsional stiffness remains after a loss of 17% of the femur. These results suggest that cortical disruption may alter the clinical criteria for prophylactic stabilization of the distal femur.

Notes:

9:01am–9:07am

Skeletal and Extraskeletal Mesenchymal Chondrosarcoma: A Review of 42 Cases

Satoshi Kawaguchi, MD
Israel Weiss, MD
Patrick P. Lin, MD
Bryan S. Moon, MD
Robert L. Satcher, MD, PhD
Valerae O. Lewis, MD

Introduction: Mesenchimal chondrosarcoma (MSC) is a rare variant of chondrosarcoma. Despite being there consensus for distinct clinicopathologic entity of MSC, its clinical features, prognostic variables, and role of adjuvant therapies remain controversial. Most studies contain small number of patients.

Methods: Forty-two cases of MSC, which had been diagnosed at the authors' institute, were analyzed for, demographics,

treatments, outcomes and prognostic variables. Survival was estimated using the Kaplan-Meier plots. Impact of adjuvant chemotherapy and adjuvant radiotherapy and other variables over overall, disease-free, metastasis-free and recurrence-free survival rates was determined by using the log-rank test. A probability of 0.05 or less was accepted as statistically significant. The average follow-up period was 4.8 years.

Results: There were 20 women and 22 men with the mean age at diagnosis of 33 years. Half of the cases were skeletal and extraskeletal, respectively. The tumors were located mainly in the trunk (71%). Overall survival of the 42 patients with MSC was 53% in five years and 38% in ten years. Disease-free survival was 21% in five years and 4% in ten years. Age younger than 30 years was defined as an undesirable prognostic factor in patients with a localized tumor. Treatment with no radiotherapy was significantly associated with poor recurrence-free survival. Adriamycin-based chemotherapy regimens yielded radiographic and histological responses in most of the cases examined**.**

Discussion and Conclusion: This is the largest study of MSC analyzing the survival of the patients and prognostic variables comprehensively. The present study revealed the role of adjuvant radiotherapy for MCS in local control of the tumor. Our findings also indicated the feasibility of the use of adriamycin-based chemotherapy as adjuvant in the treatment of MSC which has high propensity of metastasis.

Notes:

9:08am–9:14am

Induction of Bone Regeneration by BMP-7 in Critical Sized Defects Using a Novel Internal Fixator

Joel C. Williams, MD
Matthew Anderson, MS
Blaine A. Christiansen, PhD
A. Hari Reddi, PhD
Mark Lee, MD

Introduction: Segmental bone defects are a challenging orthopaedic problem with multiple etiologies including high-energy trauma, infection, revision surgery, and tumor resection. Critical-sized defects (CSDs) represent a major clinical challenge, as reliable, evidenced-based solutions are not available. Critical translational studies will require reliable, reproducible studies in relevant animal models. The aim of this investigation was to develop and validate a novel CSD model in rats using an internal fixation device.

Methods: Six millimeter diaphyseal CSDs were created in femora of 344 skeletally mature male Fischer rats and stabilized with a commercial radiolucent PEEK plate and 6 bicortical locking titanium screws that provide angular stability. Rats with CSDs were randomly assigned to three treatment groups: high dose rhBMP-7 (100μg/25μL) on absorbable collagen sponge (ACS), low dose rhBMP-7 (25μg/25μL) on ACS, and control (ACS alone). Radiographs were obtained at 2-week intervals until the end of treatment and graded 0 (no bone formation), 1 (bone formation without union) or 2 (union) by two blinded investigators. All animals were sacrificed at eight weeks and bone formation was evaluated by radiographs, μCT and biomechanics.

Results: In the high dose BMP-7 group there was 100% union on radiographs by four weeks, whereas 73% of the low dose animals demonstrated bone formation without evidence of union at the time of sacrifice (8 weeks after surgery). None of the control animals demonstrated radiographic evidence of bone formation. Micro-CT results demonstrated two and three-fold increases in bone volume (BV) in the low dose (52.55 mm3) and high dose groups (77.66 mm3) when compared with the control group (24.57 mm3) (both significant). Total callous volume (CV) in the high dose group (236.32 mm3) was nearly 7 times larger than the control group (33.91 mm3) and over 3 times larger than the low dose group (72.88 mm3) (both significant). Bone volume fraction (BV/CV) and absolute bone mineral density (ABMD), which are measures of mineralized tissue within the callous for the high dose group were approximately 50% smaller than control and low dose groups, suggesting an endochondral healing process. Mean torsional stiffness and torque to failure of high dose BMP-7 group were 132% and 95%, compared to contralateral femurs. The control and low dose femurs were not amenable to biomechanical testing. The high dose BMP-7 on ACS in our rodent CSD model resulted in reproducible, high-quality bone regeneration. In the absence of BMP-7, ACS alone resulted in marginal bone formation without union based on radiographic and μCT analyses. None of the control animals or low dose animals united. Interestingly, the bone regenerate in the low dose group was significantly denser than the high dose BMP-7 group, suggestive of a distinct healing process.

Conclusion: This clinically relevant and highly reproducible animal model will be of great utility in optimizing potential clinical treatment of CSDs and permits systematic evaluation

of the influence of construct stiffness and substrate on bone regeneration.

Notes:

9:15am–9:21am

An Autologous Cartilage Tissue Implant (ACTI) for Treating Grade III Chondral Injuries to the Femur: Intermediate Term Results from Initial FDA Trials

Dennis C. Crawford, MD, PhD
Thomas M. DeBerardino, MD
Claude T. Moorman III, MD
Dean C. Taylor, MD
C. Benjamin Ma, MD
James Chesnutt, MD
Bradley J. Nelson, MD
Riley J. Williams III, MD

Introduction: The purpose of this study was to evaluate the safety and therapeutic efficacy of an ACTI derived from seeding autogenous chondrocytes on a collagen matrix.

Methods: Patients with full thickness ICRS grade III chondral injuries to the distal femur were treated with ACTI and evaluated prospectively in two preliminary FDA clinical trials. Arthroscopically harvested autogenous chondrocytes were seeded into a type I collagen honeycomb scaffold and implanted using a collagen bio-adhesive after 6 weeks of ex-vivo culture. Adverse events were quantified, Range of motion (ROM) and Patient Reported Outcomes (PRO) including IKDC, SF-36 Physical Component Summary, VAS pain score, and KOOS scores, were obtained at baseline and intervals.

Results: Twenty nine patients (8 Phase I, 21 Phase II study) were treated. Data are reported for Phase I patients at 60 months, and 20/21 Phase II patients at a minimum of 36 months (1 lost to follow up at 2 years). Mean final follow-up of 41±16 months is reported. All serious adverse events (n = 3) were isolated to one patient and not related to the implant. Significant decreases from baseline were reported for average VAS pain scores (17±18) at 6 weeks and for highest VAS pain scores at 3 months (23±31), and sustained through final visit. Similarly, KOOS pain score was significantly improved from baseline at final follow-up (24±10). The SF-36 score was significantly improved from baseline for all follow-up visits. Mean change from baseline in ROM was 6±8 degrees at final follow-up.

Discussion and Conclusion: Pain, as measured by the VAS and KOOS, is significantly reduced at 6 weeks following ACTI and sustained at mean 41 months. Functional PROs were similarly improved by 3 months and at final follow up. ACTI appears to be both relatively safe and effective after periods of more than 40 months and up to 5 years.

Notes:

9:22am–9:28am

The Role of G-Protein Coupled Estrogen Receptor 1 in Fracture Healing

Rahul Banerjee, MD
*Brigham K. Au, MD
Sagar Patel, BS
Orhan K. Oz, MD, PhD
Joseph Borrelli Jr., MD
Christopher T. Chen, PhD

Introduction: G protein-coupled estrogen receptor 1 (GPER1), a novel receptor for estrogen, has been shown to play a role in estrogen-promoted growth plate closure and bone remodeling. The purpose of this study was to determine the role of GPER1 in fracture healing utilizing a mouse femur fracture model.

Methods: Wild-type (GPER1+/+) mice and knockout (GPER1-/-) mice underwent retrograde intramedullary nailing of the right femur followed by creation of a closed femur fracture utilizing a previously established model. Animals were sacrificed at 1 week and 6 weeks and the injured femur was analyzed using histology, microCT and biomechanical testing (three-point bending stiffness).

Results: 15 wild-type and 19 GPER1-deficient mice were utilized. At 1 week after fracture, histological analysis demonstrated increased Safranin-O staining in the GPER1-deficient mice, suggesting the acceleration of endochondral ossification. At 6 weeks after fracture, increased formation of hard tissue callus with mineralized tissue was found in both groups. Analysis of the fracture callus at 6 weeks

using microCT demonstrated increased bone mineral density and bone volume in the GPER-1 deficient mice when compared to the wild-type mice, again suggesting an accelerated healing process. At 6 weeks after fracture, the three-point bending stiffness of the GPER-deficient fractured femurs was also greater than those of the wild-type femurs ($p = 0.02$) and approached 74% of the control (unfractured) femur.

Conclusions: Our findings showed that a deficiency of GPER1 in mice can accelerate the healing of a closed femur fracture at 6 weeks as determined by μCT and biomechanical testing. This study demonstrates that GPER1 plays a significant role in the regulation of fracture healing. The GPER1 receptor may serve as a useful target for potential therapeutic modalities to enhance fracture healing.

Notes:

Thursday, June 14, 2012

Concurrent General Session III — Sports Medicine

Moderator: Rudolf G. Hoellrich, MD

8:40am–8:46am

The Effect of Graft Tissue on ACL Outcomes: A Multi-Center Prospective Randomized Control Trial Comparing Autograft Hamstrings to Fresh Frozen Anterior Tibialis Allograft

Steven M. Traina, MD
Keith W. Lawhorn, MD
Stephen M. Howell, MD
John E. Gottlieb, MD
Thomas D. Meade, MD
Howard Freedberg, MD

Materials and Methods: 147 patients were prospectively randomized to autogenous hamstrings versus fresh-frozen anterior tibialis allograft using a computer generated randomization protocol. 102 patients completed a minimum of 2 years of follow-up with 54 patients in the hamstring group and 48 patients in the allograft group. Lachmans testing, pivot shift, subjective and functional outcome assessments including single leg hop for distance and radiographs were performed.

Results: The average age of the autograft group was 32.0 years and 33.3 years for the allograft group. There was no difference in stability between the two groups ($p>0.05$). The mean IKDC subjective score was 91.0 for the autograft group and 90.9 for the allograft group ($p>0.05$). The functional IKDC scores for the autograft group were normal in 46 patients (85%), nearly normal in 7 patients (13%) and severely abnormal in one patient. For the allograft group, the functional IKDC scores were normal in 43 patients (89%) and nearly normal in 5 patients (10%) ($p>0.05$). There were 4 re-operations in the allograft group and 3 re-operations in the autograft group. No patient underwent revision ACL surgery nor planned to undergo revision surgery due to instability in either group during the study period despite the one patient in the autograft group with a pivot shift and a maximum manual KT of 5mm.

Conclusion: The use of fresh-frozen anterior tibialis allograft (non-treated) for ACL reconstruction produced similar subjective and functional outcomes at 24 months minimal follow-up compared to patients undergoing ACL reconstruction using autograft hamstring tendons. Thus the graft tissue, fresh-frozen allograft versus autogenous hamstrings does not appear to affect the outcomes of ACL surgery.

Notes:

8:47am–8:53am

Subacromial Pain Pump and Chondrolysis with Minimum 2-Year Follow-Up After Arthroscopic

Benjamin T. Busfield, MD
Denise M. Romero, MD
Daniel Khorshad
F. Daniel Kharazzi

Introduction: Intra-articular pain pumps with local anesthetics are a major cause of post-arthroscopic glenohumeral chondrolysis (PAGCL). We sought to determine the number of cases of PAGCL in a cohort of patients undergoing arthroscopic rotator cuff repair with placement of a subacromial pain pump with local anesthetics.

Methods: We retrospectively analyzed a consecutive series of 46 patients treated with subacromial pain pump placement after arthroscopic rotator cuff repair and subacromial decompression for full thickness rotator cuff tears. Thirty four patients met inclusion criteria of greater than 24 month follow-up with an average age of 49 (28-71). All patients had subacromial pain pumps infusing 0.25% bupivacaine without epinephrine at 2 cc/h for 48 hours. All patients had radiographic studies and a physical examination at greater than 1 year and 24 months after surgery, respectively.

Results: Patients had an average follow-up of 31.5 months. All patients had arthroscopic rotator cuff repair with a single row of bioabsorbable anchors. No patients had any evidence of joint space narrowing on post-operative radiographs. No patients had crepitus on examination and the range of motion on last follow-up included mean flexion of 148° (130°-160°), abduction of 140° (122°-160°), extension of 56° (40°-60°), internal rotation of 48° (34°-60°), and external rotation of 86° (60°-90°).

Conclusion: Subacromial pain pump use after arthroscopic rotator cuff repair at minimum two year follow-up in this case series supports the conclusion that PAGCL is very uncommon with a low flow rate subacromial pain pump.

Notes:

8:54am–9:00am

Osseous Augmentation for Bony Bankart Lesions: Best Fit Based on the Radius of Curvature

Alex DeHaan, MD
Jacqueline L. Munch, MD
Dennis C. Crawford, MD, PhD

Introduction: The importance of osseous fixation of glenoid fractures in the setting of anterior shoulder instability has been a topic of recent interest in the orthopaedic literature. The coracoid process and the iliac crest have traditionally been considered the gold standard sources for bone graft. More recently, osteochondral allograft has gained favor as a potential donor source, with the theoretical advantage of a cartilaginous surface in contact with the humeral head.

Methods: We undertook a cadaveric study to examine the radius of curvature of several potential osseous and osteochondral donor sites, in order to determine the most congruous fit for the glenoid and humeral head. Twenty-seven cadavers were dissected in order to measure nine different anatomic locations: glenoid, humeral head, lateral coracoid, inferior coracoid, distal tibia, medial tibial plateau, distal radius, radial head, and iliac crest. The radius of curvature was measured using Mose circles.

Results: The glenoid and humeral head measurements were 27.8 +/- 4.0mm and 23.1 +/- 2.9mm from superior to inferior, and 26.4 +/- 2.9mm and 20.8 +/- 1.9mm when measured anterior to posterior, respectively. Closest fit to the glenoid was the inferior coracoid (23.6 +/- 2.7mm), distal tibia (25.1 +/- 1.9mm), and medial tibial plateau (25.0 +/- 3.9). Measurements of the iliac crest were >35mm in all cadavers. The lateral coracoid (13.1 +/-2.6mm), distal radius (lunate fossa 14.8 +/- 1.0mm, scaphoid fossa 21.0 +/- 2.4mm) and radial head (17.8 +/- 3.3mm) were also deemed incongruent.

Discussion and Conclusion: Based on the radius of curvature, we found the inferior coracoid, distal tibia, and medial tibial plateau to best match the glenoid for osseous augmentation. Of these three, the inferior coracoid and distal tibia were the most reproducible.

Notes:

9:01am–9:07am

Collagen Stuffed Sutures Enhance Healing of Full-Thickness Rotator Cuff Tears

Alan M. Hirahara, MD, FRCSC

Purpose: To evaluate the clinical effectiveness of a new collagen stuffed suture on full-thickness rotator cuff repairs.

Methods: Fifty-nine patients had their full-thickness rotator cuff tears repaired with a collagen stuffed suture while forty-five patients were repaired using a standard double row technique with standard sutures. In the study group, patients were repaired using a speed fix technique with a collagen stuffed suture and a 4.5 mm Vented Swivel Lock anchor. The control patients were repaired using a suture bridge or speed bridge technique (VSL anchors and fibertape). We did not exclude patients who had associated pathology. Non-compliant patients and those suffering post-op trauma were excluded. Patients were evaluated clinically with VAS pain scores and ASES scores monthly for six months. Days to discharge and return to work were also evaluated. Repeat ultrasound or

MRA was performed for people having persistent pain or complaints to evaluate healing.

Results: Six out of forty-five (13.3%) control patients failed to heal, requiring revision repair while two of fifty-nine (3.4%) study patients failed to heal. Pain scores decreased in both groups from pre-op to six months (Study: 6.6 to 1.6 / Control: 5.9 to 2.4). ASES scores increased in both groups (Study: 43.2 to 76.6 / Control: 47.1 to 71.3). Time to discharge was 159.0 days (Control) compared with 110.7 days (Study). Return to work was 175.8 (Control) days to 59.9 days (Study).

Conclusions: Collagen stuffed suture appears to enhance healing of rotator cuff repairs as there were fewer failures in the study group. Patients were discharged and returned to work faster. However, there was no significant difference in pain or functional recovery. Further study to enhance the power of this study is required.

Notes:

9:08am–9:14am

Graft Jacket Allograft Rotator Cuff Reconstruction Shoulder Scores and MRI Outcomes at Two Years

Randy Clark, MD
Stephen J. Snyder, MD

Introduction: Massive irreparable rotator cuff tears, pose a serious challenge to surgeons and patients. Patients complain of significant pain and disability that limits their lifestyle. Many of these patients have had a failed rotator cuff repair. Treatment options vary widely and options range from conservative treatment to debridement and decompression, partial repair, tendon transfer, reverse total shoulder, or some form of graft reconstruction. In this study, allograft acellular human dermal matrix (AAHDM) was used for graft reconstruction of the massive rotator cuff tear.

Methods: One hundred and ten patients and 113 shoulders underwent a graft jacket allograft (GJA) reconstruction for a massive rotator cuff tear between 3/4/2003 to 7/26/2011. These patients were evaluated at the 3-month post-operative and one year post-operative time point with an intra-articular gadolinium enhanced MRI and the results were evaluated by two orthopedic surgeons and a musculoskeletal radiologist to determine whether the graft was intact or torn. These patients also completed simple shoulder test (SST) and Modified UCLA Shoulder Scores at the pre-operative and two-year post-operative mark.

Results: The three month post-operative MRI evaluations demonstrated 83% (74/89) patients with an intact GJA, 17% (15/89) patients had a GJA tear and 21 patients did not undergo the MRI. At the one-year post-operative appointment of the previously intact reconstructions, 89% (41/46) patients had an intact GJA, 11% (5/46) patients experienced a new tear and 28 did not undergo further advanced imaging. The SST significantly improved from a preoperative average of 5.7 +/- 2.8 to a post-operative score of 9.8 +/- 2.7 ($p<0.001$). UCLA scores significantly improved from 17 +/- 4.6 to 27 +/- 7.1 ($p<0.001$).

Notes:

9:15am–9:21am

Cadaveric Study of the Effect of In-Situ Biceps Tenodesis on Glenohumeral Range of Motion

Patrick J. McGahan, MD
Hinesh V. Patel, BS
Ephraim Dickinson, MD
Jeremi Leisure, MS
William Montgomery III, MD

Introduction: Previous studies have demonstrated that the humerus slides freely along the long head of the biceps tendon (LHBT). It seems intuitive that any block to this motion would result in decreased glenohumeral (GH) range of motion (ROM). The goal of our study was twofold: to more thoroughly characterize the excursion of the LHBT and to measure the effect of in-situ biceps tenodesis on GH ROM.

Methods: Using a custom biomechanical testing setup, excursion of the LHBT and rotation of the humerus were measured at 0, 15, 30, 60, and 90 degrees of GH abduction in the plane of the scapula. An in-situ biceps tenodesis with the biceps anchor still intact was sequentially performed in two positions: 0 degrees abduction and maximum external rotation followed by 0 degrees abduction and maximum

internal rotation. The effect of the tenodesis on ROM was then measured.

Results: Our study demonstrated an average excursion of 19.4 cm of the LHBT as the humerus was taken through full ROM in the plane of the scapula. Tenodesis of the LHBT in a position of 0 degrees abduction and maximum internal rotation resulted in a significant decrease in GH external rotation of 47 degrees with the arm in 0 degrees abduction.

Conclusion: This novel finding may aid clinical decision-making in scenarios where the LHBT is at risk for adhesions such as proximal humerus fractures, shoulder arthroplasty, and the stiff shoulder. In these situations, biceps scarring within the groove likely has biomechanical consequences similar to an in-situ tenodesis, and thus may limit ROM and clinical outcomes.

Notes:

9:22am–9:28am

Arthroscopic Hip Labral Reconstruction with Gracilis Autograft: 2-Year Minimum Outcomes

Dean K. Matsuda, MD
Raoul J. Burchette, MA, MS

Summary: This case series with matched controls demonstrates a beneficial contribution of arthroscopic hip labral reconstruction with gracilis autograft in multi-step surgeries for femoroacetabular impingement.

Introduction: The labrum appears to have a significant role in hip preservation which has fostered a growing trend towards labral preservation. However, during surgery, the labrum may not be salvageable by current repair methods. The gracilis is an alternative graft source requiring no post-harvest manipulation harvested from a small knee incision familiar to many surgeons and offers advantages of graft tensioning and graft-labral overlap, techniques (video and animations available) that may optimize labral functional restoration. There is currently high interest but a paucity of clinical evidence regarding hip labral reconstruction.

Methods: Our initial consecutive series of patients undergoing this procedure completed pre-and minimum 24-month post-operative nonarthritic hips scores (NAHS), underwent chart review and were queried as to complications and knee pain. Two control groups were obtained from a concurrent prospective clinical outcome study at the same institution with 24-month minimum followup. We first looked at the significance of changes in NAHS among the study group using the Wilcoxon signed rank test. We used two approaches to form comparable groups. The first was 1 to 1 matching of the 8 cases to 8 controls (cam-pincer femoroacetabular impingement (FAI) patients without labral reconstruction). We matched on five-year age group, gender, Tonnis grade, and pre-operative NAHS. The second approach was by linear regression of postoperative NAHS for all patients, adjusting for surgery group, age, body mass index (BMI), osteoarthritis (Tonnis 0, 1 or 2), and pre-operative NAHS.

Results: Eight consecutive patients (7 male) of average age 34.6 years (range 18-58) with average 30 month followup (range 24-37) in patients with cam-pincer FAI (5 without osteoarthritis, 3 with Tonnis 1) that underwent concurrent acetabular and femoral osteoplasties with labral reconstruction showed a high level of satisfaction (7 highly satisfied, 1 moderately satisfied) and a 50.5 point increase in NAHS (statistical significance) with mean pre-operative score of 41.9 (range 25-64) and mean post-operative score of 92.4 (range 83-99). Matched controls had a mean pre-operative NAHS of 55.4, an improvement of 22.5 (statistically significant), and a mean post-operative NAHS of 77.9. The coefficients from the linear regression of post-operative NAHS on age, BMI, gender, Tonnis grade, surgery group (whether or not labral reconstruction) and pre-operative NAHS showed only surgery group and pre-operative NAHS were statistically significant predictors of post-operative NAHS. There were no major complications or arthroplasty conversions.

Discussion and Conclusion: This is the first study of hip labral reconstruction (open or arthroscopic) with matched controls and minimum 2-year outcomes. Compared to matched controls, patients undergoing arthroscopic labral reconstruction had lower pre-operative NAHS reflective of more severe labral insufficiency but equal or better post-operative scores. Our findings support arthroscopic labral reconstruction with gracilis autograft as contributing a beneficial clinical effect in select patients with nonsalvageable labrae. These patients may have clinical outcomes comparable to those undergoing labral refixation despite having more severe labral pathology.

Notes:

Thursday, June 14, 2012

General Session V — Resident Award Papers

Moderator: Brian A. Jewett, MD

11:35am–11:43am

Blockade of Matrix Metalloproteinase-3 After Traumatic Nerve Injury Offers a Novel Treatment for Improving Functional Recovery

Tom Chao, MD
Derek Frump
Peter Hanh
Vincent J. Caiozzo
Tahseen Mozaffar
Ranjan Gupta

Hypothesis: Functional recovery after repair of traumatic nerve injuries is often rather poor. As long-term denervation leads to motor end plate destabilization, this loss of functional end points may be responsible for poor outcomes following nerve repair. Recent research supports that this process is secondary to removal of trophic elements such as agrin that maintain the neuromuscular junction (NMJ). Furthermore, it has been found that matrix metalloproteinase-3 (MMP-3) is responsible for removing agrin from the NMJ. This study seeks to examine whether the NMJ may be preserved after denervation if MMP-3 is inactivated.

Materials and Methods: A murine model for a segmental sciatic nerve injury was created and plantaris muscles were extracted from wildtype and MMP-3 knockout mice at 1 week, 2 week, 1 month, and 2 months after injury. Immuno-histochemical and Western blot analysis was conducted for NMJ components as well key molecular mediators, agrin and MuSK. Functional evaluation of 1 month denervated muscles was performed ex vivo in order to determine to what extent they remain responsive to acetylcholine activation.

Results: In contrast to wildtype mice, MMP-3 knockout muscle showed that AchRs remained intact up to the 2 month time point. Agrin immunofluorescence was also observed late after denervation in the knockout but not the wildtype. MuSK remained significantly phosphorylated 1 month after denervation in knockouts. Functional assessment of muscles demonstrated that activation with acetylcholine in MMP-3 knockouts was substantially greater than wildtypes (1.84±0.346 N vs 0.674±0.221 N).

Conclusion: Acetylcholine receptors are resistant to destabilization by denervation in MMP-3 knockouts. Agrin is maintained at the motor end plate in MMP-3 knockouts despite denervation. Functional activation of denervated muscle in MMP-3 knockouts remains robust. This research provides exciting data that supports investigation of MMP-3 inhibitors in-vivo to improve functional recovery after traumatic nerve injury.

Notes:

11:44am–11:52am

Arthroscopic Basic Task Performance in Shoulder Simulator Model Correlates with Clinical Shoulder Arthroscopy Experience

Kevin D. Martin, DO
Philip J. Belmont Jr., MD
Andrew Shoenfeld, MD
Kenneth L. Cameron, PhD
Brett D. Owens, MD

Introduction: The technical skills required to perform arthroscopy are multi faceted and require practice and repetition. Gaining this skill set can be costly and time consuming, also raising the question of patient safety. These difficulties coupled with changes in the Accreditation Council of Graduate Medical Education (ACGME) resident work hour guidelines is making proficiency harder to obtain in the traditional apprenticeship model. This has created an opportunity for simulation to emerge as viable training source for basic arthroscopic skills. Our goal was to evaluate the correlation between timed task performance in an arthroscopic shoulder simulator and the clinical arthroscopy experience of residents.

Methods: Twenty-seven residents were voluntarily recruited from an orthopedic residency program. Each subject was tested annually for three consecutive years on a standardized arthroscopic shoulder simulator and objectively scored on time to completion on an object localization task. Each subject's total number of shoulder arthroscopies, total

arthroscopies and total cases by postgraduate year were calculated from their ACGME case log. Generalized Estimating Equation (GEE) regression analysis with multivariable's was performed to determine the correlation between simulation performance and number of total shoulder arthroscopies, general arthroscopies and total cases.

