Western Orthopaedic Association

75th Annual Meeting

July 27–30, 2011
The Royal Hawaiian & Sheraton Waikiki
Honolulu, Hawaii

2011
Meeting Program

Chuck Freitag
Executive Director, DTMS

Cynthia Lichtefeld
Director of Operations, DTMS

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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 sponsor continuing medical education for physicians. The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 30.5 *AMA PRA Category 1 Credits*™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

President's Message

Dear Colleagues,

Ted and Pam Stringer

Aloha!! Pam and I are privileged and honored to welcome you to Waikiki on the occasion of the 75th Anniversary of the Western Orthopaedic Association. We proudly present to you a diverse and pertinent academic program in combination with unique social activities for you and your family.

Our program Co-Chairmen, Drs. Jim Duffey and Mike Dohm have created an outstanding Scientific Program including symposia on the following topics: Pain Management, Hip Arthroscopy, Spine Surgery, Management of Upper Extremity Fractures, Current Concepts in Management of Osteoarthritis, Hip and Knee, and Allografts. Our Scientific Program will include podium and poster presentations and will feature seven award winning Resident Papers. The meeting will provide 30.5 CME credits.

My Presidential Guest Speaker is Dr. G. Paul DeRosa, MD, who is my long term teacher, mentor, and friend. He will provide perspectives on his career through "Ruminations of an Orthopaedist." Paul's resume includes terms as President of the Mid-America Orthopaedic Association (MAOA), the Pediatric Orthopaedic Society of North America (POSNA), and the American Orthopaedic Association (AOA). He served as Executive Director of the American Board of Orthopaedic Surgery (ABOS), from 1995-2008 and continues to serve as an emeritus member of the Board and the Duke University Department of Orthopaedics. He brings a unique perspective to our podium and I especially look forward to Paul and his wife MaryAnn's participation in our meeting.

The Howard Steel Lecturer is Dr. Harvey Schiller, PhD, who will address "Lessons in Leadership from a Sports Perspective," based on his extensive experience which includes his roles as Executive Secretary of the United States Olympic Committee (USOC), President of Turner Sports, and CEO of YankeeNets. Harvey is one of the premier sports executives in the U.S. and I'm sure that you and your family will enjoy his presentation — I'll look forward to introducing my long-time friends Harvey Schiller and his wife Marcia to you.

We will also have an additional presentation from our Managing Director, Dr. Larry Housman, on the History of the WOA as we celebrate our 75-year milestone. Our AAOS President, Dr. Dan Berry will provide us with an Academy update in addition to his participation in our Scientific Program.

I would like to express my sincere and heartfelt appreciation to the dedicated members of the WOA Board. I am thankful for your counsel and your friendship. I would also like to thank my Presidential Predecessors for their guidance and mentorship. Finally I would like to thank the Data Trace Staff for their special expertise and support, including Chuck Freitag, Executive Director, Cynthia Litchfield, Director of Operations, and Stacy Wald, Director of Meeting/Events. It has been my distinct pleasure to work with them.

We look forward to sharing this special opportunity in celebration of our 75th birthday in the spectacular setting of Waikiki Beach.

Mahalo!

Ted and Pam Stringer

Ted Stringer, MD and Pam Stringer
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, JULY 27, 2011

1:00pm–5:00pm	**Board of Directors Meeting** *(Niihau Room)*
2:00pm–5:00pm	**Meeting Registration** *(Ballroom Foyer)*
2:00pm–5:00pm	**Speaker Ready Room** *(Ballroom Foyer)*
3:00pm–5:00pm	**Exhibit Setup** *(Maui Room and Ballroom Foyer)*
3:00pm–5:00pm	**Scientific Poster Setup** *(Oahu and Waialua Rooms)*