Results: Accounting for multivariables the total number or prior shoulder arthroscopies performed (R=0.5486) and post graduate year in training (R=0.5952) correlated most strongly to simulator basic task performance. Subjects significantly improved (p = 0.001) their task performance on the simulator for every additional shoulder arthroscopy performed clinically. After evaluating several multivariable models, on average, for every additional post graduate year there was a 16 second improvement in the time required to complete the simulator task (p = 0.005). Similarly, after controlling for the influence of program year, on average there was 0.25 second decrease in the time to complete the similar task with every additional shoulder arthroscopy performed during residency training (p = 0.008).

Discussion: These results show a strong correlation between performance of basic arthroscopic tasks in a simulator model and the number of total shoulder arthroscopies performed. This data confirms our hypothesis that the simulator does represent task specific procedures and reflects the surgical clinical experience of the test subject.

Conclusion: This study suggests that the clinical arthroscopy experience of residents is indicative of basic arthroscopic task performance in a simulator environment. This also suggests that training on a validated arthroscopic simulator may improve simple basic arthroscopic skills. Our data may also serve as a guide to program directors, allowing them to adjust case loads based on proficiency at a given task.

Notes:

11:53am–12:01pm

Daptomycin and Tigecycline Have a Broader Effective Dose Range than Vancomycin as Prophylaxis Against a Surgical Implant *Staphylococcus Aureus* Infection

Jared A Niska, MD
Jonathan H. Shabazian
Romela Irene Ramos
Jonathan R. Pribaz, MD
Fabrizio Billi
Lloyd S. Miller

Introduction: Vancomycin is widely used for intravenous prophylaxis against surgical implant infections. However, it is unclear whether alternative antibiotics used to treat methicillin-resistant *S. aureus* (MRSA) infections are effective as prophylactic agents. The aim of this study was to compare the efficacy of vancomycin with daptomycin or tigecycline as prophylactic therapy against a methicillin-sensitive *S. aureus* (MSSA) or MRSA surgical implant infection in mice.

Methods: MSSA or MRSA was inoculated into the knee joints of mice in the presence of a surgically placed medical-grade metallic implant. The efficacy of low versus high dose vancomycin (10 vs. 110 mg/kg), daptomycin (1 vs. 10 mg/kg) and tigecycline (1 vs. 10 mg/kg) intravenous prophylaxis was compared using in vivo bioluminescence imaging, ex vivo bacterial counts and biofilm formation.

Results: High dose vancomycin, daptomycin and tigecycline resulted in similar reductions in bacterial burden and biofilm formation. In contrast, low dose daptomycin and tigecycline but not vancomycin retained a therapeutic effect against the implant infection.

Conclusions: In this mouse model of surgical implant MSSA or MRSA infection, daptomycin and tigecycline prophylaxis were effective over a broader dosage range than vancomycin, suggesting the potential for improved prophylactic therapy against surgical implant infections in humans.

Notes:

12:02pm–12:10pm

A Biomechanical Comparison of Plate Fixation and Calcium Phosphate Cement for Distal Femoral Metaphyseal Defects

Joel C. Williams, MD
Derek F. Amanatullah, MD, PhD
Adam D. Shellito, MS
Robert M. Tamurian, MD

Introduction: The optimal stabilization method after tumor resection in the distal femur remains unclear. Small defects often do not need stabilization, however there is convincing evidence that large defects need augmentation. Traditional methods include plate fixation and/or bone graft substitution. The goal of this study is to investigate the optimal stabilization method for large distal femoral defects.

Methods: Thirty-eight fourth generation composite adult femurs were randomly divided into five groups. Defects that typically result after tumor resection were created in the distal lateral metaphysis ($60cm^3$). The constructs evaluated included locked plate fixation, calcium phosphate packing, and locked plate fixation with calcium phosphate packing. Femurs with empty defects and intact femurs served as controls. Each specimen underwent axial and torsional stiffness testing along with torsional loading to failure.

Results: Axial stiffness testing revealed that the plate and calcium phosphate group was the stiffest construct (3.54 N/m), which was 18% stiffer than the plate only group, 23% stiffer than the empty group, and 16% stiffer than the calcium phosphate group, however this comparison was not statistically significant. The plate and calcium phosphate group had the highest torsional stiffness (15.62 Nm/degree), which was 6% stiffer than the plate group, 14% stiffer than the empty group, and 2% stiffer than the calcium phosphate group, however this comparison was not statistically significant. The plate and calcium phosphate group and the calcium phosphate group were 46% and 28% larger than the plate only group, and 67% and 58% as strong as the intact distal femur, respectively.

Discussion and Conclusions: These data reveal that the plate with calcium phosphate construct provides more axial and torsional stiffness, and an overall stronger construct than the plate alone construct. When compared with the calcium phosphate alone construct, however, the data show no significant difference in stiffness and only a 14% higher load to failure. Thus, stabilization with calcium phosphate cement alone likely provides enough stability and the addition of a plate may not be necessary.

Notes:

12:11pm–12:19pm

The Effect of Pedicle Screw Hubbing on Pullout Strength in the Thoracic Spine

Daniel G. Kang, MD
Haines Paik, MD
Ronald A. Lehman Jr., MD
Anton E. Dmitriev, PhD
Rachel A. Gaume, BS

Introduction: The purpose of our study was to evaluate pull-out strength (POS) of fixed-head pedicle screws after "hubbing" versus standard fixation in the thoracic spine. In the osteoporotic spine, hubbing the pedicle screw head against the dorsal cortex is postulated to provide a load-sharing effect thereby improving pull-out resistance. Also, reduction of the moment arm provided by the hubbing effect may reduce implant loosening by decreasing cephalocaudad toggling.

Methods: Twenty-two (22) fresh-frozen, human cadaveric thoracic vertebrae were obtained and DEXA scanned. Osteoporotic (n = 16) and normal (n = 6) specimens were instrumented with pedicle screws non-hubbed on the control side, and with "hubbing" into the dorsal lamina in the opposite pedicle. Cyclic fatigue loading in a cephalocaudad direction was applied for 2000 cycles at a rate of 1 Hertz (Hz). Pull-out testing was performed in-line with the midline of the vertebra at a rate of 0.25 mm/sec and peak POS measured in Newtons (N).

Results: Irrespective of BMD, "hubbed" screws resulted in significantly lower POS (290.5 ± 142.4 N) compared to standard pedicle screws (511.5 ± 242.8 N). During instrumentation, 50% (n = 11) of hubbed pedicles fractured through the lamina or superior articular facet (SAF), and 83% of pedicles fractured during hubbing in the non-osteoporotic spine. No visible fractures occurred during instrumentation of the pedicles on the "non-hubbed" side. Mean POS for hubbed screws was significantly lower in the osteoporotic versus normal BMD specimen (242.62 ± 118.73 N versus 418.16 ± 126 N).

Discussion and Conclusion: Hubbing of pedicle screws resulted in significantly lower pull-out strength compared to conventional pedicle screws in the thoracic spine. Hubbing may result in iatrogenic fracture of the dorsal lamina, transverse process, or SAF. Hubbed pedicle screws are biomechanically inferior to standard pedicle screws and should be avoided in the osteoporotic spine.

Notes:

12:20pm–12:28pm

Change in Physical Activity One Year After Lumbar Decompression With or Without Fusion: Is It Correlated to Self-Reported Outcome Scores?

Rosanna Wustrack, MD
Guillermo Ramirez
Shane Burch, MD

Introduction: Several studies have shown a significant improvement in patient-reported outcomes following surgery for degenerative lumbar conditions. However, change in physical activity was not measured. The goal of this study was to determine, using accelerometry, whether improvement in activity occurred one year following lumbar surgery. This study also evaluated the correlation between objective and subjective measures of activity.

Methods: Forty-seven patients over the age of 18 undergoing lumbar decompression with or without fusion were followed prospectively for one year. Patients' activity levels and duration were assessed pre-operatively and at 6 weeks and 12 months post-operatively using an accelerometer. Average duration (min/day) of moderate to vigorous activity (MVPA) was determined. Patients also completed the ODI, EQ-5D and SF-36 questionnaires at each time point. Change in activity and HRQL scores were analyzed using the paired t-test; correlation between the change in activity and HRQL scores were analyzed using the Spearman Rank Correlation Coefficient.

Results: At baseline the group spent an average of 8.7 min/day in MVPA. This improved to 13.8 min/day at one year; the average change per individual was 5.1 min/day (95% CI 0.85-9.7; $p = 0.05$).

Conclusions: Following decompression with or without fusion for degenerative lumbar conditions, there is a significant improvement in both HRQL scores and average min/day of MVPA. However, there is no correlation between the change in HRQL scores and activity; one should use caution when trying to infer improvements in physical activity from commonly used self-reported outcome tools.

Notes:

12:29pm–12:37pm

Incidence and Morbidity of Concominant Spine Fractures in Combat Related Amputees

Adam Bevevino, MD
Ronald A. Lehman Jr., MD
Scott M. Tintle, MD
Daniel G. Kang, MD
Theodora C. Dworak, BS
Benjamin K. Potter, MD

Introduction: High-energy blasts are the most frequent cause of combat related amputations in Operations Iraqi and Enduring Freedom (OIF/OEF). The non-discriminating effects of this mechanism, often results in both appendicular and axial skeletal injuries. This study sought to determine the incidence and consequence of associated spine fractures on patients with traumatic lower extremity amputation sustained during OIF/OEF.

Methods: Data from 300 consecutive combat related lower extremity amputations was retrospectively reviewed and grouped. Group I consisted of amputees with an associated spine fractures, and Group II consisted of amputees without spine fractures. The results of the two groups were compared with regard to initial presentation and final functional outcomes.

Results: A total of 226 patients sustained 300 lower extremity amputations. Twenty-nine of these patients had a spine fracture (13%). Group 1 had a higher Injury Severity Score (ISS) than Group 2 (30 vs. 19). Group I patients were also more likely to be admitted to the ICU (86% vs 46%). Furthermore, Group I patients had a significantly higher rate of heterotopic ossification in their residual limbs (82% vs 55%).

Discussion and Conclusion: The incidence of spine fractures in combat related amputees is 13%. The results suggest combat related amputees with spine fractures are more likely to sustain severe injuries to other body systems, as indicated by the significantly higher ISS scores and rates of ICU admission. This group also had a significantly higher rate of heterotopic ossification formation, which may be attributable to the greater local and/or systemic injuries sustained by these patients.

Notes:

2012 Scientific Program Abstracts — Friday

(An asterisk (*) by an author's name indicates the presenter.)

Friday, June 15, 2012

General Session VIII — Young Investigator Award Papers

Moderator: Peter J. Mandell, MD

8:30am–8:38am

Functional Assessment of Acute Local Versus Distal Transplantation of Human Neural Stem Cells Following Spinal Cord Injury

Ivan Cheng, MD
Robert E. Mayle Jr., MD
Don Y. Park, MD
R. Lane Smith, PhD
Ian Corcoran-Schwartz, BS
Eugene J. Carragee, MD

Introduction: Previous studies have demonstrated functional recovery of rats with spinal cord contusions after transplantation of neural stem cells adjacent to the site of injury.

Methods: Four groups of Long-Evans hooded rats were identified: 2 experimental and 2 control. All subjects underwent a laminectomy at the T10 level. A moderate spinal cord contusion at the T10 level was incurred by use of the Multicenter Animal Spinal Cord Injury Study Impactor. Experimental subjects received a subdural injection of hNSCs adjacent to the site of injury or an intrathecal injection of hNSCs through a separate laminotomy made in the mid-lumbar spine distal to the site of injury. Control subjects received an injection of control media alone. Subjects were assessed following injury and then weekly for 6 weeks using the BBB Locomotor Rating Score.

Results: Twenty four subjects underwent spinal cord injury and injection, 6 in each group (local cells, local medium, distal cells, distal medium). A statistically significant functional improvement in subjects that received hNSCs injected either locally or distally to the site of injury was observed when compared to controls ($p = 0.023$ and 0.016 respectively). There was no significant difference between subjects that received hNSCs either local or distal to the site of injury ($p = 0.92$).

Discussion and Conclusion: The acute transplantation of hNSCs into the contused spinal cord of a rat led to significant functional recovery of the spinal cord, when injected either locally or distally to the site of spinal cord injury. Patients may be able to receive a potentially therapeutic injection of hNSCs through a traditional lumbar puncture in the acute phase after their injury.

Notes:

8:39am–8:47am

Surgical Treatment of Insertional Achilles Tendinopathy with or Without Flexor Hallucis Longus Tendon Transfer: A Prospective, Randomized, Controlled Trial

Kenneth J. Hunt, MD
Carroll P. Jones, MD
Bruce E. Cohen, MD
W. Hodges Davis, MD
Robert B. Anderson, MD

Introduction: Chronic insertional Achilles tendinopathy is a common pathology that can be difficult to manage. Some have advocated augmentation with the FHL tendon in patients over age 50 and with more severe tendon disease. We hypothesize that FHL augmentation will be associated with superior clinical outcome scores and greater ankle plantarflexion strength compared with Achilles debridement alone.

Methods: Consecutive patients greater than 50 years of age who had failed non-operative treatment for chronic insertional Achilles tendinopathy were randomly assigned to Achilles decompression and debridement alone (Group 1) or Achilles decompression and debridement augmented with FHL transfer (Group 2). Outcome measures included: AOFAS ankle/hindfoot score, visual analog pain scale (VAS), ankle and hallux plantarflexion strength, and a patient satisfaction survey.

Results: A total of 28 enrolled patients had a minimum of one year follow-up, 15 in group 1 and 13 in group 2. The average patient age was 60.7 years. AOFAS and VAS scores improved in both groups at 6 months and 1 year with no difference between groups. There was greater ankle plantarflexion strength in group 2 at 6 months, and a trend toward greater ankle plantarflexion strength at one year, compared to Group 1 ($p=0.07$), with no difference between the two groups in hallux plantarflexion strength pre-op and at 1 year. 90% of patients were satisfied with the outcome of their procedure. There were significantly more wound complications in Group 2 ($p<0.05$).

Conclusion: We found no difference in clinical outcome scores and patient satisfaction when comparing patients treated with Achilles debridement alone versus FHL augmentation for chronic Achilles tendinopathy. However, we found greater ankle plantarflexion strength at 6 months in the FHL augmentation group. Augmentation with FHL transfer does not appear to demonstrate superior pain relief or functional outcomes at one year compared to Achilles debridement and decompression alone.

Notes:

8:48am–8:56am

Evaluation of Akt/mTOR Activity in Muscle Atrophy and Fatty Infiltration After Rotator Cuff Tears in a Rat Model

Brian Feeley, MD
Xuhui Liu, MD
Sunil K. Joshi
Sanjum P. S. Samagh
Dominique Laron
Hubert Kim, MD

Background: Akt/mammalian target of rapamycin (mTOR) signaling pathway plays a central role in muscle mass maintenance in response to mechanical loading. However, the role of this pathway in the development of muscle atrophy and fatty infiltration after massive rotator cuff tears (RCT) remains unknown.

Methods: Adult rats were randomly divided into 2 groups, receiving unilateral complete rotator cuff tendon transection (TT) or supraspinatus nerve transection (DN), respectively. We evaluated the Akt/mTOR signaling pathway activity, as well as its interaction with the expression of atrophy-related genes (MuRF-1 and MAFbx) in rotator cuff muscle with Western-blot analysis and real-time RT-PCR. Fat related genes (SREBP-1 and PPAR-gamma) were evaluated as well. A paired T-test was used for statistical analysis.

Results: Akt/mTOR activity was significantly reduced in supraspinatus muscle after tendon rupture, but increased after nerve injury. MuRF-1 and MAFbx were increased following denervation, but not tendon transection. SREPB-1 and PPARγ were elevated after nerve injury.

Conclusion: The Akt/mTOR pathway is regulated differently in rotator cuff muscle atrophy after tendon rupture and nerve injury. Tendon transection leads to a decrease in protein synthesis, whereas denervation leads to an increase in expression of MuRF-1 and MAFbx and increase in protein degradation. Denervation also leads to an increase in fat related gene expression (SREBP-1 and PPARγ) at 6 weeks.

Clinical Relevance: Rotator cuff muscle atrophy is believed to be one of the reasons responsible for the failure of attempted massive RCT repair. Our data suggest that both mechanisms (tendon rupture and denervation) of atrophy are important and should be considered independently when developing treatment strategies to decrease the degree of atrophy following rotator cuff tears and repairs. Importantly, this pathway also appears to have an effect on the development of fatty infiltration as well.

Notes:

Friday, June 15, 2012

Concurrent General Session XI — Trauma

Moderator: Julius A. Bishop, MD

2:10pm–2:16pm

Evaluation of Patient and Hospital Outcomes Before, During, and After Implementation of a Comprehensive, Multidisciplinary Geriatric Hip Program

Cory Collinge, MD
Kindra McWilliams-Ross, RN, BSN, CNP
Tara Weaver, RN, BSN, CRN

Introduction: The purpose of this study was to evaluate the patient and hospital outcomes before, during, and after imple-

mentation of a comprehensive, multi-disciplinary geriatric hip fracture program at our institution.

Methods: This is a retrospective cohort study of consecutive operatively treated elderly hip fracture patients managed at our busy level 2 trauma center and community hospital. Patients were divided into one of three groups: 1) those treated before our hip fracture program (n = 211; July, 2008 –April, 2009), 2) during implementation of the hip fracture program (n = 212; May, 2009 –Feb, 2010), and 3) after the hip fracture program was instituted and participation was well-established (n = 234; March, 2010-Dec, 2010). Patient and injury factors, a number of peri-operative parameters (including time to medical clearance and surgery, cardiology consults and tests, ICU days, lengths of stay), hospital costs, complications and mortality (in-hospital, and 30 day and 1 year) were compared.

Results: There was significant improvement in most parameters of care for these patients, including time from admission to medical clearance and surgery, number of cardiology consults and major cardiology tests, number of ICU days, overall length of stay, post-operative length of stay, and hospital costs. In-hospital mortality significantly increased during the implementation of this program, although once established was not significantly increased compared to before the program. Most deaths were attributed to respiratory failure and pneumonia. Thirty-day and one-year mortalities were not significantly different between the three groups.

Conclusion and Discussion: The vast majority of hospital parameters were significantly improved during and after implementation of our comprehensive, multidisciplinary geriatric hip fracture program. However, we saw a significant increase in in-hospital mortality during implementation of this program, although 30-day and 1-year mortality rates were similar between the groups. Team members should be aware that a learning curve may exist in implementing similar programs and appropriate caution should be taken during this process.

Notes:

2:17pm–2:23pm

The Modified Posterior Approach to Posterior Pelvic Ring Injuries: A Technique for Minimizing Soft Tissue Complications

Ty Fowler, MD
Julius A. Bishop, MD
Michael Bellino, MD

Introduction: Surgical techniques and fixation strategies for the treatment of unstable posterior pelvic ring injuries continue to evolve. The safety of the posterior surgical approach in particular has been questioned due to high rates of wound related complications. The goal of this study is to introduce a modified posterior approach to the posterior pelvis designed to minimize soft tissue complications, and to summarize our clinical experience using this approach at a level 1 trauma center over a ten-year period.

Methods: A retrospective analysis of our clinical experience with the modified posterior approach was undertaken. Patients were identified over a ten year period between 2001 and 2011 and included if they had undergone a posterior approach to the pelvis using the modified posterior approach for acute fracture management or late reconstruction after malunion or nonunion. Patients were only included if they had at least 4 weeks of follow-up with documentation of wound healing status. Details of the modified surgical technique are also presented.

Results: Forty-five patients were identified as having undergone a modified posterior approach to the pelvis with a total of 51 incisions. Twelve patients (13 incisions) were eliminated due to inadequate data. The final analysis was performed on a total of 33 patients with 38 incisions. There was one deep wound infection resulting in an overall wound complication rate of 2.63%.

Discussion and Conclusion: Performing a soft-tissue friendly posterior approach to the traumatized pelvic ring is an important part of optimizing outcome. We have presented a detailed description of a novel posterior approach to the pelvis and documented favorable outcomes in terms of wound healing compared to other published reports.

Notes:

2:24pm–2:30pm

Optimal Management of Isolated Closed Humeral Shaft Fractures: A Decision Analysis Model

Julius A. Bishop, MD
*Lauren Klak
Kristen Fleager, MD

Introduction: The optimal treatment for closed and isolated humeral shaft fractures remains controversial. Open reduction and internal fixation subjects the patient to surgical and anesthetic risks, but allows quicker functional recovery. Non-operative treatment avoids the risks of surgery but bracing is required and function restricted during fracture healing. The purpose of this study was to use decision analysis to identify the optimal management strategy for isolated humeral shaft fractures while incorporating the preferences of the patient.

Methods: A decision tree was constructed to model the various treatment options for a patient with a humeral shaft fracture along with the possible outcomes. Outcome probabilities were determined from systematic literature review. Patient derived utility values for each outcome were estimated. Fold back analysis was performed to identify the optimal treatment strategy and sensitivity analyses performed to determine the effects of varying the outcome probabilities and utilities on decision making.

Results: Non-operative treatment is the optimal management strategy when patient derived utility for non-operative treatment leading to uncomplicated fracture healing is greater than that for uncomplicated fracture healing after surgical fixation. When parameters were varied in sensitivity analysis it was noted that when the likelihood of nonunion after non-operative treatment increases or when the utility value for uncomplicated healing after surgical fixation increases, open reduction and internal fixation becomes the preferred management strategy.

Conclusion: This decision analysis model indicates that non-operative treatment of is the optimal strategy. In clinical settings where the risk of non-union after non-operative treatment is high or when an informed patient has a strong preference for early functional recovery, open reduction and internal fixation may optimize outcome.

Notes:

2:31pm–2:37pm

Long Term Results and Costs of Free Flap Coverage and Ilizarov Bone Transport in Lower Limb Salvage

David W. Lowenberg, MD
Rudolf Buntic, MD
Gregory M. Buncke, MD
Brian Parrett, MD

Introduction: It is a common teaching that patients with severe open tibial injuries with infection and bone loss are better served byamputation than complex limb salvage. Our preference is limb salvage with wide debridement, free muscle flap coverage, and Ilizarov bone transport. The purpose of this study was to evaluate the long term results and costs of this treatment modality.

Methods: A retrospective review was performed of all consecutive patients with lower extremity wounds with tibial defects who were recommendedamputation and were instead treated with flap reconstruction and Ilizarov bone transport by a single surgeon. A criterion was at least 6 year follow-up. Outcomes assessed were flap complications, tibial union, infection, need for future surgeries,ambulation status, employment status, and need for chronic narcotic use. Patients were also surveyed regarding their satisfaction with their reconstruction. A cost analysis was also performed for this treatment modality and q Kaplan-Meier curve was constructed to determine the lifetime risk for re-operation.

Results: Thirty-four were included with 14 acute Gustilo IIIB defects and 20 chronic tibial defects. 35 muscle flaps were performed with one flap loss (2.9%). The mean tibial bone defect was 8.7 cm, mean duration of bone transport was 10.8 months, and mean follow-up was 11 years. Primary nonunion rate at the docking site was 8.8% and malunion rate was 5.9%. All patients achieved final union and there were no cases of recurrent osteomyelitis. No patients underwent future amputations, 29% required re-operations, 97% were ambulating without assistance, 85% were working full time, and only 5.9% required chronic narcotics. All patients were satisfied with their decision to pursue limb salvage. Mean lifetime cost per patient per year after limb salvage was significantly less than the published cost foramputation by a factor of nearly 10 fold.

Discussion: This long term study confirms the benefits and cost savings to society of limb salvage overamputation for care of the severely traumatized limb.

Notes:

2:38pm–2:44pm

Does Modern Nail Geometry Affect Nail Positioning in the Distal Femur of Elderly Hip Fracture Patients? A Radiographic Comparison of Otherwise Identical Hip Nails with 200cm vs. 150cm Radius of Curvature

Cory Collinge, MD
*Michael J. Beltran, MD

Introduction: Mismatch between the radius of curvature for intramedullary hip nails and the native femoral bow may result in anterior nail placement and subsequent cortical irritation or perforation in osteoporotic bone. As a result, many manufacturers have altered the geometry of modern nails in an attempt to better match native femoral anatomy. Our purpose was to compare implant positioning in the distal femur between two cohorts of elderly patients undergoing intramedullary nailing for a hip fracture with a modern cephalomedullary hip nailing system using either a 200cm or 150cm radius of curvature.

Methods: We retrospectively assessed 60 consecutive patients with a geriatric, peritrochanteric hip fracture (Orthopaedic Trauma Association [OTA] 31A injury pattern) treated with a single intramedullary mail system at our regional Level II trauma center. All patients managed after the introduction of the 150cm curvature nail received that implant, whereas all prior received the 200cm nail. Intraoperative lateral radiographs were reviewed to asses implant placement in the distal femur with particular attention to the anteroposterior location and relationship to the anterior cortex. Nail position was described by measuring the midline of the nail's tip along a perpendicular line from the posterior to the anterior cortices, so that 0.50 would be at the mid axillary line of the femur and 0.67 would be at the anterior one-third junction.

Results: The average position of nails with a radius of curvature of 150cm was closer to the normal femoral bow when compared to the 200cm nails (0.63 vs. 0.55, statistically significant). One nail with a 150cm radius of curvature abutted the anterior cortex compared to three in the 200cm nail cohort, and one of these three abutments was associated with a non-displaced distal femur fracture.

Notes:

2:45pm–2:51pm

Medial Plantar Wounds Associated with Calcaneal Fractures

Reza Firoozabadi, MD, MA
Patricia A. Kramer, PhD
Stephen K. Benirschke, MD

Introduction: The purpose of this study is to evaluate soft tissue healing and potential complications in open calcaneal fractures that have a medial plantar wound (MPW).

Methods: A retrospective review of medical records at a Level I trauma center included 12 adults with 13 calcaneal fractures with a MPW. All patients were treated with intravenous antibiotics, irrigation and debridement, and temporary stabilization. Definitive reduction and stabilization (open reduction and internal fixation using a lateral plate, screws and K-wires) was performed an average of 33 days after injury.

Results: The most commonly associated injury with a MPW was a transcalcaneal-talonavicular fracture dislocation (8/13 injuries). The average follow up was 40 months while the time from injury to the last visit to the operating room for MPW closure related procedures averaged 76 days. Time from injury to complete healing of the MPW averaged 23 months. Five fractures developed an infection requiring intravenous antibiotics. Two patients required split thickness skin grafts to aid with wound healing and one patient required a free gracilis flap 10 months after injury to treat a chronic open MPW with resolving osteomyelitis. This patient went on to a below knee-amputation secondary to flap failure. Nonunion of the calcaneal fracture occurred in 3 patients.

Conclusion: This distinct subset of calcaneal fractures should be reported, because little information to direct surgeons in the treatment of these injuries exists. Furthermore, patients with this type of injury—even those with Type I open fractures—need to understand that their injury is associated with long-term sequelae, including complications with wound healing, high infection rates, and a higher potential for subsequentamputation than other open hind foot wounds. Surgeons who do not have expertise with soft tissue complications of calcaneal fractures should strongly consider transferring these patients to regional trauma centers for management.

Notes:

2:52pm–2:58pm

Antegrade Femoral Nailing in the Setting of Acetabular Fracture Requiring a Kocher-Langenbeck Approach

Julius A. Bishop, MD
William W. Cross III, MD
James C. Krieg, MD
Milton L. Routt Jr., MD

Introduction: Ipsilateral fractures of the femur and acetabulum represent a severe combination of injuries for which optimal management remains uncertain. The goals of this study were to report the results of ipsilateral femoral and acetabular fractures treated with antegrade femoral nailing and Kocher-Langenbeck approach and evaluate the assertion that this treatment strategy is associated with increased morbidity.

Methods: This was a retrospective cohort study at a regional Level I trauma center. We identified 16 patients with a femoral fracture treated with antegrade nailing and an ipsilateralacetabular fracture treated with a Kocher-Langenbeck approach. The incidence of wound healing complications and heterotopic ossification were assessed.

Results: One patient died as a result of his injuries and two more were not available for long term follow-up. One had a deep infection requiring irrigation, debridement and IV antibiotics. One patient developed a hematoma requiring irrigation and debridement in the operating room. At final follow-up, two patients had no heterotopic ossification (HO) about the hip, four had Brooker class I HO, three had Brooker class II HO, two had Brooker class III HO and two patients had Brooker class IV HO requiring excision.

Conclusions: Ipsilateral femoral and acetabular fractures represent a severe injury constellation. Antegrade nailing of the femur with ipsilateral Kocher-Langenbeck exposure for fixation of the acetabulum was not associated with excessive rates of wound healing complications but the incidence of HO was increased. The presence of an ipsilateralacetabular fracture is not a contra-indication to antegrade femoral nailing but more aggressive HO prophylaxis may be indicated under these circumstances.

Notes:

Friday, June 15, 2012

Concurrent General Session XII — Total Joint

Moderator: James I. Huddleston, MD

2:10pm–2:16pm

Defining the Indications for Modularity in Primary Total Hip Arthroplasty: Modular vs. Non-Modular Femoral Implants

Paul J. Duwelius, MD
*Laura Matsen-Ko, MD
Robert L. Burkhart, PA
Clayton J. Carnahan, PA
Grant Branam, BS
YingXing Wu, MD
Cecily Froemke, MS
Lian Wang, MS
Gary L. Grunkemeier, PhD

The purpose of this study was to compare the accuracy of modular vs. non-modular total hip arthroplasty (THA) in recreating the preoperative planning objectives concerning offset, leg length equality and version. The hypothesis was that modular total hip components are more accurate in achieving the objectives of recreating the preoperative plan in a higher percentage of cases, better outcomes, and a lower revision and complication rate. Two cohorts of patients, one underwent modular THA and the other non-modular THA, were followed prospectively for a minimum of 2-years.The results showed that a modular-neck stem (MNS) achieved a head center not offered by a non-modular-neck stem (NMNS) in 64% of the patients. In addition, at minimum 2-year follow-up, a higher rate of leg length equality was observed in modular THA patients, whereas the offset and complication rates were similar between the two cohorts. Although our hypothesis was only confirmed for the accuracy in achieving the leg length equality, the MNS does provide more options to recreate the head center. For primary THA, reasonable indications to use MNS are situations in which recreation of the head center is not possible with a NMNS. Based on the results of this study we recommend use of a modular stem only if recreation of the head center is not possible with a nonmodular stem.

Notes:

2:17pm–2:23pm

Injectable Calcium Phosphate Cement for Retroacetabular Osteolysis During Revision THA

Andrew I. Spitzer, MD
*Nicole M. K. Behnke, MD
Melissa M. Gross

Introduction: Retroacetabular osteolysis from polyethylene wear debris is a significant challenge during revision THA. Removing a well-fixed acetabular component may lead to substantial bone loss necessitating complex reconstruction. Retention of a well-fixed implant is an attractive option. However, grafting of the bony defect is technically limited by access to the retroacetabular space. Injectable calcium phosphate cement is a self-setting liquid which converts to hydroxyapatite in an isothermic reaction, producing void-filling osteoconductive structural support. We present a case series of patients with retroacetabularosteolysis treated with retention of implants, head and liner exchange, and calcium phosphate cement injected through screw holes in the acetabular cup.

Methods: Via a posterior approach, retroacetabular osteolytic debris was debrided through the screw holes of well-fixed acetabular components in 5 patients. Calcium phosphate cement was then injected through the screw holes into these defects. Heads and liners were exchanged. Routine clinical examinations and radiographs were performed.

Results: Average age was 58.8 years (R 33-78) in 3 men and 2 women. There were no wound complications or dislocations. Average follow-up was 10.5 months (R3-24). All patients returned to preoperative functional levels. No fixation or component failures occurred, and the radiographs demonstrated fill of the defects without deterioration.

Discussion and Conclusions: Injectable calcium phosphate cement is an effective osteoconductive structural filler for retroacetabular osteolytic lesions in a THA with a well-fixed acetabular component. Longer follow-up is necessary to determine bony substitution of the cement and healing of the osteolytic lesions.

Notes:

2:24pm–2:30pm

Hemoglobin A1C as a Predictor of Complications After Total Knee Arthroplasty

Joshua Griffin, MD
Bryce Allen, MD
Daniel C. Jupiter
Emily Y. Eye
Kindyle Brennan

Background: Patients with diabetes are at an increased risk of adverse events following total knee arthroplasty (TKA), and those with uncontrolled diabetes mellitus have increased odds of complications. The purpose is to identify a Hgb A1c value at which the risk of complications increases significantly.

Methods: A retrospective chart review with 2 year follow up was performed of 5071 TKAs from 2003 to 2011. 812 patients (16%) had diabetes. Patient demographics, preoperative end organ failure, Hgb A1c, perioperative blood glucose, perioperative complications as well as need for revision surgery and transfusion were collected.

Results: Of the 812 patients with diabetes, the average BMI was 34.21 with end organ damage (EOD) present in 313 patients (39%) and an average Hgb A1c of 6.93(range 4.4-12.8). One hundred twenty nine complications were identified in 109 patients (13.4%) with 59 medical, 35 surgical, 22 wound, and 18 infectious complications. Medical complications were increased in pts with EOD (11.8 vs 4.8,) and transfusion (15.9 vs 5.0), with Hgb A1C not statistically different between those with a medical complication and those without. There were no significant differences between those with and without surgical complication in respect to age, gender, BMI, perioperative blood glucose, EOD, Hgb A1c, or transfusion. Examination of wound and infectious complications showed a significantly higher Hgb A1c in those with wound complications than those without (7.29 vs 6.92). No statistically significant differences were found in terms of age, gender, BMI, perioperative blood glucose or EOD with respect to wound and infectious complications.

Conclusions: TKA in diabetic patients is associated with a high rate of complications. Our data do not demonstrate an increased rate of complications with increasing Hgb A1c or a level beyond which the rate of complications is increased. Hgb A1C in isolation is a poor predictor of perioperative medical and surgical complications.

Notes:

2:31pm–2:37pm

Outpatient UKA — Is It Safe?

Mark McBride, MD
Carola Romero, PA-C
Joseph Jankiewicz, MD

Introduction: Over the past several decades, numerous surgical procedures have been perfected in the inpatient hospital setting and then evolved into outpatient procedures. This has been shown to be a safe and economical transition for many orthopedic procedures. We report here our early experience with our initial consecutive series of outpatient UKAs done in a free standing ASC (ambulatory surgery center).

Materials and Methods: From 8/26/2008 to 4/22/2011 there were 30 UKAs performed as outpatient procedures at a free standing ASC. The average patient age was 57.7 years and there were 23 males / 7 females. All patients had general anesthesia with periarticularinjection of the involved knee (30 cc of Marcaine with epinephrine 1:100,000) and an intraarticular injection after closure of the capsule with 20 cc of Marcaine with epinephrine mixed with 5 cc of morphine sulfate. Patients were discharged home when stable. The postoperative length of stay ranged from 60 - 180 minutes (average of 85 minutes).

Results: No patients required admission to the hospital for any reason. There was one hemarthrosis in a medial UKA which was managed conservatively. There was one patient with a lateral UKA who developed patellofemoral synovial entrapment 3 months postoperatively and this was successfully managed with arthroscopic debridement. The vast majority of patients were ambulating well and without walking aids at the 2 week postoperative evaluation.

Conclusion: Outpatient UKA was found to be a safe, efficient, and effective method for the management of unicompartmental osteoarthritis of the knee in this relatively healthy cohort of patients. It is now our routine approach for patients undergoing UKA, with inpatient hospitalization being reserved for those patients who are at higher postoperative risk due to multiple medical comorbidities or who are felt to be pain control challenges due to preoperative narcotic management of their arthritis pain.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation.(Refer to page 39).*

Notes:

2:38pm–2:44pm

Patient Factors Predict Functional Outcomes After TKA

Justin Roth, DO
Knute C. Buehler, MD
Jianhua Shen, MS
Marybeth Naughton, BS

Introduction: There is a wide disparity in functional performance after TKA. We analyzed postoperative functional results to identify high and low performing outliers and patient factors that contribute to functional performance.

Methods: In a prospective, multicenter study, 293 CRTKA patients with minimum 2-year follow-up were divided into 3 groups based on 2-year functional performance. Group A included 61 knees (20.8%) identified as having high postoperative function if Knee Society Score (KSS) was ≥90, Lower Extremity Activity Score (LEAS) was ≥13, and SF-36 Physical Component Score (PCS) was ≥50. Group C included 64 knees (21.8%) identified as low functioning at 2 years postoperative if KSS was <70 or LEAS was <6 or SF-36 PCS was <35. Group B included 168 knees (57.3%) identified as having normal function if they did not meet Group A or C criteria.

Results: Seventy-five percent of Group C were female (vs. 49.6% in Group A), with higher mean age (68.8 vs. 64.5 years), BMI (31.5 vs. 28.8) and preoperative narcotic use (23.4% vs. 19.7%). There was a difference in preoperative SF-36 General Health Scores (Group A: 55.9; Group B: 51.3; Group C: 48.6) which widened by 2 years postoperative. The general health of the patients in Group A and B improved (+2.0 and +2.5 points respectively) while the general health in Group C declined (-1.3 points). There was no difference in operative site complications or systemic events between groups; there was a higher incidence of non-operative adverse miscellaneous events, related to the patient's general health in Group C. All 3 groups demonstrated marked improvement in pain relief (Group A: +56.9; Group B: +54.3; Group C: +51.1) and ROM (Group A: +11.1°; Group B: +12.9°; Group C: +14.2°).

Discussion and Conclusion: Preoperative age, gender, BMI, narcotic use and general health status influence postoperative functional scores after CR TKA. Significant improvements in pain relief and ROM at 2 years are independent of functional outcomes.

Notes:

2:45pm–2:51pm

Analysis of the Addition of Femoral-Sciatic Block and CPM to the Pain Management Protocol of our Joint Replacement Program

Paul Prefontaine, PT
*Jack W. Wylie, MD
Jon R. Cook, PT, DPT

Introduction: The purpose of this paper is to compare two pain management protocols utilized in our Joint Replacement Program (JRP). Goals of the JRP are to pro-actively manage pain and nausea, optimize ROM and mobility, and shorten length of stay (LOS). It was hypothesized that utilizing femoral-sciatic nerve blocks (Blocks) with continuous passive motion (CPM) could further achieve these goals. We compared a protocol that utilizes pre-op oral analgesia, short acting spinal anesthesia, peri-articular injections, patient controlled anesthesia and same day physical therapy with a protocol that utilizes Blocks and CPM in addition to the above protocol.

Methods: Forty consecutive patients in the JRP that received Blocks and CPM were prospectively studied over 10 months. Their results were compared to 39 randomly selected non-blocked patients. Post-op pain medication, nausea, ROM, gait distance, and LOS were tracked. Patients were evaluated with the 6-minute walk test (6MWT) and Knee Injury and Osteoarthritis Outcome Score (KOOS) pre-operatively.

Results: Pre-op the groups showed similar KOOS and 6 MWT scores. Average pain medication consumption was higher for the blocked group on the day of surgery and post-op day 4; higher on post-op day 2 and 3 in the non-blocked. There was no statistical difference between the groups in incidence of nausea or ROM. Average LOS was 3.48 days for the blocked and 3.33 days for the non-blocked. On the day of surgery and post-op day 1 the blocked group had significantly lower gait distance.

Discussion and Conclusion: Results indicate that TKA patients with femoral-sciatic blocks and CPM had: 1) Increased pain medication consumption on the day of surgery; 2) No significant difference in nausea; 3) No difference in ROM; 4) Decreased ambulation capacity on the operative day and post-op day 1; 5) increased LOS. These findings do not support the use of nerve blocks and CPM in our JRP.

Notes:

2:52pm–2:58pm

Identification of Landmark Registration Safe Zones in CA-TKA

Derek F. Amanatullah, MD, PhD
Paul E. Di Cesare, MD
Patrick A. Meere, MD
Gavin C. Pereira, MBBS, FRCS (Tr & Orth)

Introduction: Computer assisted total knee arthroplasty may reduce the number of patients whose components are positioned outside the acceptable range. We evaluate the tolerable error in landmark registration that will not significantly affect implant position.

Methods: We incorrect registered of each landmark in 2-mm intervals and documented the distance of deviation from each anatomic landmark required to change the varus/valgus, flexion/extension, or slope by 1º.

Results: There was a tolerance for incorrect registration of at least a 6 mm about the malleoli in any direction, femoral epicondyles in the superior/inferior direction, as well as the femoral and tibial centers in any direction. However, there was less than 2 mm of tolerance for incorrect registration in the anterior or posterior direction for the medial and lateral femoral epicondyles.

Conclusion: Incorrect registration of the distal femoral epicondyles in either the anterior or posterior direction had a profound effect on the rotation of the femoral component. It is imperative to find the distal femoral epicondyles and register them as close to their anatomic positions as possible.

Notes:

2:59pm–3:06pm

Early Experience with a High Flexion Mobile Bearing Knee: Technique and Complications During the Learning Curve

Andrew I. Spitzer, MD
*Nicole M. K. Behnke, MD
Melissa M. Gross
Marci B. Spitzer

Introduction: Mobile bearing total knee arthroplasty reduces wear and its osteolytic potential, allows rotation of the knee to self-align throughout motion, provides the necessary rotation for deep flexion without excessively loading the bearing surface, and may improve patellar tracking. Balance in the coronal and saggital planes is critical in order to prevent subluxation or dislocation of the bearing surface.

Methods: Between 9/10 and 6/11, 67 LPS Flex Mobile Bearing TKAs were implanted in 32 females and 31 males, with a mean age of 64 years (R 31-87), and BMI of 32 (R 21-48) utilizing a strict gap balancing technique with a fully adjustable anterior/posterior cutting block. 65 knees had osteoarthritis and 2 had rheumatoid arthritis.

Results: Excellent functional recovery and early satisfactory flexion were routinely observed. One patient required intraoperative conversion to a fixed bearing tibia due to inability to achieve balance with the available mobile bearing polyethylene thicknesses. Complications included one peroneal nerve palsy which resolved, one posterior dislocation without bearing disruption after a fall which required anesthesia for closed reduction, and one dislodgement of the polyethylene after a trip and twist event which required surgical removal and replacement of the insert.

Discussion and Conclusions: The benefits of a mobile bearing in total knee arthroplasty can be readily achieved utilizing this implant system. Even during a surgeon's early experience with this prosthesis, its high flexion design and other features facilitate early return of motion and functional recovery, and along with meticulous attention to gap-balancing, minimize complications associated with the mobile bearing.

**The FDA has not cleared this drug and/or medical device for the use described in this presentation.* *(Refer to page 39.)*

Notes:

2012 Scientific Program Abstracts — Saturday

(An asterisk (*) by an author's name indicates the presenter.)

Saturday, June 16, 2012

Concurrent General Session XV — Upper Extremity

Moderator: Kevin L. Smith, MD

8:45am–8:51am

Biomechanical Effect of Scapular Notching in the Reverse Total Shoulder Prosthesis

Barth B. Riedel, MD
Paul Williams, PhD
Wesley Phipatanakul, MD

Introduction: Rotator cuff tear arthropathy is a difficult problem but can be managed effectively with the reverse total shoulder prosthesis. Similar to all joint replacement surgery, the reverse shoulder does come with some challenges and complications. One highly discussed topic is that of scapular notching and its clinical effect. To our knowledge there has been no biomechanical study analyzing the effect of scapular notching on the construct strength of the reverse shoulder prosthesis. The biomechanical properties of the reverse shoulder arthoplasty with varying levels scapular notching was investigated using a load to failure model.

Methods: Foam blocks with similar properties to cancellous-glenoid bone were used. Groups were divided into a control group (no notch), type I, type II, type III, and type IV notches with each group consisting of ten trials. Notches were machined into each block, the glenoid base plate with glenosphere was attached, and each construct was loaded to failure with an Instron materials testing machine. Load to failure curves where then calculated. ANOVA and Tukey test for multiple comparisons for both maximal load and slope were used.

Results: The mean load to failure was 1.12kN for the control group, 1.02 kN for the type I, 1.03kN for the type II, 0.91 kN for the type III, and 0.83kN for the type IV notch. Notch IV was significantly lower than control, type I or II. Notch III was also significantly lower than the control group. There was no significant difference between control, notch I, or notch II. There was no statistical difference between the slope of the curves for each group ranging from 247-299kN/m. Notch IV represented approximately a 26% reduction in load to failure compared to the control group, and a 20% reduction compared to notch II.

Discussion: There was a significant load to failure difference between the type III and IV notch groups and the control group. There was a strong trend as notching increased, load to failure decreased. Load to failure curves for all groups were close to linear. This suggests that plastic deformation weakening the construct before the yield point was minimal in all groups, and likely did not strongly influence the results.

Notes:

8:52am–8:58am

Biomechanical Study of ECRL Tenodesis for Scaphoid Rotatory Instability

Hisham A. Bismar, DO
Dale R. Wheeler, MD

Scapholunate ligament injury is the most common soft tissue injury in the wrist leading to carpal instability. Left untreated, this injury can lead to a predicted pattern of carpal instability and the formation of painful wrist arthritis (SLAC wrist). This study investigates the biomechanical efficacy of the use of a new ECRL tenodesis technique to correct scaphoid flexion deformity. Five fresh-frozen upper extremities cadaveric specimens disarticulated at the elbow were examined arthroscopically to insure they all had a competent SL ligament. Wrist extensors and flexors tendons were dissected at mid forearm. The tendons were physiologically loaded to place the wrist various positions. The SL angle and gap were measured

before and after sectioning of the scaphoid stabilizer ligaments, and after ECRL tenodesis. After sectioning scaphoid ligamentus stabilizers the scaphoid flexed relative to the lunate with the wrist in neutral, radial and ulnar deviation. The observed change was maximal with the wrist in neutral (50.8°±4.29° to 67.0°±10.5°). This difference was statistically significant in neutral, radial, and ulnar wrist positions. ECRL tenodesis decreased SL angle in all positions with the largest restoration occuring in neutral wrist position (56.8°±6.12°). The scapho-lunate gap increased for all positions after sectioning scaphoid ligamentus stabilizers. After ECRL tenodesis, the SL gap further increased in all wrist positions. The ECRL tenodesis appears to decrease scapho-lunate angle under dynamic wrist loading conditions. This decrease in the SL angle is the result of stabilization of the distal pole of scaphoid which decreases its palmar flexion instability. The ECRL tenodesis appears to accentuate the scapho-lunate gap due to the direction of pull of the tenodesis. ECRL tenodesis in wrists with scapholunate instability can decrease scaphoid flexion deformity with minimal alteration of normal wrist range of motion. Based on this study, the use of ECRL tenodesis in scapholunate instability warrants further investigation.

Notes:

8:59am–9:05am

Technical Tip: Provisional Mini-Fragment Plate Fixation in Clavicle Shaft Fractures

Tiffany N. Castillo, MD
Julius A. Bishop, MD

Introduction: Plate fixation is playing an increasingly prominent role in the management of select clavicle fractures. However, short oblique and comminuted fracture patterns are not easily reduced and provisionally stabilized via conventional clamp application and lag screw placement and in these cases it can be challenging to obtain and maintain an appropriate reduction. We present a technique in which a mini-fragment plate is utilized to provisionally maintain fracture reduction while the definitive plate is applied.

Methods: We anticipate the need for provisional plating as part of our pre-operative plan in the setting of extensively comminuted or short oblique fracture patterns. We use a standard approach to the clavicle, preserving supraclavicular nerves and raising a full thickness fascial flap. If the fracture cannot be held reduced during definitive implant placement, we then consider provisional fixation utilizing a 2.0 mm mini-fragment plate that accepts low profile 2.4 mm screws. This provisional plating is compatible with either superior or anterior placement of the definitive implant.

Results: We have used this technique to treat 13 clavicle fractures between August 2010 and September 2011. A single fellowship-trained orthopaedic trauma surgeon performed all surgeries (11 males, 2 females, mean age 47 years, 4-17 months follow-up). Provisional plates were placed anteriorly in 3 cases and superiorly in 10 cases, while definitive plates were placed anteriorly in 5 of the cases and superiorly in 8 cases. The provisional plate was not retained in 2 cases. All patients have had uneventful fracture healing, no wound complications, and no loss of reduction.

Discussion and Conclusion: Provisional reduction plating may be an effective technique for the surgical treatment of short oblique or comminuted clavicle fractures where effective provisional clamp application or wiring can be difficult given the fracture pattern, relatively small surgical field and the complex anatomy of the clavicle.

Notes:

9:06am–9:12am

Radiographic Characterization of Capitate Morphology

Timothy Niacaris, MD, PhD
Ketan Patel, MD
Trevor Starnes, MD, PhD
Michael Murphy, MD
James Higgins, MD

Introduction: There are three distinct morphologies of the capitate. The flat type (Type I), the spherical type (Type 2) and the V-shaped type (Type 3) are present in 65%, 21% and 14% of the population respectively1. Following a proximal row carpectomy, Yazaki et al. demonstrate that the V-shaped capitate creates an articulation with the lunate facet of the radius that has a small contact area relative to other capitate types. They further propose that this articulation leads to high contact pressures that may result in early failure following PRC in

patients with a V-shaped capitate. We evaluated the ability of plain radiographs, CT and MRI to accurately predict capitate type as described by Yazaki et al.

Methods: We performed plain radiographs, CT and MRI of the wrists of 48 fresh frozen cadaver arms. The capitate was subsequently dissected from each cadaver and grossly characterized according to the classification system described by Yazaki et al. Two attending hand surgeons and one fellow-level hand surgeon characterized capitate type based on each imaging modality. We determined the sensitivity and specificity of each modality for predicting the true capitate type as determined by gross characterization.

Results: We found all three imaging modalities to have a low sensitivity and specificity for predicting capitate type. Plain radiographs, CT and MRI have a sensitivity and specificity of 0.50/0.75, 0.64/0.82 and 0.58/0.79 respectively. Across all capitate types, the sensitivity of each modality was lowest for predicting the V-shaped capitate type (0.33 for plain radiographs, 0.17 for CT and 0.25 for MRI).

Discussion and Conclusion: These data suggest that plain radiographs, CT and MRI are poor predictors of true capitate type. This will limit the usefulness of these modalities in studies to assess whether the V-shaped capitate is a predictor of early PRC failure in the clinical setting. We are currently investigating whether three-dimensional CT surface reconstructions will increase the sensitivity of this modality for predicting capitate type.

Notes:

9:17am–9:23am

Risk Factors for Development of Heterotopic Ossification of the Elbow After Fracture Fixation

Emilie Cheung, MD
Geoffrey D. Abrams
Michael Bellino

Background: Postoperative heterotopic ossification (HO) about the elbow after surgical fixation of fractures is common and can contribute to dysfunction. Factors associated with HO formation following surgical fixation of elbow trauma are not well understood.

Methods: All patients who underwent surgery for elbow trauma at our institution from October 2001 through August 2010 were retrospectively reviewed. Patients with prior injury or deformity to the involved elbow were excluded. Demographic data, fracture type, surgical treatment, and presence, location, and size of HO were recorded. Fisher's exact test, chi-squared, and multivariate logistic regression were utilized with an alpha value of 0.05 used for significance.

Results: A total of 159 patients were identified with 89 (37 males, 52 females) meeting inclusion and exclusion criteria. Average age was 54.4 years (range 18-90) and average follow-up time was 180 days. Age, male gender, LCL repair, and dual-incision approach were not associated with increased ectopic bone formation. Distal humerus fractures were a significant predictor of heterotopic bone. In those who ultimately developed HO, it was visible on 2 week radiographs in 86% of cases.

Conclusion: This investigation found predictors for the development of HO following surgical fixation of intra-articular elbow fractures. Furthermore, only 14% of patients without HO at 2 week radiographs went on to develop HO at time of final follow-up. This may suggest that absence of HO on 2 week radiographs may predict a more favorable outcome.

Notes:

9:24am–9:30am

Reverse Total Shoulder Arthroplasty: A Review of Revision and Complication Rates in 265 Consecutive Cases

John Costouros, MD

Introduction: Although reverse total shoulder arthroplasty (RTSA) provides an effective surgical treatment for select complex shoulder conditions, reported revision and complication rates are higher when compared to non-constrained shoulder arthroplasty. The purpose of this study was to analyze the early to mid-term complication and revision rates for primary RTSA in a consecutive series of patients.

Methods: All reverse shoulder arthroplasties performed between 2005 to 2009 at one statewide health maintenance organization were captured using a standardized electronic database. Validation of cases and complications was performed using Centers for Disease Control (CDC) guidelines and

Agency for Healthcare Research and Quality (AHRQ) patient safety indicators. Complications were stratified into those requiring revision surgery (infection, instability, implant failure, periprosthetic fracture, hematoma) or those managed nonoperatively (thromboembolic events, superficial infection).

Results: Of 3,181 shoulder arthroplasties performed during this period, 265 were RTSA (8.3%) performed by 52 surgeons. Fifteen surgeons performed 75% of these replacements. There were 12 patients lost to follow-up due to termination of insurance and 14 deaths, yielding 239 total patients. Patient retention rate was 96% during the study period with average follow-up of 25.3 months. There were 150 female patients and 89 males, with a mean age of 76 years. The overall rate of revision surgery was 8% (21 patients). Reasons for surgical revision included instability (52%,11), glenosphere failure/scapular notching (33%, 7), deep infection (19%, 4), and hematoma (5%, 1). The average duration of time between the index procedure and revision surgery was 311 days (range 3-1446, SD=381). Non-surgical complications included 2 cases of deep vein thrombosis (0.01%) and 3 cases of pulmonary embolism (1%) treated nonoperatively. Female gender (p=0.04) and surgeon volume less than 40 cases (p=0.01) was associated as a risk factor for surgical revision.