THURSDAY, JULY 28, 2011

6:00am–6:30am	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
6:00am–2:40pm	**Meeting Registration** *(Ballroom Foyer)*
6:00am–2:40pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** *(Maui Room and Ballroom Foyer)*
6:00am–5:10pm	**Speaker Ready Room** *(Ballroom Foyer)*
6:15am–6:30am	**First Business Meeting** *(Kauai Room)*
6:30am–2:40pm	**Scientific Sessions and Symposia** (See pages 6-7 for details.) *(Kauai Room)*
9:00am–10:30am	**Spouse/Children's Hospitality*** *(Monarch Room at Royal Hawaiian)*
10:45am–1:00pm	**Cooking Demo Featuring Chef Darren*** *(Koko Crater Room)*
11:30am–12:00pm	**Howard Steel Lecture** *(Kauai Room)*
12:30pm–1:30pm	**Industry Workshop — ConvaTec*** *(Akaka Falls and Ioa Needle Rooms)*
1:00pm–5:30pm	**Sea Life Park*** *(Meet at Aloha Landing)* **The Royal Dolphin Swim** **Dolphin Encounter** **Sea Trek Adventure**
1:30pm–4:40pm	**Mini Circle Island Excursion*** *(Meet at Aloha Landing)*
2:40pm–3:40pm	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
3:40pm–5:10pm	**Multimedia Education Session** *(Ballroom Foyer)*
6:30pm–9:30pm	**Welcome Reception*** *(Helumoa Playground)*

FRIDAY, JULY 29, 2011

6:00am–6:30am	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
6:00am–1:30pm	**Meeting Registration** *(Ballroom Foyer)*
6:00am–2:00pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** *(Maui Room and Ballroom Foyer)*

* See Activities Information on pages 8-9 for more details.

6:00am–5:00pm	**Speaker Ready Room** *(Ballroom Foyer)*
6:30am–2:00pm	**Scientific Sessions and Symposia** (See pages 6-7 for details.) *(Kauai Room)*
9:35am–10:05am	**Presidential Guest Speaker** *(Kauai Room)*
12:15pm–5:30pm	**Golf Tournament*** *(Meet at Aloha Landing)*
12:40pm–3:20pm	**Lyon Arboretum*** *(Meet at Aloha Landing)*
2:00pm–3:00pm	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
3:00pm–5:00pm	**Multimedia Education Session** *(Ballroom Foyer)*
5:30pm–7:30pm	**Exhibitor and Poster Reception*** *(Maui Room and Ballroom Foyer)*
5:30pm–7:30pm	**Kids' Movie Night with Arts & Crafts and Dinner*** *(Honolulu and Kahuku Rooms)*

SATURDAY, JULY 30, 2011

5:30am–6:30am	**WOA Board Meeting w/Breakfast** *(Niihau Room)*
6:00am–6:30am	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
6:00am–1:55pm	**Meeting Registration** *(Ballroom Foyer)*
6:00am–1:55pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** *(Maui Room and Ballroom Foyer)*
6:00am–4:55pm	**Speaker Ready Room** *(Ballroom Foyer)*
6:30am–1:55pm	**Scientific Sessions and Symposia** (See pages 6-7 for details.) *(Kauai Room)*
1:25pm–1:55pm	**Presidential Address** *(Kauai Room)*
1:55pm–2:55pm	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
2:00pm–5:00pm	**Diamond Head Crater Adventure*** *(Meet at Aloha Landing)*
2:55pm–4:55pm	**Multimedia Education Session** *(Ballroom Foyer)*
7:00pm–11:00pm	**Family Gala Dinner Dance*** *(Monarch Room at Royal Hawaiian)*

SUNDAY, JULY 31, 2011

7:30am–1:00pm	**USS Arizona Memorial and Battleship Missouri Excursion*** *(Meet at Aloha Landing)*

* See Activities Information on pages 8-9 for more details.

Scientific Program Agenda

Kauai Room (unless otherwise specified)

Presenters and times are subject to change.