Discussion and Conclusion: RTSA is associated with high complication and revision rates relative to primary non-constrained shoulder arthroplasty in the community setting. At early to midterm follow-up, instability is the primary reason for revision surgery. Further longitudinal studies and understanding of wear mechanisms are needed to determine long-term failure rates.

Notes:

9:31am–9:37am

A Clinical Evaluation of a New Arthroscopic Biceps Tenodesis Technique

Alan M. Hirahara, MD, FRCSC

Purpose: To evaluate the clinical effectiveness of a new arthroscopic biceps tenodesis technique.

Methods: Fifteen study patients had their biceps tenodesed with a new distal notch arthroscopic technique while nine control patients had a tenotomy. In the study group, the biceps within the distal notch was identified using ultrasound guidance. Arthroscopic stitching of the proximal, intra-articular biceps tendon and release was performed. Arthroscopically, the biceps was identified at the distal notch and pulled out one of the portals. Resection of 20 mm of tendon was done after baseball stiching the tendon. A 6.5 x 30 mm tunnel was created in the distal notch. A knotless surgical technique was then used to tenodesis the tendon into the tunnel. We did not exclude patients who had associated pathology. Non-compliant patients and those suffering post-op trauma were excluded. Patients were evaluated clinically with VAS pain scores and ASES scores monthly for six months. Days to discharge and return to work were also evaluated.

Results: One out of fifteen (6.7%) study patients ripped out their tenodesis. Pain scores decreased in both groups from pre-op to six months (Study: 6.5 to 0.9 / Control: 7.7 to 2.1). ASES scores increased in both groups (Study: 41.8 to 81.5 / Control: 34.2 to 72.5). Days to discharge & return to work were 125.6 / 121.8 and 208.3 / 94.7 for Study / Control groups, respectively.

Conclusions: The new arthroscopic distal-notch biceps tenodesis is easy and effective. It helps reduce pain and improve function, just as well as a tenotomy. Tenodesis has already been shown to result in greater muscular strength and improved cosmesis and decreased potential for muscular spasms. Further study to enhance the power of this study is required.

Notes:

9:38am–9:44am

Bone Mineral Density of the Lumbar Spine and Femoral Neck Do Not Correlate with Loss of Reduction in Elderly Distal Radius Fractures

Brett N. Robin, MD
Matthew Ellington, MD
Michael L. Brennan, MD
Chanhee Jo, PhD

Introduction: Osteopenia and osteoporosis are well-documented risk factors for fragility fractures such as those involving the distal radius. The relationship between bone mineral

density and the healing of these fractures in elderly patients, however, is not well defined or understood. Age and bone mineral density from DEXA scans are often considered when contemplating operative management versus closed reduction and splinting for these fractures. We hypothesized that an increasing degree of osteoporosis in the femoral neck and lumbar spine is associated with loss of reduction following closed manipulation and splinting in elderly patients with distal radius fractures.

Methods: A retrospective review was performed, evaluating 61 patients (57 females, 4 males) over the age of 60 with a displaced distal radius fracture definitively managed with closed reduction and splinting. T-scores from the lumbar spine and femoral neck were recorded from dual energy x-ray absorptiometry (DEXA) scans performed within 1 year of injury. The initial fracture radiographs, post reduction radiographs, and healed radiographs were evaluated radiographically with respect to standard criteria, including volar tilt, radial height and radial inclination. The percentage of reduction maintained with respect to each reduction variable was calculated. T-scores of the lumbar spine and femoral neck were then correlated with percent of retained reduction using Pearson's correlations coefficients.

Results: There was no correlation between T-scores of the lumbar spine or femoral neck and the amount of reduction lost throughout the healing process of distal radius fractures with respect to volar tilt, radial height, or radial inclination.

Discussion and Conclusion: There appears to be no relationship between bone mineral density, based on T-scores of the lumbar spine and femoral neck, and the ability to maintain reduction following closed manipulation and splinting of displaced distal radius fractures in patients over age 60.

Notes:

Saturday, June 16, 2012

Concurrent General Session XVI — Foot & Ankle / Practice Management

Moderator: Michael P. Kennedy, MD

8:45am–8:51am

A CT Study Characterizing the Anatomy of the Uninjured Ankle Syndesmosis

Elliot S. Mendelsohn, MD
*Thomas G. Harris, MD
C. Max Hoshino

Introduction: The syndesmosis is commonly described as being 30 degrees externally rotated, but this has not been validated in the literature. One of the steps to achieving an anatomic reduction of the syndesmosis is placement of reduction tenaculums and screws perpendicular to the plane of the joint. Therefore, it is critical to understand the normal orientation of the syndesmosis joint in order to prevent malreduction. Since postoperative plain radiographs have been shown to be inaccurate in evaluating the reduction of the syndesmosis, CT is more frequently being used to evaluate the accuracy of syndesmosis reduction. Defining the width of the uninjured syndesmosis provides a baseline for comparison of postreduction CT's.

Methods: At Harbor-UCLA Medical Center, 18 adult patients (30 extremities) were identified from November, 2010 - December, 2011 that had fine-cut CT scans of the lower extremities to evaluate for vasculopathy. Prior syndesmosis injuries and fractures were excluded. The degree of external rotation of the syndesmosis was measured relative to the femoral transepicondylar axis. The width of the syndesmosis joint space was measured 1cm superior to the joint line.

Results: The syndesmosis was an average of 31.7 ± 5.9 degrees externally rotated with respect to the femoral transepicondylar axis. The anterior, central, and posterior width of the syndesmosis joint space was 1.5 ± 0.9, 1.7 ± 0.6, and 2.4 ± 1.2 mm, respectively. The posterior width was significantly greater than the anterior (p=.002) and central width (p=.01).

Discussion and Conclusion: In accordance with expert opinion, the syndesmosis is approximately 30 degrees externally rotated. Therefore, reduction clamps and screws should be placed at this angle to avoid syndesmosis malreduction. The posterior joint space width is significantly wider than the ante-

rior and central joint spaces. This provides a baseline for comparison in future studies using postoperative CTs to evaluate syndesmosis reduction.

Notes:

8:52am–8:58am

Ankle Fusion in Patients with Hemophilia

Benjamin Bluth, MD
Yi-Jen Fong, MD
Justin J. Houman, BS
James V. Luck Jr., MD
Mauricio Silva, MD

Introduction: Ankle fusion in patients with hemophilia is a well-accepted treatment for end-stage arthropathy. However, long-term outcome data has been lacking, with many studies reporting findings based on very small sample sizes. The objective of this study was to evaluate the long-term results of ankle fusion in a large group of hemophilic patients treated at a single institution.

Methods: The results of 57 ankle fusions performed on 45 patients between 1971 and 2010 were reviewed retrospectively with a mean follow-up time of 6.6 years. Data was gathered for type and severity of hemophilia, HIV status, fixation technique, post-operative complications, and requirement of additional surgeries. A pain score and modified American Orthopaedic Foot & Ankle Society (AOFAS) hindfoot score was calculated for twenty ankles available for follow-up.

Results: There were no intra-operative or immediate post-operative complications related to fusion of the ankle. While the overall non-union rate was 10.4% for tibio-talar fusion and 8.3% for sub-talar fusion, this rate was reduced to 3.7% and 5.6%, respectively, after the introduction of newer surgical techniques in 1995. None of these non-unions required revision surgery. Subsequent sub-talar fusion was required in 3% of ankles who underwent primary tibio-talar fusion. The modified AOFAS scale demonstrated that 75% had no pain in the operated ankle a mean of 7.2 years following surgery. The remaining 25% scored their average pain as 3 out of 10. The functional portion of the score suggested that patients have minimal activity limitations, the ability to walk for long distances, little or no gait abnormality, and overall good alignment.

Discussion/Conclusion: Ankle fusion is an excellent alternative for end-stage hemophilic arthropathy of the ankle. It successfully relieves pain and provides a good functional outcome. While the incidence of non-union is relatively high, it appears to be similar to that in the non-hemophilia population.

Notes:

8:59am–9:05am

The Three Axis Spherical Total Ankle Replacement (TAR) Concept Revisited: Maxium 5-Year Experience with a Custom Two-Part Non-Cemented Hard-on-Hard Horizontally Impacted Press Fit Design

Richard C. Smith, MD

Introduction: In the early 1970s, a metal on polyethylene spherical TAR met initially with encouraging results only to succumb, as did cylindrical design, to late failure attributed to ill-conceived cement fixation and delamination of the over stressed polyethylene, not the spherical concept. With Investigational Review Board approval, four patients successfully received a non-FDA approved custom TAR of metal-on-metal (M-on-M), the longest follow up now 5 years.

Methods: An antero-lateral approach was employed. A simple cutting block whose height corresponded to the combined height of the prosthetic components as well as theamount of bone to be removed to accommodate them, is placed into the distracted space provided, and with its four degree sagittaly converging tapered dove-tail saw slots (two proximal, two distal) ensuring osteotomies will be registered congruently, the bone between cuts is removed and refined with a tapered dove-tail broach, the two prosthetic components are then simultaneously taped into place horizontally, in a Morse-taper-like fashion.

Results: P.N., a 58-year-old man, 5 years post TAR. Pre-operative diagnosis traumatic arthritis and subtalar fusion. He remains very satisfied. O.C., a 58-year-old nurse, 3 years post TAR. Pre-operative diagnosis traumatic arthritis. She remains

very satisfied. Two patients did not reach the two-year follow up criteria, required. (1year 10 months and 1 year 3 months) but their circumstances warrant inclusion.

Discussion and Conclusion: No instability was encountered with spherical TAR, prior subtalar fusion not a contraindication, edge loading minimized, implantation forgiving with simple tooling, and lastly, spherocity beingamenable to hard-on-hard technology (ceramic-on-ceramic proposed) has provided an alternative to polyethylene.

Notes:

9:13am–9:19am

Talus and Fibula Kinematics After Syndesmosis Injury: Implications for Optimizing the Surgical Treatment Algorithm

Kenneth J. Hunt, MD
Elizabeth George, BA
Anthony K. Behn, MS
Derek P. Lindsey, MS

Introduction: High ankle sprains, or injuries to the distal tibiofibularsyndesmosis, are predictive of long-term ankle dysfunction. The current paucity of data on this topic has resulted in difficulty with injury assessment and making management decisions. Using a cadaveric model, our objectives were to determine: 1) the radiographic changes, and 2) rotational and linear displacement of the talus and the fibula relative to the tibia with sequential syndesmosis ligament injury.

Methods: Eight cadaveric specimens underwent serial sectioning of the anterior-inferior tibiofibular (AITFL), interosseous (IOL), posterior-inferior tibiofibular (PITFL), and deltoid ligaments. After each ligament release, specimens underwent external rotation followed by lateral translation. Kinematic data (using a validated infrared LED motion capture system) and radiographic measurements were obtained. Repeated measures ANOVA with a Bonferroni/Dunn post hoc test was calculated for interspecimen comparisons.

Results: With external rotation testing, talar external rotation relative to the tibia increased significantly with each ligament after AITFL sectioning. Fibular external rotation increased significantly after release of the AITFL and IOL. Posterior displacement of the fibula began following AITFL release. Significant radiographic widening of the medial clear space and syndesmosis occurred only after release of the deltoid ligament. With lateral translation testing, syndesmosis and medial clear space widening were not significantly different compared to the intact state until after release of the deltoid ligament.

Conclusions: Stress radiography does not appear to be a reliable indicator of mild or moderate syndesmosis injuries. Significant talar rotation and posterior fibular displacement occur during external rotation, even with moderate syndesmosis injury, and prior to disruption of the deltoid ligament. The change in joint kinematics may explain why patients with moderate-to-severe syndesmosis injuries take longer to heal and develop long term dysfunction. Surgical stabilization or a longer period of immobilization should be considered for patients suffering from moderate or severe syndesmosis injuries.

Notes:

9:20am–9:26am

Talar Body and Head Fractures in Snowboarders

Nancy M. Luger, MD
Kyle E. Swanson, MD
Cecilia Pascual-Garrido, MD
Britta L. Swanson, PhD

Introduction: Fractures of the lateral process of the talus, also known as “snowboarder’s ankle,” commonly occur in snowboarders. Fractures of the talar head and body also occur, but with much less frequency. A description of talar head and body fractures caused by snowboarding, their treatment and subsequent outcomes has not been reported in the literature.

Methods: A retrospective chart review was performed on all cases collected from 2008-present to include all snowboarding injuries with talar body, head, or lateral process fractures. Radiographs were reviewed and the fractures were characterized. Questionnaires, including the Foot and Ankle Disability Index (FADI), were mailed to the patients. The pre-operative reports, surgical treatments and outcomes were evaluated.

Results: A total of eight patients were identified with fractures of the talus caused by a snowboarding injury. Six of the eight patients sustained talar body fractures, one patient sustained a talar head fracture, while the eighth patient had a fracture of the lateral process. None of the patients developed avascular necrosis, nonunion/malunion, or required subsequent surgery. FADI scores indicated good to excellent results post-operatively.

Discussion and Conclusion: It is well known that snowboarders are risk for lateral process of the talus fractures associated with their sport. However, talar body and head fractures have not been well-published injuries and seem to be occurring with more frequency as the sport continues to gain popularity. This study demonstrates a case series of snowboarders in a small ski town that were treated for these talar injuries and had a functionally good-excellent outcome. Awareness of this injury can lead to improved diagnosis and timely treatment.

Notes:

9:27am–9:33am

Musculoskeletal Proficiency of Emergency Medicine Physicians

Garet Comer, MD
Emily Liang
Julius A. Bishop, MD

Introduction: Frequently, emergency medicine (EM) physicians perform the initial evaluation and management of urgent and emergent musculoskeletal problems so it is critical that they achieve a basic level of proficiency in musculoskeletal medicine. However, inadequacies as well as dissatisfaction with musculoskeletal education have been well documented amongst medical students, residents, and attending physicians. The goal of this study was to assess the adequacy of musculoskeletal educationamongst EM residents and attending physicians.

Methods: A validated musculoskeletal medicine competency examination was administered to the emergency medicine residents and faculty at an academic medical center. Additionally, a questionnaire was administered that surveyed demographic data, experience with common orthopedic procedures and management, and comfort with administering musculoskeletal care.

Results: Forty-seven percent of resident physicians and 39% of attending physicians failed to achieve a passing score on the examination. Senior residents were no more likely than junior residents to pass the examination. Faculty in practice for greater than five years had a significantly higher passing rate than faculty in practice less than five years. Satisfaction with the musculoskeletal training provided in residency strongly correlated with examination passage rate.

Discussion and Conclusion: Significant deficiencies in musculoskeletal education existamongst emergency medicine physicians at all levels. Given the frequency with which these physicians evaluate and treat acute musculoskeletal conditions, additional resources should be committed to their education.

Notes:

9:34am–9:40am

MRI Utilization in a Six Man Orthopedic Practice Before and After Acquisition of a .3T Open MRI

John Finkenberg, MD

Introduction: Over utilization is argued as the greatest deterrent from allowing physicians to acquire in-office MRI equipment. Radiologist and hospitals own the majority of MRI facilities.

Methods: A six-man orthopedic group monitored utilization one year before and two years after acquisition of a .3T open MRI (ACR Accredited). The physicians other than the author were blinded regarding the study or its outcome. Individual physician established/new patient volume, payor mix, in-office, hospital and independent out-patient MRI use was tabulated. One hundred percent of the studies were evaluated by board certified radiologists.

Results: Practice volume increased by 11% over the three years (2008-2010). Thirty percent of the patients were covered by Medicare. The greatest utilization was from the spine subspecialist whose practice volume increased by 9.6% and the MRI utilization increased by 5.2%. Hospital MRI use

decreased by 0% (32/32) at one hospital and 73% (30/8) at the second community hospital. There was an 88% (690/83) decrease in utilization of the radiology owned independent MRI facility.

Discussion: There was no evidence of MRI overutilization in a six man orthopedic group when an in-office .3T open MRI unit was acquired. Significant benefits were noted in patient satisfaction (travel, scheduling, cost), immediate physician review, ease of study modification by ordering physician and future availability for review and duplication.

Notes:

Saturday, June 16, 2012

Concurrent General Session XVIII — Pediatrics

Moderator: Ellen M. Raney, MD

12:40pm–12:46pm

Range of Motion of the Healthy Pediatric Elbow: Cross-Sectional Study of a Large Population

Mauricio Silva, MD
*Justin H. Barad, MD
Rachel S. Kim, BA
Edward Ebramzadeh, PhD

Introduction: There is a paucity of normative data on elbow range of motion in the pediatric population, and the limited reports available on this topic have significant methodological shortcomings. The availability of normative data is critical when setting the particular goals of a therapeutic approach. The purpose of this study was to analyze a large population of normal pediatric elbows to determine normative values of range of motion, and how those values relate to patient characteristics.

Methods: Our institution has been conducting an ongoing, prospective, IRB-approved data-collection project on pediatric elbow fractures. As part of the project, the range of motion data of the healthy, contralateral elbow is being recorded for comparison purposes. Passive arc of motion data on 1,361 normal pediatric elbows was collected from January 1, 2008, through August 31, 2011. The arc of motion was measured with the use of a goniometer calibrated in 1° increments, using standard techniques.

Results: Of the 1,361 patients included in this analysis, 55% were boys and 45% were girls. Of the elbows included, 57% and 43% were left and right elbows, respectively. The mean age of the patients was 4.9 years (range: 1-16 years). The mean amount of flexion, extension and arc of motion measured in these 1,361 elbows was of 142° (range: 125°-155°), -11° (range: -35°-0°), and 153° (range: 127°-175°), respectively. There was no clinical difference in the mean amount of flexion, extension and arc of motion measured in boys (141°, -11°, and 152°, respectively), as compared to girls (143°, -12°, and 154°). The available data demonstrate no correlation between patient age and theamount of flexion arc, extension arc, or the total arc of motion. Similarly, no correlation was found between patient weight and the amount of flexion arc, extension arc, or the total arc of motion.

Discussion and Conclusion: To our knowledge, this is the largest study to date on normative values of elbow range of motion in the pediatric population. In contrast to previous studies, our data suggest that elbow range of motion in this population is not affected by gender, age or subject weight. The availability of normative data is critical when setting the goals of a particular therapeutic approach.

Notes:

12:47pm–12:53pm

Return to Sports After Surgery to Correct Adolescent Idiopathic Scoliosis: A Survey of the Spinal Deformity Study Group

Daniel G. Kang, MD
Ronald A. Lehman Jr., MD
Lawrence G. Lenke, MD
Daniel J. Sucato, MD, MS

Introduction: Participation in sports and athletic activities by children and adolescents has become an important aspect of society. There have been no studies in the last decade, with modern posterior instrumentation, concerning the nature and timing of postoperative return to athletic activities, with recommendations continuing to be based largely on anecdote and axiomatic teaching. Therefore, we set out to identify current

factors influencing return to sports after surgery to correct adolescent idiopathic scoliosis.

Methods: A survey was administered to members of the Spinal Deformity Study Group (SDSG). The survey consisted of surgeon demographic information, 6 clinical case scenarios and three different construct types (hooks, pedicle screws, and hybrid).

Results: Twenty-three surgeons completed the survey, with 43% being orthopaedic spine surgeons, 57% being pediatric orthopaedic surgeons. Respondents were all experienced, expert deformity surgeons, and this was supported by 50% performing an average of 21-50 AIS cases per year, and 44% of surgeons with >20 years in practice. Most patients were allowed to return to non-contact and contact sports within 3-6 months, and collision sports within 6-12 months postoperatively. We also found pedicle screw instrumentation allows earlier return to contact & non-contact sports. For all construct types, approximately 20% of respondents never allow return to collision sports, whereas all surgeons allow eventual return to contact & non-contact sports regardless of construct type. There was only 1 reported catastrophic failure in a patient with implant pullout after snowboarding 2 weeks postoperatively.

Discussion and Conclusion: Modern posterior instrumentation allows surgeons to recommend earlier return to sports, with the majority allowing non-contact and contact sport at 6 months and collision sports at 12 months. There continues to be significant variability in surgeon recommendations, and further studies are necessary to determine the safety of return to sports, although complications and adverse events appear to be rare.

Notes:

12:54pm–1:00pm

The Outcome of Non-Operative Treatment of Medial Epicondyle Fractures in the Pediatric Population

Juliann Kwak, MD
Rachel S. Kim, BA
Mauricio Silva, MD

Introduction: The treatment of pediatric medial epicondyle fractures (PMEF) of the humerus is controversial.

Methods: We retrospectively analyzed clinical and radiographic information on fifty-one PMEF that were included prospectively in our pediatric elbow fracture database, from April 2007 through September 2011. The 51 fractures were seen in 36 boys and 15 girls, with an average age of 11 years (4-16 years). Forty-one of the fractures (80.4%) were treated non-operatively, with the use of a long arm cast. For comparison, the data on ten fractures (19.6%) that were treated surgically (open reduction and internal fixation) was analyzed. The indication for surgery was an intra-articular incarceration of the medial epicondyle in five patients, and family preference in five patients. The presence of clinical (infection, vascular, neurologic, of otherwise) or radiographic (non-union) complications, and the recovery of range of motion were compared between groups.

Results: The mean follow-up was 25 weeks (6-121 weeks). The mean fracture displacement for the non-operative group was 4.7mm (0-21mm), as compared to 14.1mm (2.1-36mm) for the operative group ($p < 0.00001$). Incarceration of the medial epicondyle was seen in 50% of the cases in which there was an associated elbow dislocation. The length of cast immobilization was of 21 days (6-33 days) in the non-operative group, as compared to 17 days (8-35 days) in the surgical group ($p = 0.04$). No complications were seen in either group. At their latest follow-up, all fractures were clinically and radiographically healed, either by fibrous or bony union. All patients were asymptomatic, with no complains of late ulnar nerve symptoms. At the latest follow-up, the range of motion of the affected elbow, as compared to the normal, contralateral side, was of 93% in the non-operative group and 89% in the operative group ($p = 0.16$). While there are no significant differences between the two groups, the main limitation for motion at the latest follow-up was a lack of recovery of terminal extension.

Conclusions: Non-operative treatment is a viable alternative for most pediatric medial epicondyle fractures. The results of this study suggest that, even for displaced fractures, conservative management can result in adequate outcomes. There are certainly specific indications for surgical treatment, including the intra-articular incarceration of the medial epicondyle after an elbow dislocation. In order to better understand the long-term outcomes of the treatment of medial epicondyle fractures, a randomized controlled trial is necessary.

Notes:

1:01pm–1:07pm

Short Leg Casting for Toddler's Fractures

Drew J. Brown IV, MD
Nicholas R. Scarcella, MD
Byron H. Izuka, MD

Introduction: An isolated fracture of the tibial shaft, or so-called "toddler's fracture," is a common injury seen in young children. This fracture is typically an oblique fracture of the shaft of the tibia with minimal or no displacement. Current treatment recommendations are sparse in the literature as to the optimal method for immobilization. A long leg cast is more difficult to ambulate in, is more difficult to care for and results in more joint stiffness and muscular atrophy. We hypothesize that treatment of toddler's fractures with a short leg cast will be as effective as treatment with a long leg cast.

Methods: A retrospective review of patients' charts and radiographs obtained from a single surgeons practice from 2008-2011 was performed. Inclusion criteria were isolated, spiral fractures of the tibial shaft in patients 13 years of age and younger. Exclusion criteria were multiple fractures (including those of the fibula), displaced fractures requiring reduction, evidence of any underlying metabolic bone disease and lack of adequate radiographic follow-up.

Results: Forty-nine patients were included in this study with an average age of 4.9 years of age. Patients were treated for an average of 39.5 days in a short leg cast. 3/49 patients required a cast change due to various patient factors. We found that 49/49 (100%) of the patients achieved union at an average of 1.2 months with no loss of alignment occurring during cast-treatment. No cast-related complication occurred.

Discussion and Conclusion: Long leg casting has historically been the recommended treatment for isolated fractures of the tibial shaft in children. We found that short leg casting is a safe and effective alternative with little risk for fracture displacement.

Notes:

1:08pm–1:14pm

Plain Radiography Versus 3-Dimensional CT Scan in Assessing Cobb Angle for Complex Spinal Deformities

Meghan Imrie, MD
Ivan Cheng, MD
Don Y. Park, MD
Lawrence A. Rinsky

Purpose: Scoliosis is a complex spinal deformity whose true magnitude can be difficult to capture by 2-dimensional imaging, especially in large or unusual curves. Our group noticed an under-representation of curve magnitude by xray compared to 3-dimensional CT scanning (3DCT) in some patients; we therefore wished to investigate first the reliability of Cobb angle measurement in 3DCT and then compare it to X-ray measurement of the same curve.

Methods: This was a retrospective review of all patients with spinal deformity who had obtained a 3DCT from 2001 until 2011 and had a comparative xray within 6 months of the CT without any intervention between the two studies. Three observers (1 pediatric orthopaedist, 1 spine surgeon, and 1 spine fellow) independently measured both X-rays and CT scans on 3 separate occasions separated by at least a week using the digital PACS system. Three separate measurements were made for each 3DCT: using the same endplates as were used for the Cobb angle on the plain xray (CT same), rotating the film to find the worst deformity and selecting end vertebrae from there (CT worst), and using the posterior elements (CT posterior). Intra-observer and inter-observer reliability were assessed by the intraclass correlation coefficient (ICC, excellent 0.81 to 1.00) and comparisons between the X-ray and CT measurements by ANOVA.

Results: Seventeen patients were identified, average age of 10.3 years (2.2-18.4 years). Diagnoses varied but included congenital scoliosis (7), neuromuscular scoliosis (3), and severe idiopathic (2). The intra-observer ICC values were: for plain X-ray, 0.97-0.99, for CT same 0.92-0.98, for CT worst 0.91-0.97, and for CT posterior 0.80-0.93. The average inter-observer reliability ICC values were: for plain X-ray, 0.92, for CT same 0.83, for CT worst 0.82, and for CT posterior 0.94. The X-ray Cobb averaged 6 degrees less than the CT worst (p = 0.067). Although this does not reach statistical significance, there was a significant correlation between curve magnitude and difference in measures (r = 0.62, p = 0.001), indicating greater disagreement as the curve increases. Using the posterior elements on the CT grossly underestimates the

curve, 51 versus 70 degree average, *p* significant while using the same endplates gives a similar Cobb angle as the plain X-ray, 72 versus 70 degree average.

Conclusion: Cobb angle measurement, even in complex curves, has excellent intra- and inter-observer reliability when assessed on plain film or 3DCT, no matter how the end vertebrae are chosen. As curve magnitude increases, plain X-ray Cobb may underestimate the deformity as compared to 3DCT.

Notes:

1:15pm–1:21pm

Suture Augmentation of Plated Pediatric Clavicle Fractures

Nicholas R. Scarcella, MD
Lorrin Lee, MD
Byron H. Izuka, MD

Introduction: The vast majority of clavicle fractures in the pediatric population can be treated nonoperatively due the robust osteogenic potential in this population. Operative treatment may be required in instances of skin tenting or significant displacement. In cases where comminuted fragments are too small to fix with plates and screws, suture material can be used to hold reduction of such pieces to the plate construct.

Methods: Case series consisting of retrospective review of 6 patients' charts and records from a single surgeons practice between 2008-2011. Inclusion criteria were isolated comminuted clavicle fractures requiring open reduction and internal fixation in pediatric patients due to significant displacement or skin tenting. Clavicle fractures which could be treated nonoperatively were excluded. All fractures were open reduced and large comminuted fragments were held with suture fixation to the plate and screw construct.

Results: Six pediatric patients from a single surgeons practice were included in this study. All patients underwent superior plating of the clavicle with suture augmentation of large comminuted fragments. Clinical and radiographic union was observed in 6/6 patients at follow up. Follow up is ongoing. A variety of suture material was used. There were no operative or post-operative complications. Fragments fixed typically were in the form of a large butterfly fragment and in one case involved a fragment that was found to be rotated in the sagittal plane 180 degrees anteriorly. Such fragments were open reduced at time of surgery and secured to the plate and screw construct with suture material.

Discussion and Conclusion: Suture augmentation can be utilized to improve final reduction and fixation of clavicle fractures in the pediatric population to maximize chance of union. We found this technique to be an option open to surgeons to improve reduction at time of operation.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation.(Refer to page 39).*

Notes:

1:22pm–1:28pm

Lateral Spurring Following Pediatric Lateral Condyle Fractures

Jonathan R. Pribaz, MD
Mauricio Silva, MD
Nicholas M. Bernthal, MD
Thalia Wong, BS

Introduction: Bony overgrowth over the lateral condyle, or "lateral spurring," is commonly identified following lateral condyle fractures of the humerus in children. Despite its frequent recognition, no prior study has defined the phenomenon, established an incidence rate, explored a correlation with fracture or treatment characteristics, nor assessed whether it is of functional significance.

Methods: We retrospectively analyzed 212 consecutive lateral condyle fractures. Spurring was defined as an overgrowth of bone over the lateral condyle resulting in an irregularity of the metaphyseal flare. The magnitude of the spurring was classified by measuring the increase in maximum inter-epicondylar width (IEW) of the distal humerus on the latest follow-up radiograph.

Results: Of the 212 fractures, 73% developed a lateral spur. Of those, 43% had a mild spur, 38% a moderate spur, and 19% a severe spur. Fractures that developed a spur had a mean initial displacement of 3.3 mm, as compared to 1.1 mm in those that did not develop spurring. The amount of initial displacement was higher for fractures that developed mild (2.4 mm), moderate (3.6 mm), and severe (4.9 mm)

spurs, as compared to fractures with no spur. At the latest follow-up, patients that developed lateral spurring had a mean relative arc of motion of 93.7% of the normal contralateral elbow, whereas patients without a spur had a relative ROM of 94.3%.

Discussion and Conclusion: Lateral spurring is an extremely common sequela of lateral condyle fractures in children. The development of a spur does correlate with initial displacement and surgical treatment. The size of the spur is associated with the amount of initial fracture displacement. Despite concerns from patients, families, and physicians alike, neither the presence nor the size of the lateral spur appear to influence the final outcome.

Notes:

1:29pm–1:35pm

Outcomes of Rectus Femoris Transfers in Children with Cerebral Palsy: Effect of Transfer Site

William F. Scully, MD
Mark L. McMulkin, PhD
Glen O. Baird, MD
Andi B. Gordon, MPT
Bryan J. Tompkins, MD
Paul M. Caskey, MD

Introduction: Distal rectus femoris transfer is a widely accepted and effective treatment for children with cerebral palsy who present with stiff knee gait. Previous research has reported improvement in knee arc of motion regardless of transfer site, but sample sizes and patient disease severity were unmatched and quite different in these studies. The purpose of this study was to compare the outcomes of children with cerebral palsy treated with a distal rectus femoris transfer for stiff knee to one of three sites: medial to either the semitendinosus or sartorius or lateral to the iliotibial band. Sample sizes in the three groups were equal and matched by the overall gross motor function of the subjects in each group.

Methods: The Motion Analysis Laboratory database was queried for all subjects who had a rectus femoris transfer with pre- and post-operative gait studies. The Iliotibial Band (ITB) group, 14 subjects (20 sides), was the smallest group of subjects identified. This group established the sample size for Sartorius (SR), and Semitendinosus (ST) groups which originally had larger sample sizes but were matched to reflect similar proportions of Gross Motor Functional Classification System Level to the ITB group.

Results: There were no significant differences between the three rectus femoris transfer groups pre-operatively on knee gait variables. Comparison of pre- to post-operative data demonstrated significant gait improvements for all three groups in knee arc of motion of 11, 12, and 12 degrees for the ITB, SR, and ST groups respectively. There were also significant improvements in timing of peak knee flexion in swing, and knee extension at initial contact for all three groups. No significant differences were noted between the three groups in magnitude of improvement.

Discussion/Conclusion: Distal rectus transfer continues to be an effective procedure for treating stiff-knee gait in cerebral palsy. The location site of the transfer resulted in equally beneficial outcomes; therefore, the transfer site location can be based on surgeon preference and concomitant procedures.

Notes:

Saturday, June 16, 2012

Concurrent General Session XIX — Spine

Moderator: Robert A. Hart, MD

12:40pm–12:46pm

Incidence of Venous Thromboembolism (VTE) Following Lumbar Decompression and Fusion: Results from the California Hospital Discharge Database (317,301 Procedures)

John Martino, MD
*Rolando F. Roberto, MD

Introduction: Evidence-based guidelines for anticoagulation following spinal surgeries do not exist, as the incidence of VTE following these operations is poorly defined. We exam-

ined the three month cumulative incidence (CI) of DVT, PE, patient death, and hospital readmission within ninety days following four common spinal procedures: discectomy; laminectomy; lumbar posterior fusion; and lumbar anterior fusion. The effects of patient sex and age were also examined as variables.

Methods: Linked California Hospital Discharge Database records were used to determine the CI of VTE (DVT plus PE), death, and hospital readmission from 1996 to 2006. ICD-9-CM codes were used to identify specific procedures and VTE diagnoses. Patients with VTE prior to operation were excluded.

Results: Based on 317,301 procedures (144,183 discectomies, 88,001 laminectomies, 65,983 posterior lumbar fusions, and 19,134 anterior lumbar fusions), the CI of VTE was 1,593 events with 821 DVTs and 772 PEs. The incidence of VTE after discectomy was 0.3% (404 cases, 202/202 DVT/PE), 0.5% after laminectomy (427 cases, 201/226 DVT/PE), 0.8% after posterior fusion (534 cases, 262/272 DVT/PE), and 1.2% after anterior fusion (228 cases, 156/72 DVT/PE). After discharge and within 90 days of operation, 26,352 (8.3%) patients were readmitted and 784 (0.25%) died. 901 of the 1,593 VTE events occurred after discharge from the index operation (3.4% readmission rate).

Discussion/Conclusion: VTE following spinal surgery occurs infrequently, with increasing risk after fusion (odds ratio 2.5 anterior, 1.7 posterior, statistically significant difference) when compared to discectomy or laminectomy. Half of the VTE events were DVT alone, and about half of all VTE events were diagnosed after the original hospitalization. VTE accounted for a small fraction of all readmissions within 90 days of surgery. Death following elective spinal surgery is quite rare. Practitioners should consider pharmacologic VTE prophylaxis after anterior fusion of the lumbar spine (VTE above 1%).

Notes:

12:47pm–12:53pm

Surgical Salvage of Failed Lateral Access Interbody Spinal Fusion (XLIF)

Kim R. Driftmier, MD
Myles M. Mitsunaga, BA
D. Thomas Rogers, MD
Jon F. Graham, MD
Morris M. Mitsunaga, MD

Introduction: Recently minimally invasive lateral access spinal fusion has been gaining popularity. Extreme lateral interbody fusion (XLIF) has been shown to successfully treat various pathologies of the lumbar spine. We performed the XLIF on 153 patients from May, 2008 to June 2011. We reviewed our series to investigate potential reasons for failure and to assess the results following reoperation.

Methods: We retrospectively reviewed the charts of 153 patients who underwent the XLIF procedure by the senior author. Lumbar diagnosis included lumbar spinal stenosis, degenerative spondylolisthesis and lumbar degenerative scoliosis. MRIs were reviewed and spinal stenosis was graded according to the MRI classification using qualitative severity grading based on the morphology of the dural sac. Radiographs were followed for progression of subsidence, spondylolisthesis or worsening of scoliotic deformity. The patients were followed clinically and filled out the Oswestry questionnaire before and after their initial surgery and subsequent to the salvage procedure.

Results: A total of 253 lumbar levels were operated on in 153 patients. Of these, 18 patients (12%) demonstrated clinical failure necessitating secondary posterior salvage surgery. The most common cause of failure was progressive subsidence with residual spinal stenosis especially in postmenopausal females with spondylolisthesis and osteoporosis. Salvage procedures for these patients included posterior decompression with supplemental posterior instrumentation and fusion, most commonly the interlaminar lumbar instrumented fusion (ILIF) procedure. Follow up on these patients demonstrated good to excellent clinical results using the Oswestry questionnaire grading score and the Prolo clinical outcome classification.

Discussion and Conclusion: We conclude that pre-operative evaluation of bone mineral density and MRI can predict failures of the XLIF procedure. Risk factors for failure include: high grade spinal stenosis, low bone mineral density, and presence of spondylolisthesis with osteoporosis in the postmeno-

pausal female. We found that failed XLIF can be successfully salvaged with a posterior decompressive and stabilizing procedure such as ILIF.

Notes:

12:54pm–1:00pm

Results of Three Different Techniques Using the Lateral Approach for Lumbar Interbody Arthrodesis

Michael R. Briseño, MD
Robert T. Arrigo
Stefan A. Mindea
Shashank Ravi
Navpreet K.Bains
Ivan Cheng, MD

Introduction: The outcomes data of differing techniques for the lateral approach to the spine remain sparse. This is a comprehensive retrospective review performed with multiple surgeons.

Materials and Methods: A chart review was performed of all patients at a single institution undergoing lateral lumbar interbody arthrodesis from July 2008 until July 2011. Three different approach techniques were identified: 1) anterolateral (AL) with retraction of the entire psoas muscle, 2) shallow docking (SD) superficial to the psoas with directly visualized dissection through the psoas, and 3) traditional transpsoas (TP) dissection using neuromonitoring.

Results: One hundred twenty six patients were identified, 81 male and 45 female. Average age was 61.8 years (22 - 86 years) and 25.4% of patients had one or more adverse events in the perioperative period. Thirteen patients (10.3%) had anterior/lateral thigh parasthesias, 9 (7.1%) had radicular pain, and 3 (2.4%) had post-operative weakness. There was one case each of graft/instrumentation failure, superficial wound infection, ileus, and three cases of peri-operative stroke. Four patients returned to the OR within 30 days. There was a 31.6% rate of adverse events in the AL group, 31.0% rate with the SD group, and a 19.0% rate with TP group. 99.1% of patients had either Grade A or B anterior fusion at last follow-up. VAS scores for back and leg pain improved from 6.3 to 3.7 and 5.9 to 3.7 respectively. ODI score improved from 43.4 to 33.1.

Discussion: In this study, 25.4% of patients sustained a post-operative adverse event following lateral interbody arthrodesis. The transpsoas approach appears to have the lowest rate of adverse events when compared with the anterolateral and shallow docking approaches.

Notes:

1:01pm–1:07pm

An Algorithm to Identify 90-Day Readmissions After Fusion Surgery for Adult Thoracolumbar Spinal Deformity

Steven Takemoto, PhD
Alexandra Carrer
William Schairer
Vedat Deviren
Serena Hu
Sigurd Berven, MD

Introduction: Unplanned readmissions are an indicator of quality of care and also may affect reimbursement rates. Various alternatives to fee-for-service reimbursement including not paying for avoidable rehospitalizations are being considered. Here we develop and validate an algorithm to determine potentially avoidable readmissions attributable to spinal fusion for thoracolumbar spinal deformity.

Methods: We used ICD-9 diagnosis and ICD-9-CM procedures codes to develop algorithms to: 1) distinguish unplanned versus planned staged procedures, 2) exclude admissions for causes unrelated to the fusion procedure, and 3) to determine the cause of readmission. Algorithms considered surgical procedures, surgical approach, and hierarchies of diagnoses. Algorithms were validated with chart review, with agreement rates described using the Kappa statistic.

Results: Of the 875 deformity patients having a primary fusion surgery between 12/2005-9/2011, 770 that were free of osteomyelitis, infection or tumor were considered. There were 68 unplanned readmissions and 59 planned staged admissions in 90 days (127 all-cause readmissions). There were 84 algorithms tested for (1), 3 for (2), and 24 for (3). Algorithm and chart review agreement rates ranged poor to excellent (Kappa >0.8): 1) planned readmission from 33.6% to 91.1%; 2) excluding unrelated readmissions from 68.4% to 91.0%; 3) assigning readmission diagnosis from 70.9% to

93.4%. The cumulative 30-, 60-, and 90-day unplanned readmission rate were 5.6%, 8.1%, and 8.8%. There were ten major causes of readmission – the primary cause of readmission at 30 days was surgical site infection (65.1%, n = 28/43) and at 61-90 days was proximal junctional kyphosis (33.3%, n = 2/6).

Discussion and Conclusion: Unadjusted algorithms do not account for planned and unrelated readmissions. An algorithm utilizing ICD-9 diagnosis and procedure codes attributed only 53.5% of all-cause 90-day readmissions to be true unplanned readmissions. We will examine whether the high algorithm concordance rate is replicated at other centers.

Notes:

1:08pm–1:14pm

Meta-Analysis of Fusion Rates for Minimally Invasive TLIF Performed Without Posterolateral Bone Grafting and Fusion

Adam Bevevino, MD
David E. Gwinn
Daniel G. Kang, MD
Ronald A. Lehman Jr., MD

Introduction: The need for posterolateral fusion (PLF) in addition to interbody fusion during minimally invasive (MIS) transforaminal lumbar interbody fusion (TLIF) has yet to be established. Omitting a PLF significantly reduces the overall surface area available for achieving a solid arthrodesis, however it decreases theamount additional soft tissue dissection and potential costs of additional bone graft. This analysis sought to perform a meta-analysis to establish the fusion rate of MIS TLIF performed without attempting a posterolateral fusion.

Methods: We performed an extensive Medline and Ovid database search through December 2010 revealing 39 articles. Inclusion criteria necessitated that a one or two level TLIF procedure was performed through a paramedian minimally invasive approach with bilateral posterior pedicle screw instrumentation and without posterolateral bone grafting. Computerized tomography (CT) verified fusion rates were mandatory for inclusion.

Results: Seven studies (case series and case controls) met-inclusion criteria with a total of 408 patients that underwent MIS TLIF as described above. 56.6% of patients were female with overall mean age of 50.7 years. 78.9% of patients underwent single level TLIF. Average radiographic follow-up was 15.6 months. All patients had autologous interbody bone grafting harvested from the pars interarticularis and facet joint of the approachside. Either PEEK or allograft interbody cages were used in all patients. Overall fusion rate, confirmed by bridging trabecular interbody bone on CT scan, was 94.7%.

Conclusion: This meta-analysis suggests that MIS TLIF performed with interbody bone grafting alone has similar fusion rates to MIS or open TLIF performed with additional posterolateral bone grafting and fusion.

Notes:

1:15pm–1:21pm

Decrease in Airway Complications Following Enhanced Fluid and ICU Protocol in Patients Undergoing Cervical Decompression and Fusion Crossing the Cervico-Thoracic Junction

John P. Dupaix, BS
*Robert A. Hart, MD
Renata Rusa, MD
Joseph Volpi, BS

Introduction: Airway compromise remains an important potential complication for patients undergoing combined anterior and posterior cervical decompression and fusion (CAPCDF) crossing the cervico-thoracic junction. Intraoperative and postoperative fluid restriction may reduce risks of airway complications in this population. This report compares incidence of airway issues prior to and following initiation of a fluid restriction protocol.

Methods: A retrospective study was performed comparing airway complications such as postoperative airway edema requiring re-intubation and/or prolonged intubation beyond 48 hours prior to and after a protocol of intraoperative fluid restriction with maintenance of intraoperative blood pressure with colloid and vasopressors was implemented in patients undergoing CAPCDF. Secondary endpoints also compared

included operative time, intraoperative blood loss, and volume of IV fluid replacement.

Results: Among patients operated prior to establishment of the protocol, 45% (9/20) experienced airway edema requiring extended intubation or reintubation. This rate was reduced to zeroamong 8 patients operated following the creation of the protocol ($p = 0.029$). IV fluid volumes were reduced from 6190 mL to 4802 mL after institution of the protocol ($p = 0.016$). EBL was analogous at 1024 mL prior to the protocol and 869 mL following its establishment, as was total surgical time was 7.09 hours and 6.97 hours, respectively.

Discussion/Conclusion: Establishment of a fluid management protocol for patients undergoing CAPCDF reduced the incidence of postoperative edema requiring prolonged intubation. Airway complications were decreased following combined anterior/posterior cervical decompression and fusion crossing C7-T1 with an enhanced inter-operative and ICU protocol restricting intraoperative crystalloid, keeping the head in a elevated position, and delaying extubation. Although this study is a retrospective review with a small number of patients, it nonetheless suggests a technique to reduce the incidence of this potentially lethal complication. Larger studies to assess the efficacy of this intervention are warranted.

Notes:

1:22pm–1:28pm

Patient Perception of Lumbar Spinal Stiffness After Posterior Instrumented Lumbar Fusions

Jayme Hiratzka, MD
Shannon L. Hiratzka, MPH
Robert A. Hart, MD

Introduction: Increasing numbers of patients are undergoing lumbar spine fusion procedures in the United States. While these surgeries are often successful in relieving pain due to instability, these benefits come with a corresponding loss of lumbar range of motion. If significant, this motion loss may lead to difficulties in activities of daily living (ADLs). Previous studies have found that limitations in ADLs resulting from lumbar fusion surgeries are not accurately predicted by commonly used outcome measures such as the Oswestry Disability Index and SF-36 score. In response to this, we have devised and validated a 10-question survey to specifically address difficulties in ADLs due to lumbar stiffness after fusion surgeries.

Methods: The Lumbar Spine Disability Index (LSDI) was prospectively administered to 46 patients undergoing primary posterior instrumented lumbar fusion of 1-5 segments. LSDI scores were collected, along with ODI and SF-36 scores preoperatively and at 3-, 6-, 12-, and 24 months postoperatively. This abstract reports the 2-year results of this cohort.

Results: LSDI scores were analyzed using a paired t-test. Overall, there was a mean decrease in LSDI score from preoperative to one-year postoperative for patients undergoing 1-level fusion (n = 19) of 14.14% (95% CI -23.41%, -4.86%; $p = 0.0049$). Small non-significant changes were seen for those patients undergoing 2-level (1.67%, 95%CI -9.37%, 12.72%; $p = 0.7427$), 3-level (5.35%; 95%CI -14.88%, 12.71%; $p = 0.4620$) and 5-level (6.47%, 95%CI -6.1%, 19.08%, $p = 0.2909$) fusions.

Discussion and Conclusion: At one year follow-up, patients undergoing posterior instrumented fusion of a single lumbar levels report a decrease in difficulty with ADLs due to lumbar stiffness when compared to preoperative values. No difference in scores in patients undergoing 2-, 3- or 5-level fusions could be demonstrated with the available numbers.

Notes:

1:29pm–1:35pm

The Ventral Lamina and Superior Facet Rule: A Morphometric Analysis for Ideal Thoracic Pedicle Screw Start Point

Daniel G. Kang, MD
Ronald A. Lehman Jr., MD
Lawrence G. Lenke, MD
Rachel A. Gaume, BS
Haines Paik, MD

Introduction: With the increasing popularity of thoracic pedicle screws, the freehand technique has been espoused to be safe and effective. We set out to define the morphologic relationship of the ventral lamina (VL) to the pedicle for optimal pedicle screw starting point in the thoracic spine.

Methods: One hundred fifteen thoracic spine vertebral levels (n = 229 pedicles, 1 excluded due to fracture) were evaluated. After the vertebral body was removed, K-wires were inserted retrograde along the four boundaries of the pedicle. Using digital calipers, we measured width of the superior articular facet (SAF) and pedicle at the isthmus, and from the borders of the SAF to the boundaries of the pedicle. We calculated the morphologic relationship of the VL and center of the pedicle (COP), to the SAF.

Results: The VL was identifiable in all specimens forming the roof of the spinal canal, and confluent with the medial pedicle wall (MPW). The mean distance from SAF midline to the MPW was 1.34±1.25 mm medial. The MPW was lateral to SAF midline in 34 (14.85%) pedicles, with a mean distance of only 0.52±0.51 mm lateral. The mean distance from SAF midline to COP was 2.22±1.49 mm lateral. The COP was medial to SAF midline in only 11 (4.80%) pedicles.

Discussion and Conclusion: The VL is an anatomically reproducible structure, consistently located medial to the SAF midline (85%). We also found the COP consistently lateral to the SAF midline (95%). Based on these morphologic findings, the starting point for thoracic pedicle screws should be 2-3 mm lateral to the SAF midline ("superior facet rule"), allowing screw placement in the COP, and avoiding penetration into the spinal canal.

Notes:

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2012 WOA Poster Presenters

Poster Abstracts

(An asterisk (*) by an author's name indicates the presenter.)

Poster 1

Optimal Fixation for Horizontal Medial Malleolus Fractures

Derek F. Amanatullah, MD, PhD
Erik McDonald, BS
Adam D. Shellito, MS
Shain Lafazan
Alejandro Cortes
Shane Curtiss, AS
Philip R. Wolinsky, MD

Introduction: This study evaluated the mechanical properties of four different fixation methods of horizontal fractures of the medial malleolus.

Methods: Identical horizontal osteotomies were created in synthetic distal tibiae using a jig. The specimens were randomly assigned to one of the four fixation groups (n = 10 per group) - plate: a contoured 2.0 mm mini-fragment 10-hole T-plate secured to the distal tibia using four 40.0 mm x 2.4 mm cortical screws; tension band: a standard figure-of-eight tension band was fashioned with 18-gauge wire and secured distally with two 2.0 mm diameter Kirschner wires placed parallel to each other; parallel screws: two 40 mm length, 4.0 mm diameter cancellous screws were placed parallel to each other; divergent screws: two 40 mm length, 4.0 diameter screws were placed with approximately 35° of divergence. The specimens were then tested using offset axial tension at 10 mm/minute until 2 mm of displacement occurred.

Results: The average stiffness was 177.7 +/- 26.2 N/mm for the plate group, 124 +/- 15.9 N/mm for the tension band group, 141.2 +/- 23.9 N/mm for the parallel group, 112 +/- 22.2 for the divergent group. The average stiffness of the plate construct was significantly greater than any of the other constructs. The average stiffness of the tension band, parallel, and divergent groups were not significantly different from each other. The average force at 2 mm of displacement was 362 +/- 72.2 N for the plate group, 266.7 +/- 43.0 N for the tension band group, 291.7 +/- 47.1 N for the parallel group, and 230.5 +/- 44.0 N for the divergent group. The average force at 2 mm of displacement was significantly greater with the plate construct than any other construct. The average force at 2 mm of displacement of the tension band, parallel, and divergent groups were not significantly different from each other.

Conclusion: Using a contoured 2.0 mm mini-fragment T-plate as the method of fixation resulted in a stiffer construct that required more force for 2 mm of displacement when used to stabilize an osteotomy model of a horizontal medial malleolus fracture.

Poster 2

Caudad Pedicle Screw Compression Optimizes Thoracic Kyphosis Correction: A MicroCT and Biomechanical Analysis of Pedicle Morphology and Screw Failure

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Daniel G. Kang, MD
Anton E. Dmitriev, PhD
Melvin D. Helgeson, MD
Lawrence G. Lenke, MD

Introduction: As surgeons perform cantilever correction maneuvers in the spine, it is common to have pedicle screws pullout or displace while placing corrective forces on the construct. Currently, surgeons either compress against the cephalad aspect of the pedicle, or vice versa. The purpose of this study was to evaluate the bone density/trabecular width of the thoracic pedicle and correlate that with its resistance against compressive loading utilized during correction maneuvers in the thoracic spine (i.e. cantilever bending).

Methods: Fourteen fresh-frozen cadaveric vertebrae (n = 14) were examined by MicroCT to determine bone volume / total volume ratio (% BV/TV) within the cephalad and caudad aspects of the pedicle. Specimens were sectioned in the sagittal plane. Pedicles were instrumented according to the straightforward trajectory on both sides. Specimens were then mounted and loading to failure was performed perpendicular to the screw axis (either the cephalad or the caudad aspect of the pedicle).

Results: Mean failure when loading against the caudad aspect of the pedicle was statistically, significantly greater (454.5 + 241.3 N versus 334.79 1+158.435 N) than for the cephalad pedicle. In concordance with the failure data more bone was observed within the caudal half of the pedicle (87.6% + 3.5% versus 84.3% + 6.0%) compared to the cephalad half.

Discussion and Conclusion: Our results suggest that the caudal aspect of the pedicle is denser and stronger compared to the cephalad cortex. In turn, the incidence of intra-operative screw loosening and/or pedicle fracture may be reduced if the compressive forces (cantilever bending during deformity correction) placed upon the construct are applied against the caudal portion of the pedicle.

Poster 3

Open Reduction and Intramedullary Nail Fixation of Closed Tibia Fractures

Julius A. Bishop, MD
Gregory D. Dikos, MD
Dayne Mickelson, MD
David P. Barei, MD, FRCS(C)

Introduction: Indirect reduction and intramedullary nailing of closed fractures of the tibial shaft can be challenging. Fracture displacement as well as interposed bone and soft tissue can preclude anatomic reduction and prevent the passage of an intramedullary nail. When fractures cannot be accurately reduced and stabilized utilizing closed or percutaneous techniques, a formal open reduction can be performed. The purpose of this study was to evaluate the safety and efficacy of a formal open reduction prior to intramedullary nail fixation of the tibial shaft.