THURSDAY, JULY 28, 2011

6:00am–6:30am	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
6:00am–5:10pm	**Speaker Ready Room** *(Ballroom Foyer)*
6:35am–7:25am	**SYMPOSIUM 1: Spine 1 — Biologics in Spine**
7:25am–8:40am	**SYMPOSIUM 2: Spine 2 — Spine Pain Management**
8:40am–9:00am	***Break — Please visit exhibitors*** *(Maui Room and Ballroom Foyer)*
9:00am–10:55am	**SYMPOSIUM 3: Practice Management 1**
10:55am–11:15am	***Break — Please visit exhibitors*** *(Maui Room and Ballroom Foyer)* The drawing will take place in the exhibit area at the end of the break.
11:15am–12:00pm	**GENERAL SESSION 1: AAOS Report & Howard Steel Lecture**
12:00pm–1:00pm	**GENERAL SESSION 2: Special Lecture**s
1:00pm–1:20pm	***Break — Please visit exhibitors*** *(Maui Room and Ballroom Foyer)*
1:20pm–2:40pm	**CONCURRENT SESSION 1**: **Spine, Sports Medicine & Pediatrics**
1:20pm–2:40pm	**CONCURRENT SESSION 2**: **Basic Science** *(Honolulu and Kahuku Rooms)*
2:40pm–3:40pm	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
3:40pm–5:10pm	**Multimedia Education Session** *(Ballroom Foyer)*

FRIDAY, JULY 29, 2011

6:00am–6:30am	**Scientific Poster Sessions** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
6:00am–5:00pm	**Speaker Ready Room** *(Ballroom Foyer)*
6:30am–9:05am	**SYMPOSIUM 4: Non-Arthritic Hip Pain and Hip Arthroscopy — State of the Art (and Science)**
7:50am–9:05am	**SYMPOSIUM 5: Spine 3 — Less Invasive Spine Surgery**
9:05am–9:25am	***Break — Please visit exhibitors*** *(Maui Room and Ballroom Foyer)*
9:25am–10:05am	**GENERAL SESSION 3: Board of Councilor's Report & Presidential Guest Speaker**
10:05am–11:20am	**SYMPOSIUM 6: Angles and Evidence — Acceptable Alignment for Upper Extremity Fractures**
11:20am–11:40am	***Break — Please visit exhibitors*** *(Maui Room and Ballroom Foyer)* The drawing will take place in the exhibit area at the end of the break.
11:40am–12:35pm	**GENERAL SESSION 4: Medical Legal Forum**
12:35pm–12:55pm	***Break — Please visit exhibitors*** *(Maui Room and Ballroom Foyer)*

12:55pm–2:00pm	**CONCURRENT SESSION 3: Trauma, Foot & Ankle, Tumors, and Pain Management**
12:55pm–2:00pm	**CONCURRENT SESSION 4: Total Joint, Upper Extremity & Miscellaneous** *(Honolulu and Kahuku Rooms)*
2:00pm–3:00pm	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
3:00pm–5:00pm	**Multimedia Education Session** *(Ballroom Foyer)*

SATURDAY, JULY 30, 2011

6:00am–6:30am	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
6:00am–1:55pm	**Speaker Ready Room** *(Ballroom Foyer)*
6:30am–7:55am	**SYMPOSIUM 7: Osteoarthritis Management 1 — Adult Reconstruction Hip**
7:55am–9:15am	**GENERAL SESSION 5: Special Lectures**
9:15am–9:40am	***Break — Please visit exhibitors*** *(Maui Room and Ballroom Foyer)* The drawing will take place in the exhibit area at the end of the break.
9:40am–11:05am	**GENERAL SESSION 6: Resident Awards**
11:05am–11:15am	***Break***
11:15am–12:35pm	**SYMPOSIUM 8: Osteoarthritis Management 2 — Adult Reconstruction Knee**
12:35pm–1:55pm	**GENERAL SESSION 7: Updates & Presidential Address**
1:55pm–2:55pm	**Scientific Poster Session** *(Oahu and Waialua Rooms)* **Note:** Presenters will be available to answer questions.
2:55pm–4:55pm	**Multimedia Education Session** *(Ballroom Foyer)*

Activities Information

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

Thursday, July 28, 2011

Spouse/Children's Hospitality

9:00am–10:30am *(Monarch Room at Royal Hawaiian)*

A speaker will talk on the history of the Royal Hawaiian and surrounding area. A 45-minute hotel tour will be given for anyone interested after breakfast. Continental Breakfast is included.