Methods: Using the trauma database at a level-I trauma center, 230 tibia fractures treated using intramedullary nail fixation over a period of 10 years by 3 fellowship trained orthopaedic trauma surgeons were identified. Closed fractures not associated with compartment syndrome and treated with formal open reduction prior to intramedullary nailing met inclusion criteria for this study. These fractures were matched based on AO/OTA fracture classification with a retrospective cohort of fractures treated with closed reduction and intramedullary nailing. Medical records were reviewed for evidence of complications and radiographs evaluated for healing and final alignment. Descriptive statistics were used for frequency and mean analysis and univariate analysis was performed.

Results: Eleven of 230 fractures met inclusion criteria for this study. These were compared with cohort of 21 fractures treated with closed reduction and intramedullary nailing. All fractures in the open reduction group united within 5 degrees of anatomic alignment in all planes. There were no infections or nonunions. In the closed reduction group, all fractures also healed within 5 degrees of anatomic alignment. There was one deep infection and one nonunion. Univariate analysis revealed that none of the differences between the study groups were significant.

Discussion and Conclusion: Closed reduction and intramedullary nailing remains the treatment of choice for most significantly displaced fractures of the tibial shaft, but there are circumstances in which this technique is not appropriate. In these situations, open reduction with respectful handling of the soft tissue envelope is as safe and effective as the closed technique.

Poster 4

Scrub Cap Contamination

Chad Brockardt, MD
Montri D. Wongworawat, MD

Introduction: Operating room sterility is controlled via scrubbing of the hands and donning surgical gowns and gloves. The area above the neck remains nonsterile and brushing of two heads over a wound may produce an iatrogenic infection. To examine this theory we tested take home surgical scrub caps against disposable scrub caps and simulated a casual brush in the operating room.

Methods: Twenty take home non-laundered surgical scrub caps were obtained from the orthopaedic resident population. One investigator donning sterile surgical attire in the operating room performed a replication of a casual brush measuring 6 inches between two non-laundered scrub caps 18 inches above a blood auger plate. After incubation for 48 hours a quantitative analysis of colony forming units (CFUs) was measured. This was repeated with the same caps after being laundered in their owner's home. Disposable scrub caps that tie behind the head were used as a comparison. Six control plates were opened in the operating room for 30 seconds.

Results: Mean CFUs after incubation were as follows: disposable 0.86 ± 2.5 CFUs, home non-laundered 0.75 ± 1.5 CFUs, and home laundered 0.1 ± 0.31 CFUs. Chi square statistical analysis was used to compare observed and expected results

from each group measured against the control. Analysis of variance was used to compare the three means.

Discussion and Conclusion: There is no statistically significant difference between the quantity of CFUs formed between disposable, home non-laundered, and home laundered scrub caps. Although there was no statistically significant difference, mean comparison between the groups showed the take home laundered scrub caps formed the least amount of CFUs and disposable scrub caps formed the most.

Poster 5

Temporal Assessment of Osteochondral Allograft (OCA) Transplants with T2 Mapping and Delayed Gadolinium-Enhanced MRI of Cartilage (dGEMRIC) at 1 and 2 Years

Dawson Brown, MD
Michael G. Durkan, BS
Jerzy Szumowski, PhD
Dennis C. Crawford, MD, PhD

Introduction: We evaluated the biochemical health of transplanted OCA cartilage using dGEMRIC and T2 mapping and correlated those results with patient reported outcomes.

Methods: Eight patients with focal grade 4 ICRS articular cartilage defects of the femoral condyle were treated with single cylindrical OCA grafts. They were prospectively evaluated with dGEMRIC and T2 mapping at one and two years. The KOOS and IKDC subjective scores were obtained at baseline, one, and two years. Regions of interest (ROI) were drawn in repair (RC) and control (NC) cartilage. For T2 mapping, ROI were drawn in the deep and superficial layers of RC and NC. Raw T1 values were used to calculate several established dGEMRIC indexes including: relaxation rate (R1), change in relaxation rates (ΔR1) before and after contrast, and a relative change ratio between RC and NC for each ROI (ΔR1Rel).

Results: All patients reported significant improvement from baseline IKDC scores and all five subsets of the KOOS at 1 and 2 years. 6/8 patients had an increase in the ΔR1Rel from one to two years. No correlations were apparent between the dGEMRIC ΔR1Rel and the IKDC score (R = -0.20) and the KOOS pain score (R = -0.36). Comparing NC and RC showed prolonged T2 values were seen in the superficial zone at 1 and 2 years. Qualitative analysis of T2 maps showed native cartilage at the OCA interface, circumferential to the graft, had fibrous tissue formation in 3/7 patients at 1 year and 4/7 patients at 2 years.

Discussion and Conclusion: No correlation was observed between patient reported outcomes and the ΔR1Rel. Quantitative T2 mapping and dGEMRIC demonstrated OCA cartilage undergoes some level of degeneration at 1 year and 2 years post implantation. The appearance of fibrous tissue formation at the OCA interface corroborates histological studies of OCA transplantation.

Poster 6

Gender Differences in Non-Union and Malunion Following Midshaft Tibia Fractures

Lance W. Chapman, BS, MS III
Sharon L. Hame, MD
Elizabeth Nora Jovanovich, BS, MS IV
Stephanie S. Ngo, BS
Jessica E. Ellerman, MD
Jeffrey C. Wang, MD

Introduction: Midshaft tibia fractures can cause lifelong disability. They occur predominately in males and treatment options vary. The purpose of this study was to compare 5 treatments for midshaft tibia fractures and to evaluate the treatment for non-union and malunion given gender.

Methods: Patients who underwent treatment for midshaft tibia fractures from 2004-2009 were identified by CPT code using a commercially available online database of private insurance billing records. Treatments included external fixation, intramedullary nailing, open treatment with internal fixation, closed treatment with and without manipulation/ reduction. Records were cross referenced for non-union, malunion, and gender.

Results: In total, 23,418 patients were identified. Non-union developed in 209 (1%) patients and malunion in 52 (0.2%). ORIF yielded the highest incidence of non-union (2.5%). Incidence of non-union following external fixation was 2.3%, and following intramedullary (IM) nailing was 2.2%. Four patients (0.8%) in the external fixation group and 28 (0.5%) in the IM nailing group developed malunion. Of all males undergoing external fixation, 4 (1.1%) suffered non-union, whereas 8 (4.7%) of all females undergoing external fixation suffered non-union. Fourteen (1.1%) males and 2 (0.3%) females in the open treatment with internal fixation group developed malunion.

Discussion and Conclusion: Gender differences may exist in midshaft tibia fracture outcomes. Our study demonstrated a significant difference in gender with respect to non-union in the external fixation group and in malunion in the ORIF group. Further studies should examine this gender disparity.

Poster 7

Combined Transplantation of Human Neuronal and Mesenchymal Stem Cells Following Spinal Cord Injury

Ivan Cheng, MD
Don Y. Park, MD
Robert E. Mayle Jr., MD
R. Lane Smith, PhD
Ian Corcoran-Schwartz, BS
Eugene J. Carragee, MD

Introduction: Transplantation of human fetal neural stem cells (hNSCs) has previously shown significant functional recovery after spinal cord contusion in a rat model. Other studies have indicated that human mesenchymal stem cells (hMSCs) can home to areas of damage and cross the blood brain barrier. We hypothesized that acute administration of hMSCs combined with subacute hNSCs would enhance functional recovery in spinal cord injury.

Methods: Female adult Long-Evans hooded rats underwent laminectomy at the T10 level. A moderate spinal cord contusion at the T10 level was induced by use of the MASCIS Impactor. 4 groups were identified for this study. Group 1 received hMSCs intravenously (IV) immediately after spinal cord injury (acute) and returned 1 week later (subacute) for injection of hNSC directly at the site of injury. Group 2 received hMSC IV acutely and cell media directly subacutely. Group 3 received cell media IV acutely and hNSC subacutely. Group 4 received cell media IV acutely and cell media subacutely. Subjects were assessed functionally following injury and then weekly for 6 weeks using the BBB Locomotor Rating Score.

Results: Twenty four subjects were utilized in this study, 6 subjects in each group. A statistically significant functional improvement was seen in the MSC+NSC group and the NSC-only group compared with control ($p = 0.027$ and 0.042, respectively), but the MSC-only group did not demonstrate a significant improvement over control ($p = 0.145$). Comparing the MSC+NSC group and the NSC-only group, there was no significant difference ($p = 0.357$).

Discussion and Conclusion: The subacute transplantation of hNSCs into the contused spinal cord of a rat led to significant functional recovery when injected either with or without the acute IV administration of hMSCs. Neither hMSCs-alone nor the addition of hMSC to hNSC treatment resulted in significant functional improvement.

Poster 8

Biomechanical Evaluation of Mean Articular Screw Distance and Medical Calcar Support in Proximal Humerus Fractures Treated with Locked Plating

Emilie Cheung, MD
Geoffrey D. Abrams
Marc Safran
Nicholas J. Giori, MD
Derek P. Lindsey, MS

Background: Medial calcar reduction in proximal humerus fractures is important for preventing varus collapse. It remains unknown whether inferior-medial screw support alone is sufficient to prevent varus collapse and the biomechanical implications of the distance from screw tips to subchondral bone.

Methods: Nine paired fresh frozen humerii were divided into intact medial calcar (+MC) or missing medial calcar (-MC) groups through surgical neck osteotomies. Osteotomies were reduced and fixated with a proximal humeral locking plate prior to cyclic varus loading. Specimen survival, varus angulation, screw penetration through articular cartilage, and mean articular distance of the screw (MADS) (distance from screw tip to subchondral bone) on fluoroscopic imaging was recorded. Logistic regression, linear regression, Chi-squared, and Student's t-test analyses were utilized with an alpha value of 0.05 set as significant.

Results: Eight of 9 (89%) –MC specimens failed during cyclic loading versus 3 of 9 (33%) +MC specimens ($p = 0.047$). Total cycles endured were greater in the +MC group (3,587 vs. 1,606; $p = 0.06$) while varus angulation was significantly increased in the –MC group (23.4 vs. 11.6 degrees; $p = 0.04$). There were no cases of screw penetration though the articular surface in any case. Linear regression showed significance in correlating MADS and varus angulation during cyclic loading. A MADS of 5 mm correlated with a 7.8% failure rate in +MC specimens.

Conclusions: Inferior locking screws do not fully biomechanically compensate for lack of medial calcar support and

decreased MADS correlated with a lower risk of biomechanical failure.

Poster 9

Early Failure of Anterior Pelvic Ring Fixation

Jonathan Eastman, MD
James C. Krieg, MD
Milton L. Routt Jr., MD

Introduction: The purpose of this study is to present a series of patients with pelvic ring injuries who experienced pubic symphysis plate failure within 7 weeks and report associated injury and patient factors.

Methods: Through a retrospective review of a prospectively collected trauma database, 126 patients sustained a pelvic ring injury treated with anterior and posterior ring fixation were identified from December 2009 to December 2011. Surgical intervention included open pubic symphysis stabilization with a flexible 3.5 millimeters (mm) reconstruction plate and percutaneous iliosacral screws. Patients were toe-touch weight bearing on the injured side. Each patient's chart and radiographs were reviewed for pertinent information listed below.

Results: Fourteen patients sustained early failure of their anterior ring (11.1%). All patients were male. Average age was 49.3 years. AO/OTA classification showed 11 patients with 61-B1.1 injuries, 2 patients with C1.2 injuries, and 1 patient with a 61-B2.2 injury. 13 patients were classified as APC-II injuries and 1 patient sustained an APC-III injury. Mechanism of injury in the early failure patients was 42% equestrian and 29% fall from height. Time until anterior plate failure was 29 days. 13 of 14 plates (93%) failed through the parasymphyseal holes. Average displacement at time of radiographic failure was 12.4 mm. Average increased displacement noted at final clinical follow-up was 2.6mm. 2 patients required revision surgery. Four patients were noted to be non-compliant prior to failure.

Conclusion: Anterior ring fixation failure before 7 weeks is not uncommon. Equestrian injuries represent a high percentage of early failures. Further displacement after initial failure was not substantial. Early fixation failure is not an absolute indication for revision surgery. Patient education is critical to help ensure postoperative compliance. Robust posterior ring fixation may minimize further displacement. Functional outcome studies are needed to determine the long-term outcome of patients with early failure.

Poster 10

Plateau-Patella Angle in Evaluation of Patellar Height in Osteoarthritis

Matthew Ellington, MD
* Brett N. Robin, MD
Bryce Allen, MD
Chanhee Jo, PhD

Introduction: Patellar height has been measured using ratios from the lateral knee radiograph such as the Insall-Salvati, Caton-Deschamps, and Blackburne-Peele ratios. The patella-plateau angle (PPA), recently introduced as a new and simpler method of measuring patellar height, has the advantage of simplicity as it involves a single angular measurement without calculations. This method has not been validated in knees with osteoarthritis. The purpose of this study was to assess the applicability of the PPA in knees with moderate to severe osteoarthritis as a measurement for patellar height.

Methods: Three hundred one patients who underwent total knee arthroplasty at our institution were identified and radiographs prior to surgery were evaluated. Three observers, with different levels of orthopedic training, measured PPA, Insall-Salvati, Caton-Deschamps, and Blackburne-Peele indices on a subset of fifty consecutive patients. Two observers evaluated the entire cohort. Intraobserver agreement for the patella-plateau angle and interobserver agreement between all ratios were calculated.

Results: The mean PPA for the entire cohort was 25.33 and 25.62 for the two observers. The intraobserver reliability concordance correlation coefficient (CCC) was 0.92. The CCC for the interobserver reliability was the highest for the PPA compared to the other ratios. The interobserver reliability increased with the experience of the observer in all four measurements.

Discussion and Conclusion: The patella-plateau angle is a rapid and reliable way to evaluate patellar height in the osteoarthitic population. The measurement demonstrated a higher interobserver reliability in comparison to the previously described methods.

Poster 11

A Safe Protocol for Regional Anesthesia in Tibia Fractures

Darin Friess, MD
David Bailey, MS-3
Tahnee Groat, MPH
Jean-Louis Horn, MD

Introduction: Local anesthetics provide consistent pain relief during surgical fracture treatment, but may delay compartment syndrome diagnosis. We implemented a protocol in patients with tibia fractures assessed to be at moderate or low risk of compartment syndrome. This study describes the protocol and reports its safety with an initial patient cohort.

Methods: A retrospective chart review was completed from May 2007 through December 2009. Patients are divided by surgeon into risk groups for compartment syndrome - high, moderate, and low risk. High risk patients receive no regional anesthesia. For the moderate risk group, the anesthesiologist provides a sciatic and/or saphenous nerve catheter with short acting local anesthetic infusion (lidocaine 1.5% or ropivicaine 0.2%). If any signs of compartment syndrome arise on postoperative neurovascular checks, the infusion is stopped. After 30 minutes, the regional anesthetic has worn off and the physician can examine the limb unencumbered by any nerve block. Low risk patients have their catheter loaded with high dose ropivacaine 0.5%.

Results: Three hundred seventy-four tibia fractures were treated during the study period. Sixty-one fractures in 50 patients received a regional anesthetic. The group includes 18 plateau, 2 shaft, and 41 distal tibia fractures. Risk factors for compartment syndrome were collected. Thirty-seven patients with moderate risk factors had a low dose ropivacaine infusion. A high dose, long acting regional block was used in 24 low risk patients. The incidence of compartment syndrome was zero.

Discussion and Conclusion: Regional anesthesia may be safely utilized for intraoperative and postoperative analgesia. Preferential use of infusion catheters with low dose ropivicaine rather than long lasting single shot blocks allow for more accurate dosing of the regional anesthesia and the ability to turn the block ‘on’ or ‘off’ as needed for pain control or compartment syndrome assessment.

Poster 12

PASTA Bridge — A New Technique in PASTA Repairs: A Biomechanical Evaluation of Construct Strength vs. Suture Anchors

Alan M. Hirahara, MD, FRCSC

Introduction: To verify the biomechanical strength of our new technique for PASTA lesion repairs: the PASTA Bridge.

Methods and Materials: A 50% articular-sided partial tear of the supraspinatus tendon was created on six matched pairs of fresh frozen cadaver shoulders. From each matched pair, one humerus received a PASTA repair using one 4.5 mm titanium Corkscrew FT with a horizontal mattress suture while another received a PASTA Bridge. For the PASTA Bridge, a percutaneous 2.4 mm BioComposite SutureTak was placed twice for the anterior and posterior anchors. A strand of suture from each anchor was tied in a similar manner as the “double pulley” method. The opposing two limbs were tensioned and fixated laterally with a 4.75 mm BioComposite SwiveLock. Each sample was preloaded to 10N followed by cyclic loading between 10 and 100N, at 1 Hz, for 100 cycles. Post cycling, the samples were loaded to failure at a rate of 33 mm/sec. Load and position data were recorded at 500 Hz, and the mode of failure was noted for each sample. Displacement and strain was calculated using video tracking and individual marks on the supraspinatus.

Results: There were no significant differences between the two repairs in ultimate load, strain at the repair site, or strain at the margin. The modes of failure were tendon tearing midsubstance, humeral head breaking, muscle body tearing from the tendon, or tendon tearing at the repair site. Visual inspection of the samples post-testing revealed no damage to the anchors or suture damage.

Conclusion: Our PASTA Bridge creates a very strong construct with no significant difference between this and a standard single suture anchor for ultimate load or strain. This technique, in contrast, is a percutaneous, simple procedure requiring no arthroscopic knot tying and carries only a minimal risk of damage.

Poster 13

Prevention of Post-Operative Osteopenia Using IV Pamidronate: A Pilot Study

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Introduction: Post-operative bone mineral loss, especially following cast immobilization and/or non- weightbearing, is a well-known phenomenon in children that can cause fracture. Children with marginal bone density are at greatest risk. This prospective randomized control trial compared the effect of single dose IV pamidronate vs. placebo on post-operative bone mineral density (BMD) loss.

Methods: Children between the ages of 4-18 were recruited for the study: inclusion criteria included a condition predisposing to low bone density, and hip or lower extremity surgery requiring cast immobilization or non-weightbearing for at least four weeks. Dual energy x-ray absorptiometry (DXA) scans of the lumbar spine and bilateral distal femora were done pre-operatively and at least 4 weeks post-operative. Subjects were randomized to receive either a single dose of IV pamidronate (1mg/kg) or placebo, given in the immediate post-operative period. Changes in bone mineral density were compared using the Mann-Whitney test for significance in the lumbar spine. A multivariate general linear model was used to compare the effect of surgery, DXA region, and treatment on BMD.

Results: Twenty-four subjects entered into the study, and 20 completing the protocol. Pamidronate-treated subjects showed a statistically significant difference with a median gain in BMD of 0.029 gm/cm^2 in the lumbar spine compared to the control group, which showed a median loss of 0.025 gm/cm^2. Treatment did not have a significant effect on BMD loss in the distal femur, but trended toward decreased BMD loss (treatment=0.0331 gm/cm^2, control 0.0416 gm/cm^2). There were no complications or adverse reactions.

Discussion and Conclusion: The results of this small pilot study show that single dose post-operative pamidronate is safe and may prevent post-operative BMD loss in at risk children, which may decrease post-operative fracture risk. Further investigation into the use of IV pamidronate in post-operative patients is warranted.

**The FDA has not cleared this drug and/or medical device for the use described in this presentation.* *(Refer to page 39).*

Poster 14

EOS Imaging of Human Pelvis: Reliability, Validity, and Controlled Comparison with Plain Radiography

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Introduction: The new 3-D imaging technique demonstrates a unique modality combining low radiation with high image quality. As its applications for pelvic imaging is likely to progress with time we performed a pilot study to evaluate validity and reliability of this technique for assessing pelvic and acetabular morphology.

Methods: A human cadaveric pelvis model was utilized to perform consecutive conventional and 3-D imaging radiographs in 5° intervals of sagittal tilt and axial rotation (range: -15° to 15°). Within each image, six measurements were obtained: 1) verticaland, 2) horizontal distance between mid-point of sacrococcygeal joint and mid-point of the upper border of the symphysis, 3) inter-ASIS distance, 4) inter-facetal distance at S1, 5) Sharp's, and 6) Tönnis angle. In addition, coxa profunda and cross-over signs were identified. Findings with both imaging techniques were correlated with each other and with true linear measurements taken from the pelvis. For reproducibility assessment, all measurements were performed by two independent investigators and one observer repeated all measurements. Both investigators were blinded to the true linear measurements obtained from the cadaver model.

Results: We noted a strong correlation between conventional and 3-D imaging radiography (Pearson correlation range: 0.644 - 0.998) and high intra-/inter-observer reproducibility for both modalities (intra-class-correlation range: 0.795 - 1.000). The coxa profunda evaluation reached 100 % agreement for intra- and inter-observer whereas the agreement on the presence of cross-over-sign was marginally less with the intraobserver (96.2 %) and the inter-observer (92.3 %) comparison. Due to distortion caused by magnification with conventional radiographic imaging we also noted significant differences between the two modalities affecting linear measurements ($p < 0.05$).

Conclusions: The 3-D imaging technique is reliable for assessing pelvic and acetabular morphology, thus proving to

be a serious alternative to plain radiography for primary imaging in the pediatric population and potentially adults as well.

Clinical Relevance: This pilot study provides the basis for further prospective in-vivo studies that are essential to substantiate current plain radiographic indices, parameters and grading systems.

Poster 15

Prevalence of Spondylolisthesis and Concomitant Adolescent Idiopathic Scoliosis

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Introduction: The association of spondylolisthesis and adolescent idiopathic scoliosis (AIS) has never been thoroughly evaluated. Failure to appropriately identify a concomitant spinal disorder may result in inappropriate treatment and suboptimal outcomes. We set out to determine the prevalence of patients with both spondylolisthesis and AIS.

Methods: A prospective, multicenter database and radiographs were reviewed. All available radiographs were evaluated for the presence of AIS and spondylolisthesis. Patients were analyzed in three groups, which included: Group I – AIS patients requiring fusion (n = 1132); Group II – symptomatic spondylolisthesis requiring fusion (n = 66); and Group III – asymptomatic spondylolisthesis (n = 149).

Results: The radiographs for 1,266 patients were reviewed. In Group I, adequate radiographs were available for 1076 patients, and 47 (4.38%) were found to have concomitant spondylolisthesis. In Group II, adequate radiographs were available for 48 patients, and 14 (29.2%) were found to have concomitant true scoliosis, as well as 9 (13.6%) with sciatic scoliosis. In Group 3, adequate radiographs were available for 142 patients, and 28 (19.7%) were found to have concomitant true scoliosis, as well as 13 (9.2%) with sciatic scoliosis.

Discussion and Conclusion: Our results suggest symptomatic and asymptomatic spondylolisthesis are associated with concomitant scoliosis in approximately 20-30% of patients. Therefore, routine scoliosis evaluation should be considered in patients presenting with symptomatic and asymptomatic spondylolisthesis. In contrast, prevalence of AIS requiring fusion with concomitant spondylolisthesis was relatively uncommon (4.38%).

Poster 16

Soft Tissue Shadow on Lateral Cervical Spine Radiograph Does Not Predict Development or Severity of Chronic Dysphagia

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Introduction: Dysphagia is commonly reported in the early postoperative period following anterior cervical spine surgery. Although prevertebral soft tissue swelling (STS) has been hypothesized as a potential risk factor for development of chronic dysphagia, this has not been previously studied. This study is a longitudinal radiographic evaluation of the STS and its relationship to the problem of chronic dysphagia in patients undergoing anterior cervical surgery.

Methods: We retrospectively reviewed the medical records and radiographs of patient who underwent elective anterior cervical surgery from our institution during the period of 2008-2011. Patients with preoperative dysphagia were excluded. To be included in the study, the follow up of greater than 6 months and lateral cervical radiographs at preoperative, immediate postoperative, 6 week and 3 month were required. Soft tissue shadow was measured at the lower endplates of C2 and C6. Presence and severity of dysphagia was evaluated prospectively using previously published Bazaz-Yoo Scale.

Results: Sixty-seven patients met the inclusion criteria. Soft tissue shadow was greatest at immediate postoperative x-ray measuring 10.9 ± 4.7 mm at C2 and 18.9 ± 5.5 mm at C6 from preoperative measurements of 4.5 ± 1.7 mm and 14.5 ± 3.7 mm, respectively. By 6 weeks, these measurements returned to baseline levels. The prevalence of dysphagia was 73% (21% mild, 39% moderate, and 13% severe). There were no statistically significant differences in the measurements between patients with and without dysphagia. Also there were no significant differences in soft tissue shadow between mild, moderate and severe dysphagia patients.

Discussion and Conclusion: Although marked increase in the STS in the immediate postoperative period may be responsible for dysphagia in the acute stage of recovery, soft tissue shadow at immediate postoperative period, 6 weeks or 3 months does not predict the presence or severity of chronic dysphagia.

Poster 17

Correction of Lumbar Hypolordosis with Smith-Petersen Osteotomy and Transforaminal Interbody Fusion

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Introduction: The Smith-Petersen osteotomy (SPO) and pedicle subtraction osteotomy (PSO) represent polar alternatives in the correction of lumbar hypolordosis. SPO is a simple technique that yields less potential correction, whereas PSO provides substantial correction, but with greater technical difficulty and operative risk. The purpose of this study was to evaluate the radiographic results of coupling a Smith-Petersen osteotomy with a transforaminal lumbar interbody fusion (SPO + TLIF) for the correction of lumbar hypolordosis.

Methods: We retrospectively reviewed the medical records and radiographs of patients who underwent SPO + TLIF to correct lumbar hypolordosis. Operative and perioperative data was collected. The Cobb angle was used to measure the overall lumbar lordosis and focal lordosis at the osteotomy level on lateral lumbar radiographs. Radiographic measurements were made on preoperative, postoperative, one year and two year films.

Results: Fourteen patients underwent SPO + TLIF with an average age of 64 years (47–77). Eleven patients had both one-and two-year follow-up. The average focal correction at the osteotomy level at one and two years was 13.6 ± 7.7 degrees and 13.4 ± 6.1 degrees. The average correction in overall lumbar lordosis at one and two years was 17.6 ± 11.9 degrees and 15.1 ± 10.6 degrees. Blood loss averaged 2132 ml, operating time averaged 452 minutes, and hospital stay averaged 9.7 days. Five patients experienced complications, which included excessive blood loss, unplanned termination of procedure, wound infection, epidural hematoma and cardiac arrhythmia.

Discussion and Conclusion: We achieved an average increase in focal lordosis of 13.4 degrees at two years using SPO + TLIF. Although five patients experienced complications, all underwent more extensive procedures at the time the osteotomy was performed. Our results indicate that SPO + TLIF may represent an intermediate option in the correction of lumbar hypolordosis.

Poster 18

Tether Location in Adolescent Idiopathic Scoliosis by 3-D CT Analysis

P. Douglas Kiester, MD

Introduction: Adolescent idiopathic scoliosis (AIS) progresses rapidly during growth and always has rotation. Both of these strongly suggest the presence of a tether. This study was to attempt to identify any existing midline tether by the analysis of AIS CT scan data.

Methods: Eleven AIS and 8 normal CT scans were analyzed. Six midline points A through F were selected and corrected to the same horizontal plane for each vertebral body and converted to X, Y, and Z points. The distances for each point from each vertebral body to the next were calculated then summed. The point (A through F) with the shortest total distance would be the closest any existing tether. The shortest distance was considered the baseline length and was subtracted from the total lengths for all 6 points. Thus the shortest length would be zero. The remaining lengths for all of the points for all of the AIS CT scans were summed and placed on a bar graph showing the cumulative remaining lengths for all of the AIS patients.

Results: The controls showed a little random noise. The AIS results strongly, graphically pointed to the point just posterior to the ligamentum flavum on the spinous process as having the shortest length was is therefore the closet to the midline tether.

Discussion and Conclusion: This analysis not only confirms the presence of a tether in AIS, it localizes it to a very specific location. This analysis was possible because a tether will also act as an axis of rotation, and it is the rotation that changes the measured lengths of the various points to being greater than the baseline length measurement. The question is now how to best confirm this observation, and if confirmed, how should it affect treatment.

Poster 19

Minimally Invasive Total Knee Arthroplasty: A Retrospective Review of Function and Survival Stratified by BMI

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Introduction: A less invasive surgical approach is thought to provide additional benefits to the total knee arthroplasty (TKA) patient. Expected benefits would be; shorter hospital stay, less knee pain, quicker rehabilitation, and good long-term results with function. Studies have shown that performing TKA on high BMI patients may increase mobility, leading to improved quality of life. The purpose of this study is to determine whether the outcomes of a minimally invasive TKA in the high BMI patient are as good as, or better than those patients of ideal BMI.

Methods: One hundred forty patients underwent minimally invasive surgical (MIS) total knee arthroplasty. We used the median parapatellar approach. BMI was used to stratify patients into one of three categories: high BMI (30 or greater), overweight (25-29.9), or normal weight (18.5-24.9).

Measured parameters included hospital stay length, pain ratings (VAS), American Knee Society Scores, and, SF-12 surveys. Outcomes were assessed preoperatively, at 3 months, 6 months, 1 year, and 2 years.

Results: The MIS-TKA patients with high BMI had a shorter length of stay, when compared with the patients from the overweight and normal weight categories. These patients also exhibited slightly less knee pain and higher Knee Society scores at several of the time intervals. When the results for other parameters were not better for the MIS-TKA patients with high BMI, they were close to the results for patients in the overweight and normal weight categories. Pain medication frequency was also, on average, less for the MIS-TKA patients in both the high BMI and overweight categories.

Conclusion: Many of the outcomes for the high BMI patient receiving a MIS-TKA were just as good, and at some intervals better, than those for the patients of ideal BMI. Our findings suggest that MIS TKA is an option for patients with high BMI.

Poster 20

Demographic Differences in Adolescent- and Adult-Diagnosed Acetabular Dysplasia Compared to Infantile Developmental Dysplasia of the Hip

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Introduction: Acetabular dysplasia is a common cause of hip pain that can lead to premature osteoarthritis (OA). This study explores whether demographic characteristics of patients diagnosed with acetabular dysplasia (AD) in adolescence and adulthood differ from those who are diagnosed with developmental dysplasia of the hip (DDH) in infancy.

Methods: Chart review identified 633 patients who underwent periacetabular osteotomy for dysplasia from August 1991 to January 2008. Excluding patients with syndromal conditions and 80 patients lacking contact information, 421 patients received a questionnaire regarding birth and family history; 324 (70.3%) completed the survey.

Results: Respondents were divided into two groups according to whether they had a history of DDH in infancy (97 patients) or were diagnosed in adolescence-/adulthood (227 patients). Statistically significant differences were found in gender distribution (female: DDH = 97.9%, AD = 85.9%), affected limb (left hip: DDH = 42.3%, AD = 26.0%), bilaterality (DDH = 25.8%, AD = 39.2%), and breech presentation (DDH = 26.6%, AD = 9.6%). Over 50% of all respondents had a first-degree family member with hip disease and over 40% with premature hip OA. Affected family members of patients with AD were significantly more likely to have had hip replacement by age 65 (54.2% vs. 25.0%).

Discussion and Conclusion: This study confirms there are significant demographic differences between patients diagnosed with hip dysplasia in infancy versus adolescence/adulthood, which supports the hypothesis that these may represent distinct forms of dysplasia. In both, there is a familial tendency toward hip disease with a higher incidence of arthroplasty in the AD group's family members. These findings warrant further epidemiological and genetic study. Periacetabular osteotomy is effective if performed before there is substantial joint damage. Infant DDH is diagnosed with neonatal exam, but AD diagnosis is delayed until symptoms develop.

This study supports screening for AD in younger family members of patients with hip OA to facilitate early detection of at-risk hips.

Poster 21

Arthroscopic Hip Labralization

Dean K. Matsuda, MD

Summary: Arthroscopic hip labralization is a relatively simple and fast procedure without harvest morbidity that can be performed in patients requiring rim reduction with early encouraging outcomes.

Introduction: Arthroscopic hip labral reconstruction has been used in the management of the non-salvageable labrum in hopes of restoring labral function and enhancing hip preservation. Optimal candidates may be relatively young active patients without significant coxarthrosis. For patients with non-salvageable labrae that are older and/or have somewhat more chondral damage, we have developed an arthroscopic alternative to labral debridement or reconstruction. By preserving articular cartilage in the region of labral deficit with meticulous rim trimming, the resultant undermined free chondral margin ("pseudolabrum") may immediately restore a fluid seal function and may theoretically enhance hip preservation.

Methods: All patients from our database that underwent arthroscopic hip labralization met our inclusion criteria of cam-pincer FAI diagnosis and the index procedure plus acetabulo- and femoroplasty with completed preoperative and post-operative nonarthritic hip scores (NAHS) with minimum 1 year follow-up. There was 100% participation. Patients were also queried as to satisfaction and electronic medical record review was performed. Our preliminary clinical outcomes and surgical technique video are presented.

Results: Six patients (1 male, 5 female) of average age 47 years (range 37-54) with pre-operative diagnoses of camp-incer femoroacetabular impingement with average follow-up of 21 months (range 12-35) underwent arthroscopic hip labralization along with acetabulofemoroplasty. Patient satisfaction was high (4 highly satisfied, 2 satisfied). Pre-operative NAHS averaged 52 (range 24-77) and post-operative NAHS averaged 90 (range 76-100) with an average improvement of 38 (range 9-63)(statisticly significant). There were no complications, revision surgeries or conversions or scheduled conversions to total or resurfacing arthroplasties.

Discussion: By restoration of the labral fluid seal effect for symptomatic improvement and theoretical hip preservation, arthroscopic labral reconstruction is emerging with encouraging outcomes. Patients with severe anatomic and/or functional labral insufficiency deemed borderline candidates for reconstruction may benefit from hip labralization as an attractive option to labrectomy or reconstruction. It is a relatively simple and quick procedure without harvest morbidity that can be performed in patients undergoing rim reduction while offering the potential for immediate fluid seal restoration. Further investigation is merited to determine if our findings are durable, hip-preservative, and comparable to those of labral reconstruction if studied with similar cohorts.

Conclusion: Arthroscopic hip labralization offers an attractive option to labrectomy and labral reconstruction with early encouraging outcomes in select patients with severe labral insufficiency.

Poster 22

Protrusio Acetabuli: Contraindication or Indication for Hip Arthroscopy?

Dean K. Matsuda, MD

Introduction: Protrusio acetabuli has been considered a contraindication for hip arthroscopy. "Insurmountable" technical challenges relating to traction, hip access, and posterior acetabular procedures have been cited as reasons for limiting the surgical management of severe global pincer femoroacetabular impingement to more invasive open methods. As a rare and most extreme form of global pincer femoroacetabular impingement, we present the case of a 33-year-old man with bilateral symptomatic global pincer and cam femoroacetabular impingement. The purpose is to show the ability to perform femoroacetabular impingement surgery of severe deformities previously considered impossible to treat via completely outpatient arthroscopic means with successful preliminary outcomes.

Methods: We describe key arthroscopic steps permitting central compartment access, subtotal acetabuloplasty, labral reconstruction, and femoroplasty of the right hip, followed by later subtotal acetabuloplasty, labral refixation, and femoroplasty of the left. Pre-operative and 2-year post-operative nonarthritic hip score (NAHS) are reported for the right protrusio hip treated with arthroscopic intervention.

Results: The patient reported a 54-point post-operative increase in NAHS (34 to 88) at 2 years post-surgery and very

high satisfaction. Post-operative radiographs showed reduction of anterior, posterior, and superior overcoverage, the latter assessed with a 14 degree improvement in the right CEA (56 to 42) and improved anterior femoral offset without progressive joint narrowing or femoral head medialization.

Discussion / Conclusion: Albeit challenging, global pincer impingement, even acetabular protrusion, may be successfully managed with dual-portal outpatient hip arthroscopy. The modified midanterior portal enables central compartment access and extended posterior "reach" in the arthroscopic management of this most extreme form of global pincer FAI, potentially making this contraindication a historical one while respectfully challenging the "global" recommendation for open surgery in this setting. Although a rare condition, by documenting the successful management of the most severe form of global pincer FAI, lesser global deformities may now be considered for outpatient arthroscopic intervention.

Poster 23

Early Experience with Unlinked Patellofemoral and Unicompartmental Knee Arthroplasty

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Introduction: The success of UKA in patients with medial or lateral tibiofemoral OA of the knee has been well documented. For those patients who do not meet the criteria for UKA due to excessive patellofemoral disease, the procedure of choice has been total knee arthroplasty. There is an increasing population of patients who are keen to avoid total knee arthroplasty but have arthoplasty level disease in 2 compartments. By resurfacing only the 2 involved compartments, we achieve the goals of addressing the areas of arthritic involvement while preserving the opposite asymptomatic tibiofemoral compartment and cruciate ligaments.

Materials and Methods: From 5/7/2010 to 12/9/2010 there were 8 patients who met the indications for 2-compartment knee arthroplasty and were also interested in avoiding total knee arthroplasty. There were 5 males and 3 females. Three patients underwent surgery at a hospital as an inpatient and 5 were done as outpatient procedures at an ASC (ambulatory surgery center). A fixed bearing unicompartmental knee system was used for the tibiofemoral (UKA) portion and a knee cap implant was used for the patellofemoral portion (PFA).

Results: There were no complications in either group. By 4 weeks postoperative all patients were ambulating well without walking aids. Tourniquet time average was 85 minutes. Those patients having the procedure done as an outpatient stayed an average of 90 minutes postoperatively while those having the procedure done in the hospital stayed an average of 3 days postoperatively. At minimum one year follow-up, all patients had good or excellent clinical scores, no evidence of disease progression or component failure radiographically, and had not undergone additional surgery on the knee.

Conclusion: Unlinked 2-compartment knee arthroplasty (UKA with PFA) is an intriguing alternative to TKR in younger more active patients who have 2 compartments with arthroplasty level arthritis of the knee. The early good results of this cohort suggest that this approach is worth continued use but with carefully selected patients and close follow up to track survivorship of implants and monitor for disease progression.

Poster 24

Evaluation of Trends in the Surgical Treatment of Meniscus Tears

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Introduction: Arthroscopic meniscectomy of the knee is one of the most common orthopaedic procedures performed. The purpose of this study was to investigate current trends in arthroscopic meniscectomy and meniscal repair across time, gender, age, and regions in the United States.

Methods: Patients who underwent arthroscopic meniscectomy (CPT code 29881/29880) and arthroscopic meniscal repair (CPT code 29882/29883) were identified using a national database of insurance records during years 2004-2009. CPT codes 29881 and 29882 were cross-referenced with ICD-9 codes 836.0 (medial) and 836.1 (lateral) to determine treatment site. Factors identified for each patient included gender, age group, and region in the U.S.

Results: From 2004 to 2009 there were 187,607 cases of arthroscopic medial or lateral meniscectomy and repair identified. Ninety-six percent of patients underwent a meniscectomy compared to repair. Over the time period, there was no change in the rate of medial meniscectomy and a small but

statistically significant decrease in rate of lateral meniscectomy. The rate of medial meniscal repair decreased over time while no significant change was observed in the rate of lateral meniscal repair. Meniscectomy was most commonly performed in patients aged 50-59 years. Conversely, meniscus repairs were most frequently observed in patients aged 10-19 years. All procedures were performed more frequently in males, and this difference was greatest with meniscal repair (63% male; 37% female) compared to meniscectomy (53% male; 47% female). Overall, there were no significant differences in regional trends.

Conclusion: In arthroscopic knee surgery, meniscectomy is much more common than repair and is more common in older age patients. Conversely, repair of a medial or lateral meniscus tear was more common in the younger age groups. Despite advances in meniscal repair techniques and devices, the analysis did not show an overall increase in meniscal repair compared to meniscectomy over the study period.

Poster 25

Complication Rates for Spinal Fusion are Associated with a Number of Perioperative Factors, but Their Influences are Dependent on ASA Classification

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Introduction: Major medical complications are frequent occurrences in spinal arthrodesis and often lead to poor results. We have systematically examined our patients undergoing an elective thoracic/lumbar fusion to establish the prevalence of medical complications and associated risk factors.

Methods: Our retrospective study reviewed the clinical course of 709 patients undergoing spine fusion surgeries between 2007 and 2011. We evaluated the rate of major medical complications within the 30-day postoperative period with respect to American Society of Anesthesiologists (ASA) score, age, sex, operative time, number of levels, EBL, fluids, and intra-operative vital signs (temperature, mean arterial pressure, heart rate).

Results: The major determining factor was ASA classification. The overall rate was 20% for ASA 3-4 and 7% for ASA 1-2. The factors such as operative time, total levels, EBL and fluids were only important for ASA 3-4 patients. They did not influence the rates for ASA 1-2 patients. For example, the rate in the ASA 1-2 group rose from 5.2% for 1 level fusion to 7.7% for 9-22 levels, while the ASA 3-4 group rose from 5.8% to 29.4%. Similarly, the rate for the operative time of 1-3 hours was low for both groups (7% and 13% for ASA 1-2 and ASA 3-4), but when the operative time was >6 hours, the rate for the ASA 1-2 group remained low (10%),while the ASA 3-4 group markedly increased (30%). There was no statistically significant difference in the rates for sex, mean arterial pressure or heart rate. However, lower intra-operative body temperature was associated with a lower rate for ASA 3-4 patients.

Discussion and Conclusion: This study demonstrates that the ASA score is a strong predictor of risk following elective thoracic/lumbar arthrodesis, and all other factors must be evaluated not as independent factors, but dependent factors to ASA score.

Poster 26

Responsiveness of Performance-Based Knee Function Tests in Patients Following Arthroscopic Menisectomy

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Introduction: Patient questionnaires are currently used to evaluate for knee dysfunction associated with knee injury and osteoarthritis. As questionnaires can be subject to psychosocial factors, they may not accurately reflect underlying joint function. A prior study established the reproducibility of 9 performance-based knee function tests. This study examines the responsiveness of the performance-based tests following arthroscopic menisectomy.

Methods: A battery of 9 performance-based tests was designed to evaluate knee movements essential to everyday living. The battery includes active and passive range-of-motion (ROM), stair ascent, stair descent, sit-to-stand, step-

ups, step-downs, star lunges, and 6-minute treadmill travel. Thirty-five patients undergoing arthroscopic partial menisectomy completed the test twice, 1 week preoperatively and 6 weeks postoperatively. At each visit, patients also completed the Knee Injury and Osteoarthritis Outcome Score (KOOS). Wilcoxon rank sum test was used to compare mean change and Spearman correlations were computed to compare the magnitude of change in knee function tests and KOOS subscales between the two visits.

Results: Patients were on average 44±13 years-old, BMI 27.2 ±4.8 kg/m2, and 71% male. All performance-based tests improved significantly 6 weeks after partial menisectomy. Active and passive ROM improved the least, each with a 4% increase. The greatest improvement in performance was observed with stair descent (13%) and sit-to-stand (15%). Similarly all KOOS subscales improved significantly following surgery. KOOS Pain scores improved 32%, Symptoms 32%, Activities of Daily Living 22%, Sports and Recreation 48%, and Quality of Life 65%. Correlations between the change in KOOS Activities of Daily Living and performance-based tests were weak (r ranging 0-0.41).

Discussion and Conclusion: All 9 performance-based knee function tests are responsive to patients undergoing partial menisectomy. The weak correlation between improvements in performance-based tests and questionnaires indicates these measures may reflect distinct information about actual joint mechanics versus patient perception of knee-related function.

Poster 27

Novel Surgical Treatment for Sacroiliitis

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Introduction: At the turn of the 20th century, the sacroiliac joint (SIJ) was often diagnosed to be the primary pain generator of low back pain (LBP). In many cases, this was successfully treated with an open fusion of the SI joint. Recently, interest in the SI joint as a LBP generator has renewed, and surgical treatment options have improved. Sembrano and Polly (2009) reported that the SIJ is a pain generator in approximately 15% of patients with LBP. This retrospective study reports on the early findings of SIJ pain patients treated with an MIS procedure to promote fusion of the SI joint.

Methods: Five patients with pre- and post-operative pain and function scores, and post-operative satisfaction scores were followed for up to one year. Each patient was diagnosed for SIJ pain using a consistent diagnostic algorithm. Patients were then treated with porous plasma-coated MIS implants placed laterally across the SIJ through an incision of approximately 3 cm. Patients were followed for up to one year and mean pre-operative and post-operative pain scores were compared using a paired t-test at each time point with a level of significance of 0.05 ($p < 0.05$).

Results: 4 patients were female, and 1 was male. Post-operative pain and function scores were significantly lower at each time point ($p < 0.05$). For example, when asked “How much pain are you in at this time?” (scale 1-10), at 12 months the scores improved from 7.2 to 3.3. Additionally, at least 80% of the patients were satisfied.

Discussion and Conclusion: The findings of this retrospective study suggest that SI joint arthrodesis using an MIS approach is an effective treatment for patients with diagnosed SI joint pain. These findings reinforce awareness that the SI joint is a common symptom generator in LBP patients and, with proper diagnosis, patients can be effectively treated with an MIS approach.

Poster 28

Suspensory Fixation for Subpectoral Biceps Tenodesis: A Biomechanical Study

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Introduction: This study aims to evaluate the safety and biomechanical properties of suspensory fixation of proximal biceps tenodesis using a button. We compared the load to failure, stiffness and mode of failure in human cadaveric shoulders using a subpectoral location. Finally, we dissected out the axillary and radial nerves to evaluate the safety of this technique.

Methods: Twenty eight fresh-frozen human cadaver forequarters with a mean age of 52 comprised the study group. The specimens were randomly divided into 4 experimental groups. Group 1 was the unicortical intramedullary button group with tenodesis performed with a tension-slide technique. Group 2 was the interference screw group. Group 3 was fixed with a bicortical. Group 4 combined a bicortical button with the addition of an interference screw. Mechanical testing was performed. After pre-loading each sample for 2 minutes at 5N, each sample was then cycled in tension between 5 and 70N, for 500 cylces, at 1 Hz. Load to failure at 1mm/sec was then

performed. The mode of failure, ultimate load, yield load, stiffness and displacement were determined or calculated. Calculations of the distance between the axillary and radial nerves with respect to the cortical button were also calculated.

Results: There was no statistically significant difference amongst groups in terms of age, ultimate load, stiffness or displacement (figure 3). Suture/tendon interface failure was the most commonly observed mode of failure. The axillary nerve was close to the bicortical button in several of the specimens, and in many cases was directly lying on the button.

Discussion and Conclusion: Given its technical simplicity, equivalent biomechanical properties and small stress riser, surgeons should consider suspensory unicortical fixation as a practical and safe alternative to the interference screw while performing a subpectoral biceps tenodesis.

Poster 29

Revision Total Knee Arthroplasty Using a Mobile Bearing System

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*Nicole M.K. Behnke, MD
Melissa M. Gross
Paula Grandbois, RN
Kathleen Suthers
Marci B. Spitzer

Introduction: During revision TKA, augments, stems, and sleeves are routinely necessary to substitute for missing bone and optimize fixation to the remaining bone. Constrained articulations may be required to stabilize incompetent ligaments. Mobile bearings can reduce interface stress which leads to loosening. A robust, integrated revision system which incorporates all of these features facilitates intraoperative customization of the construct to the unique circumstances of each revision, and may optimize outcomes.

Methods: Forty revision TKAs were performed in 38 patients (21 males, 17 females) using a knee replacement with a self-aligning rotating platform bearing. Mean age was 67 years (R 50-86), and BMI was 30 (R 23-44). The diagnosis was aseptic loosening in 20, stiffness/instability/malalignment in 9, failed UKA in 6, and infection in 5.

Results: Every patient's status is known. Average follow-up is 3.65 years (R 0.53-8.1) with 28 knees at a minimum 2 years. Two patients with well-functioning implants died. Three knees have failed. One knee became infected, and was reimplanted after a two-stage protocol. One patient became chronically infected with a draining sinus, but expired before revision. One patient suffered an irreducible bearing spinout, requiring open reduction, subsequent distal femoral replacement for loosening, and is now awaiting femoral revision for recurrent loosening. Knee Society and WOMAC scores improved respectively from 45 (R 9-74) and 60 (R 34-70) preoperatively to 78 (R 47-100) and 31 (R 0-79) postoperatively. All primary components were implanted in 4 knees, and all revision components in 32 knees, including 4 distal femoral replacements. Two knees received a primary femoral and revision tibial component, and one isolated femoral revision was performed. Thirty-two posterior stabilized, 2 semi-constrained, and 4 hinged polyethylene inserts were utilized.

Discussion and Conclusions: This mobile bearing revision TKA system provides a versatile and complete continuum of implant options to solve bone and soft tissue deficiency across a broad spectrum of severity, enabling the surgeon to intraoperatively customize the implant to the needs of the patient. Clincal outcomes are excellent, particularly given this complex patient cohort.

Poster 30

The Use of Gelatin Hemostatic Matrix to Reduce Post-Operative Bleeding After Total Knee Arthroplasty

John Velyvis, MD

Introduction: Total knee arthroplasty places patients at risk for significant blood loss and hematoma formation. Surgeons may choose to utilize an intra-articular drain to diminish hematoma in the knee. Control of post-operative bleeding is an important aspect of patient care and outcomes. One appropriate solution is to reduce the loss of blood during and after the operation. The present study was designed to evaluate the hemostatic efficacy of the use of gelatin hemostatic matrix in patients managed with total knee arthroplasty.

Methods: In this study of primary total knee arthroplasty, 83 consecutive patients received 10mL of the gelatin hemostatic matrix and these patients were compared with 100 consecutive patients who received no Floseal. In both groups, the standard means of hemostasis were applied. In the treatment group, a gelatin hemostatic matrix was applied to the internal aspects of the operative field before skin closure. All operations were performed in a bloodless field with use of a pneumatic tourniquet. All patients received coumadin as thromboprophylaxis

starting the day after the operation. Blood loss during the operation was evaluated by measuring the volume in the suction apparatus and by estimating the amount of lost blood in the swabs at the end of the operation. The apparent postoperative lost blood was determined by measuring the volume in the suction drain canisters. All blood transfusions, preoperative and postoperative hemoglobin levels were recorded.

Results: There were no statistically significant differences between the groups for age, gender, operative side, estimated intra-operative blood loss, type of anesthesia, inpatient days, or preoperative hemoglobin. No adverse events occurred related to the use of the gelatin hemostatic matrix. Patients receiving the gelatin hemostatic matrix had a lower probability of getting a transfusion ($p = 0.004$). The probability of a blood transfusion was 5.5% in the control group and 0.5% in the treatment group. The volume of blood in the intra-articular drains was significantly reduced in the gelatin hemostatic matrix group ($p < 0.00001$). The mean value in the control group was 430.83mL and in the treatment group 120.54mL.

Discussion and Conclusion: The use of a gelatin hemostatic matrix is an effective and safe means with which to reduce blood loss and blood-transfusion requirements after total knee arthroplasty.

Poster 31

Postmodernism and the IME

Anthony H. Woodward, MD

Introduction: An IME is more subjective than commonly realized and places the physician examiner in an unexpectedly authoritarian role. Postmodernism addresses the biases, lack of objective observations and dominance of the writer in literature.

Methods: Review of the literature on postmodernism and review of guides to impairment rating.

Results: The concepts of postmodernism provide a better understanding of the limited validity and objectivity of the observations, measurements and interpretation of the records on which an IME is based, and expose the authoritarian nature of the process.

Discussion and Conclusion: Orthopaedists will acknowledge the inevitable uncertainties and biases in an IME, and realize the unstated dominance of physician's point of view.

Poster 32

Physical Activity Does Not Correlate with HRQL Scores in Patients with Degenerative Lumbar Conditions

Rosanna Wustrack, MD
Guillermo Ramirez, MS
Shane Burch, MD

Introduction: Degenerative disorders of the lumbar spine have been shown to have a negative effect on the health related quality of life, however the effect on physical activity has not been studied with objective measurement tools. We aimed to quantify activity levels in a population with lumbar spine disorders using accelerometry and to correlate activity levels with commonly used HRQL scores. The hypotheses were 1) Patients with lumbar spine disorders have a low level of activity and 2) Activity levels and patient-reported HRQL scores correlate in this population.

Methods: Adults with lumbar spine disorders scheduled for surgical treatment were enrolled in this study. Participants wore an accelerometer for 12 hours daily, three consecutive days prior to their scheduled surgery. The Oswestry Disability Index (ODI), the SF-36 Physical Component Summary Score (PCS) and the EuroQual-5D questionnaire (EQ-5D) were collected prior to surgery. The duration (average min/day) of moderate-vigorous physical activity (MVPA) was determined for each patient and then correlated the outcome scores using the Spearman Rank Correlation coefficient.

Results: Eighty-one patients with an average age of 63.8 had complete data. The average duration of MVPA for the group was 8.6 min/day (range 0-68.8, SD 17.8, median 3.5). The average ODI, SF-36 PCS, and EQ-5D scores were 46.8, 29.24, and 0.51, respectively. There was no correlation between duration of MVPA and ODI (rho = -0.248, $p = 0.038$), SF-36 PCS (rho = 0.306, $p = 0.015$), or EQ-5D (rho = 0.228, $p = 0.05$). However, the average duration of MVPA was correlated to the SF-36 Role Physical Function score (rho = 0.363, $p = 0.004$).

Conclusions: The only score that was correlated to activity was the SF-36 PF score and this was a weak correlation. The majority of this population only achieved 20% of the recommended amount of MVPA. Physical fitness should be addressed prior to surgery and targeted during rehabilitation.