Price: Included in Registration Fee

Cooking Demo Featuring Chef Darren

10:45am–1:00pm *(Koko Crater Room)*

"Hawaiiancentric" cooking classes will expose you to a variety of locally-produced, specialty ingredients. The one constant in Hawaiian cooking is the use of artistry and improvisation. The art of proper cutting and chopping techniques, helpful hints, and the sharing of recipes with local ingredients is a very important focus of this class. We will focus on such favorites as Ahi Poke, Chicken long rice, Kahuku corn and crab cake, Lomi Lomi salmon, taro, Portugese bean soup, Tahitian vanilla bean onaga and haupia. Connie Teuscher will discuss infused oils/vinegars.

Price: $98 per person (sampling while cooking/preparing is part of the culinary experience!); Maximum 40 people.

Industry Workshop — ConvaTec

12:30pm–1:30pm *(Akaka Falls and Ioa Needle Rooms)*

(CME credit not available.)

Surgical Site Infection in Total Hip & Knee Arthroplasty

Presented by: C. Lowry Barnes, MD, Arkansas Specialty Orthopaedics and Michael P. Bolognesi, MD, Duke University Medical Center

Dr. Barnes and Dr. Bolognesi will discuss the following topics:

- Overview of Surgical Infection in Hip and Knee Arthroplasty
- Risk Mitigation of Infection in Arthroplasty
- Wound Management in Total Joint Arthroplasty

Price: Included in Registration Fee; Lunch provided

Sea Life Park

1:00pm–5:30pm *(Meet at Aloha Landing)*

This exciting and interesting park provides a unique opportunity to interact with exotic sea life and animals. From swimming with dolphins and sea lions to sitting in on a penguin trainer talk, from feeding sea turtles to diving with rays, no other park gets you this close.

Price: Park admission, transportation and sales tax: $33 per accompanying non-participating adult; $23 per non-participating child (ages 3-11 years). Transportation, entrance fee, and sales tax are included in the below activities.

The Royal Dolphin Swim

The most exciting dolphin activity and the highlight of all the interactive dolphin programs. You'll get to know two of the park's smartest, fastest dolphins and take an exhilarating, thrilling ride that you'll never forget.

Price: $226 per person. Children from 8 to 12 years old each must be accompanied in the water by a paying adult; Minimum age 8 years old.

Dolphin Encounter

Are you looking for a fantastic, fun-filled family activity that lets you get close to dolphins in Hawaii? If you are traveling in a group with small children or others who simply prefer to remain in shallow water, then the Dolphin Encounter is perfect for you.

Price: $97 per person. This interactive dolphin program was designed for children. Children 1 to 7 years old each must be accompanied in the water by a paying adult. Children 8 and older may participate by themselves.

Sea Trek Adventure

This underwater stroll takes place about 18 feet deep in our Hawaiian Reef Tank. You'll be amazed as you're surrounded by magical sea life. The allure of this Sea Life Park Hawaii natural spectacle is beyond comparison. You'll see stingrays and schools of shimmering, multicolor fish.

Price: $86 per person; Minimum height: 40". Minimum age 8 years old.

Mini Circle Island Excursion

1:30pm–4:40pm *(Meet at Aloha Landing)*

It's a Hawaiian road trip, with the sights and sounds of beautiful Oahu as your companion! Take a scenic drive displaying some of the best sightseeing the island has to offer. Your first stop is the gorgeous Pali Cliffs in Nuuanu Valley, where King Kamehameha conquered the island of Oahu. You'll proceed through the historic Waimanalo community to the eastern coastline where the famous Makapuu and Sandy Beaches are known for their excellent body surfing. Stop by the "Blow Hole" to view a spectacular seawater eruption from a natural saltwater geyser. On your way back to Waikiki, a drive through the plush residential district of Kahala will take you around the famous Diamond Head Crater for some sensational vistas.

Price: $45 per person (lunch not included); Minimum 16 people.

Welcome Reception

6:30pm–9:30pm *(Helumoa Playground)*

Have a wonderful evening overlooking the ocean and enjoying the Hawaiian breezes. You'll savor food delicacies and drinks while chatting with friends and colleagues. Take pleasure in the Hawaiian entertainment and soak in the experience.

Attire: Resort Casual (no coat required)

Price: Included in Registration Fee

Friday, July 29, 2011

Golf Tournament

12:15pm–5:30pm *(Meet at Aloha Landing)*

Carved out of a magnificent tropical forest, Ko'olau Golf Club is nestled below Oahu's historic and popular Pali Lookout. Ko'olau offers breathtaking views of the majestic 2,000-foot-high cliffs of the Ko'olau Mountain Range, cascading waterfalls and commanding views of the Pacific Ocean and the beautiful windward side of Oahu. Ko'olau's natural setting provided master golf course architect Dick Nugent the opportunity to create a gem of a golf course that encompasses over 280 acres of spectacular terrain with a scenic 7,310-yard, par-72 layout unlike any other in the world. Ko'olau features impeccable conditioning and some of the most extraordinary scenery in the world.

Price: $218 per person (includes lunch, transportation, beverage cart, prizes, and golf hat).

Lyon Arboretum

12:40pm–3:20pm *(Meet at Aloha Landing)*

Nestled deep in Manoa Valley on the Island of Oahu, the Harold L. Lyon Arboretum is a leader in the fields of Conservation Biology, Ethnobotany, and Horticulture. Lyon Arboretum maintains a world renowned collection of more than 5,000 tropical plant species including one of the largest palm collections found in a botanical garden. A guided tour shares info about Hawaii's natural history, rich cultural heritage, and the Arboretum's essential work in rare plant conservation. Transportation, entrance fee, and private tour included.

Price: $67 per person (lunch not included); Minimum of 16 people.

Exhibitor and Poster Reception

5:30pm–7:30pm *(Maui Room and Ballroom Foyer)*

This is an opportunity to visit with the Exhibitors and view the Scientific Posters. Enjoy your favorite beverage and delicious fruits and cheeses.

Attire: Resort Casual (no jacket required)

Price: Included in Registration Fee

Kids' Movie Night with Arts & Crafts and Dinner

5:30pm–7:30pm *(Honolulu and Kahuku Rooms)*

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

Saturday, July 30, 2011

Diamond Head Crater Adventure

2:00pm–5:00pm *(Meet at Aloha Landing)*

This exciting, fun, and educational tour of world famous Diamond Head Crater is a 45-minute guided walk that ascends to the 763 foot summit. Along the way visitors stop at several points to rest and photograph the crater. Walking up stairways, going into a dark 200 foot tunnel and climbing a spiral staircase imparts a sense of adventure. When reaching the summit visitors are thrilled by the incredible views of Waikiki Beach, the emerald green mountains and the sparkling aquamarine water of the Pacific ocean below.

Price: $40 per person; Minimum 25 people.

Family Gala Dinner Dance

7:00pm–11:00pm *(Monarch Room at Royal Hawaiian)*

Let's get the party started! This is the night to let your hair down and have some fun with your friends and colleagues. There will be a fabulous band, dinner, drinks, and don't forget to bring your dance moves. The kids will have fun and dinner in an adjacent room with a movie and arts & crafts!

Attire: Resort Dressy (no jacket and tie required)

Price: Included in Registration Fee

Sunday, July 31, 2011

USS Arizona Memorial and Battleship Missouri Excursion

7:30am–1:00pm *(Meet at Aloha Landing)*

Travel back in time to December 7, 1941 and relive the events that surrounded that fateful Day of Infamy. You'll embark on a moving journey covering the attack on Pearl Harbor through a film, fascinating displays, and a short cruise, allowing you to board the USS Arizona Memorial where over 1,000 men of service still lay entombed. Following your visit to where America's involvement in World War II began, you'll view the battleship where it ended. Climb aboard the "Mighty Mo" for a peek back into America's history. The Battleship Missouri is the last, and most celebrated, battleship built by the U.S. Navy. It was on the decks of this celebrated warship that the Japanese surrender ceremony took place, signaling the end of their involvement in World War II. Now located on Pearl Harbor's historic Battleship Row, the Missouri is a living museum that will engage you in the history and excitement of life aboard a battleship. Enjoy a personalized guided tour of two significant warships brought back to life from the history of the United States.

Price: $93 per person (lunch not included); Minimum 16 people.

Meeting Information

FORMAT

The educational sessions will be held Thursday, Friday, and Saturday, July 28–30, 2011, from approximately 6:30am until 2:30pm, at the Sheraton Waikiki in Honolulu, Hawaii.

TARGET AUDIENCE

The 75th Annual Meeting of the Western Orthopaedic Association has been developed primarily for orthopaedic and trauma surgeons. Physician Assistants, LPNs and Physical Therapists would also benefit from this program.

SPEAKER READY ROOM

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

PHYSICIAN REGISTRATION FEE

Registration covers the Scientific Program Sessions, Meeting Program, Poster Sessions, Multimedia Sessions, Daily Continental Breakfasts, Welcome Reception, Exhibitor/Poster Reception, Gala Reception/Dinner Dance, Coffee Breaks, and Daily Drawings.

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 30.5 *AMA PRA Category 1 Credits*™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

* 20.5 CME credits for Scientific Program
* 5.5 CME credits for Multimedia Education Sessions
* 4.5 CME credits for Scientific Poster Sessions

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.

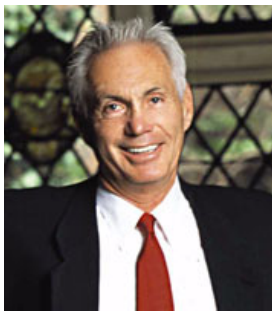
MANAGEMENT

The Western Orthopaedic Association is managed by Data Trace Management Services, 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.

2011 Howard Steel Orthopaedic Foundation Lecturer



Harvey W. Schiller, PhD

WOA is pleased to have Harvey W. Schiller, PhD as this year's Howard Steel Lecturer. He is Chairman of the Board and CEO for GlobalOptions Group, a multidisciplinary international risk management and business solutions company. He oversees GlobalOptions' New York office with a focus on the company's new business development. He also recently served as President of the International Baseball Federation, the international governing body for the Olympic sport of baseball.

Prior to joining GlobalOptions, Dr. Schiller was the Chairman of Assante US, a leading provider of financial and life management products and services to many in the sports and entertainment industry. Before Assante, he served as Chairman and CEO of YankeeNets, an integrated sports-based media company; Vice President of Sports Programming for Turner Broadcasting System; and President of Turner Sports.

Before joining Turner in 1994, Dr. Schilling was Executive Director/Secretary General of the United States Olympic Committee (USOC), and served as a member of the NCAA Executive Committee. In 1994, he was awarded the prestigious Olympic Order, the highest decorated honor presented to an individual by the International Olympic Committee, and worked directly in support of the planning and award of the 1996 Centennial Olympic Games to the city of Atlanta.

Dr. Schiller received a bachelor's degree from The Citadel and is a member of their Athletic Hall of Fame. He then earned his master's degree and doctorate from the University of Michigan.

He also served as a pilot in the U.S. Air Force, including combat service in Vietnam, and attained the rank of Brigadier General. He is a recipient of several military awards including the Legion of Merit and Distinguished Flying Cross.

2011 President

Theodore L. Stringer, MD

Colorado Springs, Colorado

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.
1943	Howard H. Markel, MD	San Francisco, CA
1944 – 1946	INACTIVE: WORLD WAR II	
1947	Alfred E. Gallant, MD	Los Angeles, CA
1948	Merril C. Mensor, MD	San Francisco, CA
1949	Harold E. Crowe