Poster 33

Mesenchymal Stem Cell and Bioactive Substrate Administration on a Suture Delivery Vehicle Confers Early Strength to Rat Achilles Tendon Repairs In Vivo

Jeffrey Yao, MD
Colin Woon, MD
Anthony K. Behn, MS
Varun Gajendran, MD
R. Lane Smith, PhD

Purpose: Exogenously administered mesenchymal stem cells and chemical stimulants, such as growth factors and bioactive substrates, are known to enhance the rate of tendon healing. Biomolecules have been successfully delivered using suture delivery vehicles, eluting growth factors over time. Using a suture delivery vehicle, the additional manual step of chemical agent administration can be obviated. We sought to evaluate the histologic and biomechanical effect of delivering both cells and bioactive substrates on a suture delivery vehicle in comparison with sutures coated with bioactive substrates alone.

Methods: Bone marrow-derived stem cells (BMSCs) were harvested from Sprague-Dawley rat femora. Experimental (cell and substrate-coated, CS) group sutures were precoated with intercellular cell adhesion molecule 1 (ICAM-1) and poly-L-lysine, and seeded with labeled BMSCs. Control (substrate only-coated, SO) group sutures were coated with ICAM-1 and poly-L-lysine only. Utilizing a matched-paired design, bilateral Sprague-Dawley rat Achilles tendons were transected and randomized to CS or SO repairs. Tendons were harvested at 4, 7, 10, 14 and 28 days and subjected to biomechanical assessment.

Results: Labeled cells were present at repair sites at all time points. CS suture repairs displayed superior strength compared to SO repairs at 7 days. Although there was no significant difference at the other time points, there was a trend toward improved strength with CS suture repair at 4 days, 10 days, and 28 days. There was no observed difference in repair strength at 14 days.

Conclusions: Based on our results, bioactive CS sutures enhance repair strength in at the 1-week time point. This effect is less evident in later stages.

Clinical Relevance: The strength nadir of a repair occurs at 1 week. Bioactive suture repair may provide a clinical advantage by "jump starting" the repair process during this strength nadir. Improved early strength may in turn allow earlier unprotected weight bearing and mobilization.

Poster 34

Intraoperative Neurophysiological Monitoring in Anterior Lumbar Interbody Fusion (ALIF) Surgery

Ilker Yaylali, MD, PhD
*Robert A. Hart, MD
Jung U. Yoo, MD
Alexander C. Ching, MD

Introduction: Somatosensory evoked potential (SSEP) and motor evoked potentials (MEP) are frequently used to monitor neurological function during spinal deformity surgery. However, there are few studies regarding the utilization of intraoperative neuromonitoring (IONM) during anterior lumbar interbody fusion (ALIF). This study presents the authors' experience with IONM in ALIF.

Methods: A retrospective review of all patients undergoing ALIF with IONM from November 2008 to July 2010 was performed.. Positive and negative predictive values based on positive alerts and occurrence of post operative neurological deficit were calculated. Factors including gender, operative time, and number and levels of interbody fusion were analyzed as risk factors for inter-operational alerts.

Results: A total of 80 consecutive patients who underwent ALIF were studied. All 80 patients had SSEP and 45 patients had MEP as part of the intraoperative neuromonitoring The remaining 35 patients did not have MEP due to neuro muscular blockade requested by the exposure surgeon. No intraoperative changes in MEP were found. Nine (11.2%) patients experienced intraoperative changes in SSEP; none of these patients had new neurological deficits post-operatively. Increased risk of SSEP changes was seen in patients undergoing fusion of both L4/5 and L5/S1 ($p = 0.024$). No correlation was found between age and positive SSEP changes ($p > 0.05$).Positive predictive value of SSEP was 0%, negative predictive value of SSEP was 100%.

Discussion and Conclusion: SSEP false positives occur relatively frequently intra-operatively during ALIF. No patients with positive intraoperative SSEP changes demonstrated new post-operational deficits. The duration of surgery and fusion of both L4/5 and L5/S1 were significant risk factors for SSEP changes leading to intraoperative alerts.

Individual Orthopaedic Instruction/ Multimedia Education

Schedule:

Thursday, June 14, 2012	2:15pm-4:15pm
Friday, June 15, 2012	4:10pm-5:10pm
Saturday, June 16, 2011	3:40pm-4:10pm

The following AAOS DVDs are available for individual viewing at the above times.

1. **Anatomy of the Knee** (25 minutes)
   Stephen L. Brown, MD; Patrick M. Connor, MD; Donald F. D'Alessandro, MD; James E. Fleischli, MD
2. **Pectoralis Major Transfer for Irreparable Rotator Cuff Tears** (11 minutes)
   Sumant G. Krishnan, MD and Kenneth C. Lin, MD
3. **Surgical Dislocation and Debridement for Femoro-Acetabular Impingement** (22 minutes)
   Christopher L. Peters, MD and Jill A. Erickson, PhD
4. **Hip Resurfacing: Direct Anterior Approach** (12 minutes)
   William J. Hozack, MD; Michael M. Nogler, MD; Stefan Kreuzer, MD; and Martin Krismer, MD
5. **Imageless Navigation in Hip Resurfacing Arthroplasty** (15 minutes)
   Michael L. Swank, MD and Amy L. Hallock, MEd
6. **Basics of Computer Navigation in Total Knee Arthroplasty** (11 minutes)
   James B. Stiehl, MD
7. **Lateral Approach for Valgus Total Knee Arthroplasty** (12 minutes)
   James B. Stiehl, MD
8. **Molded Articulating Cement Spacers for Treatment of Infected Total Knee Arthroplasty** (12 minutes)
   Adolph V. Lombardi Jr., MD, FACS; Keith R. Berend, MD; and Joanne B. Adams, BFA
9. **Arthroscopic Suprascapular Nerve Release** (23 minutes)
   Laurent Lafosse, MD
10. **Open Repair of Acute and Chronic Distal Biceps Ruptures** (25 minutes)
    James Michael Bennett, MD; Thomas Lynn Mehlhoff, MD; and James Burlin Bennett, MD
11. **Arthroscopic Acetabular Labral Repair: Surgical Technique** (9 minutes)
    Marc J. Philippon, MD; Mike J. Huang, MD; Karen K. Briggs, MPH, MBA; and David A. Kuppersmith, BS

12. **Anterior Cruciate Ligament Reconstruction Using Achilles Allograft and Interference Screws** (10 minutes)
Colin G. Looney, MD and William I. Sterett, MD

13. **Osteochondral Lesion of the Talus (OLT): Technique of Osteochondral Autologous Graft Transfer** (11 minutes)
Sameh A. Labib, MD and Brett A. Sweitzer, MD

14. **Revision ACL Reconstruction Using the Anatomic Double Bundle Concept** (14 minutes)
Freddie H. Fu, MD; Nicholas J. Honkamp, MD; Wei Shen, MD, PhD; Anil S. Ranawat, MD; and Fotios Tjoumikaris, MD

15. **The Krukenberg Procedure for Children** (25 minutes)
Hugh Godfrey Watts, MD; John F. Lawrence, MD; and Joanna Patton, ROT

16. **Single Incision Direct Anterior Approach to Total Hip Arthroplasty** (13 minutes)
William J. Hozack, MD; Michael M. Nogler, MD; Javad Parvizi, MD, FRCS; Eckart Mayr, MD; and Krismer Martin, MD

17. **Medial Patellofemoral Ligament Reconstruction** (13 minutes)
Ryan E. Dobbs, MD; Patrick E. Greis, MD; and Robert T. Burks, MD

18. **Hip Arthroscopy: Operative Set-Up and Anatomically Guided Portal Placement** (8 minutes)
Allston Julius Stubbs, MD; Karen K. Briggs, MPH, MBA; and Marc J. Philippon, MD

19. **Anatomy of the Shoulder** (24 minutes)
Donald F. D'Alessandro, MD

20. **Anterolateral Approach in Minimally Invasive Total Hip Arthroplasty** (18 minutes)
Leonard Remia, MD

21. **Patient Specific Knee Design: An Evolution in Computer-Assisted Surgery** (22 minutes)
Adolph V. Lombardi Jr., MD, FACS; Keith R. Berend, MD; and Joanne B. Adams, BFA

22. **Hemiarthroplasty for a Comminuted Fracture of the Proximal Humerus** (20 minutes)
Jon J.P. Warner, MD; Darren J. Friedman, MD; Zachary R. Zimmer, BA; and Laurence D. Higgins, MD

23. **Rotator Interval Repari of the Shoulder: Biomechanics and Technique** (7 minutes)
LCDR Matthew T. Provencher, MD, MC, USN and Daniel J. Solomon, MD

24. **Excision of Calcaneonavicular Tarsal Coalition** (7 minutes)
Maurice Albright, MD; Brian Grottkau, MD; and Gleeson Rebello, MD

25. **Extensile Surgical Approach for the Resection of Large Tumors of the Axilla and Brachial Plexus** (9 minutes)
James C. Wittig, MD; Alex R. Vap, BA; Camilo E. Villalobos, MD; Brett L. Hayden, BA; Andrew M. Silverman, BA; and Martin M. Malawer, MD

26. **The Anterior Supine Intermuscular Approach in Primary Total Hip Arthroplasty** (18 minutes)
Keith R. Berend, MD; Adolph V. Lombardi Jr., MD; and Joanne B. Adams, BFA, CMI

27. **Robotic Arm-Assisted Unicompartmental Knee Arthroplasty: An Introductory Guide** (15 minutes)
Christopher John Dy, MD; Kristofer Jones, MD; Samuel Arthur Taylor, MD; Anil Ranawat, MD; and Andrew D. Pearle, MD

28. **Vertical Humeral Osteotomy for the Revision of Humeral Components in Shoulder Arthroplasty** (21 minutes)
Geoffrey Van Thiel, MD; Gregory P. Nicholson, MD; James Patrick Halloran, MD; Dana Piasecki, MD; Matthew T. Provencher, MD; and Anthony A. Romeo, MD

29. **Techniques for Safe Portal Placement in the Shoulder: The Ring of Fire** (13 minutes)
Keith D. Nord, MD; Bradford A. Wall, MD; Prithviraj Chavan, MD; and William H. Garrett, BS

30. **Reconstruction of the Medial Collateral Ligament of the Elbow** (12 minutes)
James Michael Bennett, MD; Thomas Lynn Melhoff, MD; and Rodney K. Baker

31. **Reconstruction of Abductor Mechanism-Gluteus Maximus Flap Transfer** (15 minutes)
Leo Whiteside, MD and Marcel Roy, PhD

32. **Kinematic Alignment with Modified Conventional Instruments Instead of Patient-Specific Guides** (26 minutes)
Stephen Howell, MD

33. **Arthroscopic Management of Femoroacetabular Impingement** (12 minutes)
J. W. Thomas Byrd, MD

34. **Arthroscopic Suprascapular Nerve Decompression: Etiology, Diagnosis, and Surgical Technique** (21 minutes)
Sanjeev Bhatia, MD; Adam B. Yanke, MD; Neil S. Ghodadra, MD; Seth Sherman, MD; Anthony A. Romeo, MD; and Nikhil N. Verma, MD

35. **Combined Cartilage Restoration and Distal Realignment for Patellar and Trochlear Chondral Lesions** (12 minutes)
Peter Chalmers, MD; Adam B. Yanke, MD; Seth Sherman, MD; Vasili Karas, BS; and Brian Cole, MD, MBA

36. **Simple Arthroscopic Anterior Capsulo-Labral Reconstruction of the Shoulder** (17 minutes)
Stephen J. Snyder, MD and Jeffrey D. Jackson, MD

37. **Proximal Humerus Resection for Parosteal Osteosarcoma** (16 minutes)
Yvette Ho, MD; Camilo E. Villalobos, MD; and James C. Wittig, MD

Multimedia Financial Disclosure

Western Orthopaedic Association has identified the option to disclose as follows.

The following participants have disclosed whether they or a member of their immediate family:

1. Receive royalties for any pharmaceutical, biomaterial, or orthopaedic product or device;
2. Within the past twelve months, served on a speakers' bureau or have been paid an honorarium to present by any pharmaceutical, biomaterial, or orthopaedic product or device company;

3a. Paid Employee for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;

3b. Paid Consultant for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;

3c. Unpaid Consultant for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;

4. Own stock or stock options in any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier (excluding mutual funds);
5. Receive research or institutional support as a principal investigator from any pharmaceutical, biomaterial, orthopaedic device and equipment company, or supplier;
6. Receive any other financial/material support from any pharmaceutical, biomaterial, or orthopaedic device and equipment company or supplier;
7. Receive any royalties, financial/material support from any medical and/or orthopaedic publishers;
8. Serves on the editorial or governing board of any medical and/or orthopaedic publication;
9. Serves on any Board of Directors, as an owner or officer, on a relevant committee of any health care organization (e.g., hospital, surgery center, medical).

n. No Conflicts to Disclose.

The Academy does not view the existence of these disclosed interests or commitments as necessarily implying bias or decreasing the value of the author's participation in the meeting

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Christopher L. Peters, MD *(1. Biomet; 2. Biomet; 3b. Biomet; 8. Journal of Arthroplasty; 9. AAOS)*

Marc J. Philippon, MD *(1. Smith & Nephew, Bledsoe, Donjoy, Arthrosurface; 3b. Smith & Nephew; 4. Arthrosurface, Hipco, MIS; 5. Ossur, Arthrex, Siemens, Smith & Nephew; 6. Smith & Nephew; 7. SLACK Incorporated, Elsevier; 9. International Society for Hip Arthroscopy, AOSSM, Steadman Philippon Research Institute)*

Matthew T. Provencher, MD *(8. Arthroscopy, BMC Musculoskeletal Disorders, Knee, Orthopedics, SLACK Incorporated, Vindico Orthopaedic Hyperguide; 9. AAOS, American Orthopaedic Society for Sports Medicine, American Shoulder and Elbow Surgeons, Arthroscopy Association of North America, International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine, San Diego Shoulder Institute, Society of Military Orthopaedic Surgeons)*

Anil Ranawat, MD *(4. MAKO, ConforMIS)*

Gleeson Rebello, MD *(n.)*

Leonard Remia, MD *(3b. Encore Medical; 6. Encore Medical)*

Anthony A. Romeo, MD *(1. Arthrex, Inc.; 2. Arthrex, Inc., DJ Orthopaedics, Joint Restoration Foundation; 3b. Arthrex, Inc.; 5. Arthrex, Inc., DJ Orthopaedics; 6. Arthrex, Inc., DJ Orthopaedics; 7. Saunders/Mosby-Elsevier; 8. Arthroscopy, Journal of Shoulder and Elbow Surgery, SLACK Incorporated, Wolters Kluwer Health - Lippincott Williams & Wilkins; 9. American Orthopaedic Society for Sports Medicine, American Shoulder and Elbow Surgeons, Arthroscopy Association of North America)*

Marcel Roy, PhD *(3c. Signal Medical Corp.)*

Wei Shen, MD, PhD *(n.)*
Seth Sherman, MD *(n.)*
Andrew M. Silverman, BA *(n.)*
Stephen J. Snyder, MD *(1. Arthrex, Inc., DJ Orthopaedics, Linvatec, Sawbones/Pacific Research Laboratories, Wright Medical Technology, Inc.; 3a. Redyns Medical; 3b. Synthes; 4. Redyns Medical, Johnson & Johnson, Wright Medical; 7. Wolters Kluwer Health - Lippincott Williams & Wilkins)*
Daniel J. Solomon, MD *(2. Arthrex, Inc., Pacific Medical; 8. Arthroscopy, American Orthopedic Sports Medicine Society Sports Medicine Update; 9. AAOS, American Orthopaedic Society for Sports Medicine, Society of Military Orthopaedic Surgeons)*
William I. Sterett, MD *(1. Biomet; 3b. Arthrex, Inc.; 5. Arthrex, Inc., Smith & Nephew, Ossur, Siemens)*
James B. Stiehl, MD *(1. Zimmer, Innomed; 2. Blue Orthopaedics Computer Company, Zimmer; 3b. Blue Orthopaedics Computer Company, Zimmer; 3c. Exactech, Inc.; 4. Blue Orthopaedics Computer Company, Traumis, Inc. Technology Company; 8. Knee, Journal of Arthroplasty)*
Allston J. Stubbs, MD *(3b. Smith & Nephew; 4. Johnson & Johnson, Inc.; 5. Bauerfeind, AG; 8. VuMedi.com, Journal of Arthroscopy; 9. International Society for Hip Arthroscopy, American Orthopaedic Society for Sports Medicine, Arthroscopy Association of North America)*
Michael L. Swank, MD *(3b. Brainlab, DePuy; 6. Brainlab, DePuy)*
Brett A. Sweitzer, MD *(n.)*

Samuel Arthur Taylor, MD *(n.)*
Fotios P. Tjoumakaris, MD *(2. Ferring Pharmaceutical)*
Geoffrey S. Van Thiel, MD *(n.)*
Alex R. Vap, BA *(n.)*
Nikhil N. Verma, MD *(1. Smith & Nephew; 3b. Smith & Nephew; 4. Omeros; 5. Arthrex, Inc., Smith & Nephew, Athletico, ConMed Linvatec, Miomed, Mitek; 7. Vindico Medical-Orthopedics Hyperguide, Arthroscopy; 8. Journal of Knee Surgery, Arthroscopy, SLACK Incorporated; 9. American Orthopaedic Society for Sports Medicine, Arthroscopy Association Learning Center Committee)*
Camilo E. Villalobos, MD *(n.)*
Bradford A. Wall, MD *(n.)*
Jon J. P. Warner, MD *(1. Zimmer, Tornier; 6. Arthrocare, DJ Orthopaedics, Arthrex, Inc., Mitek, Breg, Smith & Nephew)*
Hugh Godfrey Watts, MD (n.)
Leo Whiteside, MD *(1. Smith & Nephew, Stryker; 2. Smith & Nephew; 3b. Signal Medical Corp.; 3c. Smith & Nephew; 4. Signal Medical Corp.; 8. Journal of Arthroplasty, Clinical Orthopaedics and Related Research, Journal of Orthopaedics and Traumatology)*
James C. Wittig, MD *(n.)*
Adam B. Yanke, MD *(n.)*
Zachary R. Zimmer, BA *(n.)*

Western Orthopaedic Association

76th Annual Meeting

June 14-16, 2012

The Hilton Portland
Portland, Oregon

2012 CME Credit Record

Multimedia Education

Instructions: To ensure correct CME credit is awarded, please complete this form, indicating the DVDs you watched. Return this form to the WOA Registration Desk or complete the Credit Record online at www.woa-assn.org. You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

Please Print:

Name: _____ *AAOS Member #:* _____

Address: _____

City: _____ *State:* _____ *Zip:* _____

Phone: _____ *Fax:* _____

Email Address: _____

Thank you for your cooperation.

2012 CME Credit Record Multimedia Education

Please place an × in the box by each DVD viewed and write any comments you may have in the space provided. You will be awarded hour per hour credit for time of participation.

- ☐ **DVD 1 (25 min)**
- ☐ **DVD 2 (11 min)**
- ☐ **DVD 3 (22 min)**
- ☐ **DVD 4 (12 min)**
- ☐ **DVD 5 (15 min)**
- ☐ **DVD 6 (11 min)**
- ☐ **DVD 7 (12 min)**
- ☐ **DVD 8 (12 min)**
- ☐ **DVD 9 (23 min)**
- ☐ **DVD 10 (25 min)**
- ☐ **DVD 11 (9 min)**
- ☐ **DVD 12 (10 min)**
- ☐ **DVD 13 (11 min)**
- ☐ **DVD 14 (14 min)**
- ☐ **DVD 15 (25 min)**
- ☐ **DVD 16 (13 min)**
- ☐ **DVD 17 (13 min)**
- ☐ **DVD 18 (8 min)**
- ☐ **DVD 19 (24 min)**
- ☐ **DVD 20 (18 min)**
- ☐ **DVD 21 (22 min)**
- ☐ **DVD 22 (20 min)**
- ☐ **DVD 23 (7 min)**
- ☐ **DVD 24 (7 min)**
- ☐ **DVD 25 (9 min)**
- ☐ **DVD 26 (18 min)**
- ☐ **DVD 27 (15 min)**
- ☐ **DVD 28 (21 min)**
- ☐ **DVD 29 (13 min)**
- ☐ **DVD 30 (12 min)**
- ☐ **DVD 31 (15 min)**
- ☐ **DVD 32 (26 min)**
- ☐ **DVD 33 (12 min)**
- ☐ **DVD 34 (21 min)**
- ☐ **DVD 35 (12 min)**
- ☐ **DVD 36 (17 min)**
- ☐ **DVD 37 (16 min)**

Please indicate the DVD(s) you found to be most meaningful and any comments. Begin with the DVD number.

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Please indicate any feedback that you may have concerning other DVDs. Begin with the DVD number.

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Please indicate any comments or suggestions that you have regarding the Multimedia Presentations.

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Western Orthopaedic Association

76th Annual Meeting

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Portland, Oregon

2012 CME Credit Record

Scientific Program

Instructions: To ensure correct CME credit is awarded, please complete this form, indicating the Sessions you attended. Return this form to the WOA Registration Desk or complete the Credit Record online at www.woa-assn.org. You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

Please Print:

Name: _____ *AAOS Member #:* _____

Address: _____

City: _____ *State:* _____ *Zip:* _____

Phone: _____ *Fax:* _____

Email Address: _____

Thank you for your cooperation.

2012 CME Credit Record Scientific Program

Please rate by circling the appropriate number:
5 = Excellent 4 = Good 3 = Satisfactory 2 = Fair 1 = Poor

Thursday, June 14, 2012

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
General Session I	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium I	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent General Session II ☐ *or* *General Session III* ☐		*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session IV	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium II	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session V	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session VI	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Questions Review and Answers	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Friday, June 15, 2012

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
General Session VII	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium III	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session VIII	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session IX	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium IV	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session X	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium V	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent General Session XI ☐ *or* *General Session XII* ☐		*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Saturday, June 16, 2012

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
General Session XIII	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium VI	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session XIV	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent General Session XV ☐ *or* *General Session XVI* ☐		*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium VII	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session XVII	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent General Session XVIII ☐ *or* *General Session XIX* ☐		*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Questions Review and Answers	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Comments:

_____

_____

Western Orthopaedic Association

76th Annual Meeting
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Portland, Oregon

2012 CME Credit Record

Poster Presentations

Instructions: To ensure correct CME credit is awarded, please complete this form, indicating the posters viewed. Return this form to the WOA Registration Desk or complete the Credit Record online at www.woa-assn.org. You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

Please Print:

Name: _____ *AAOS Member #:* _____

Address: _____

City: _____ *State:* _____ *Zip:* _____

Phone: _____ *Fax:* _____

Email Address: _____

2012 CME Credit Record
Poster Presentations

Please place an X in the box by each posters viewed and write any comments you may have in the space provided. Each poster viewed will account for 10 minutes of CME credit. There is a maximum of 3 CME credits available during the course of the meeting for viewing posters (or a total of 18 posters).

☐ 1	☐ 11	☐ 21	☐ 31
☐ 2	☐ 12	☐ 22	☐ 32
☐ 3	☐ 13	☐ 23	☐ 33
☐ 4	☐ 14	☐ 24	☐ 34
☐ 5	☐ 15	☐ 25	
☐ 6	☐ 16	☐ 26	
☐ 7	☐ 17	☐ 27	
☐ 8	☐ 18	☐ 28	
☐ 9	☐ 19	☐ 29	
☐ 10	☐ 20	☐ 30	

Please indicate the poster(s) you found to be most meaningful and any comments. Begin with the poster number.

_____

_____

_____

_____

Please indicate any feedback that you may have concerning other posters. Begin with the poster number.

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_____

Please indicate any comments or suggestions that you have regarding the Poster Presentations.

_____

_____

_____

2012 Overall Scientific Evaluation

Your feedback is critical to program planning and future course development. Please take a few minutes to complete and return this evaluation form to the registration desk prior to departure.

Why did you choose to attend this Meeting?	High Importance	Some Importance	Little Importance	No Importance
Course Topic(s)	☐	☐	☐	☐
Learning Method(s)	☐	☐	☐	☐
Program Faculty	☐	☐	☐	☐
Location of Program	☐	☐	☐	☐
Timeliness	☐	☐	☐	☐
Obtaining CME Credit	☐	☐	☐	☐
Poster Presentations	☐	☐	☐	☐
How did we do overall?	**Excellent**	**Good**	**Fair**	**Poor**
Course Educational Objectives	☐	☐	☐	☐
Practical Application to Practice	☐	☐	☐	☐
Faculty Selection	☐	☐	☐	☐
Opportunity to Interact with Faculty	☐	☐	☐	☐
Course Syllabus	☐	☐	☐	☐
Opportunity to Ask Questions	☐	☐	☐	☐
Lighting, Seating and General Environment	☐	☐	☐	☐
Course Length	☐	☐	☐	☐
Registration Fee	☐	☐	☐	☐
Refreshment Breaks, Food and Beverages	☐	☐	☐	☐
Lodging Accommodations	☐	☐	☐	☐
Cost of Lodging Accommodations	☐	☐	☐	☐
Overall Course Rating	☐	☐	☐	☐
How did we do on Poster Presentations?	**Excellent**	**Good**	**Fair**	**Poor**
Poster Educational Objectives	☐	☐	☐	☐
Practical Application to Practice	☐	☐	☐	☐
Opportunity to Interact with Poster Presenter/Co-Author	☐	☐	☐	☐
Poster Syllabus Material	☐	☐	☐	☐
Opportunity to Ask Questions	☐	☐	☐	☐
Poster Location	☐	☐	☐	☐
How did we do on Multimedia?	**Excellent**	**Good**	**Fair**	**Poor**
Multimedia Educational Objectives	☐	☐	☐	☐
Practical Application to Practice	☐	☐	☐	☐
DVD Selection	☐	☐	☐	☐
Multimedia Location	☐	☐	☐	☐

The program content was: **Just Right** ☐ **Too Advanced** ☐ **Too Basic** ☐

How much of the content was new to you? **Almost All** ☐ **About 75%** ☐ **About 50%** ☐ **About 25%** ☐ **Almost None** ☐

Would you recommend this meeting to colleagues? **Yes** ☐ **No** ☐

Did you perceive industry (commercial) bias in this meeting? **Yes** ☐ **No** ☐

If yes, describe: _____

What I liked best about this meeting: _____

_____

How I would improve this meeting: _____

_____

Overall, did we deliver what you came to learn? **Yes** ☐ **No** ☐

What did you learn from attending this meeting? List an example of something you learned that can be applied to your practice: _____

_____

_____

2013 Needs Assessment Survey

Please list any medical topics that you would like included in future programs planned by WOA.

Please list any Office Management Topics that you would like included in the program.

Management of: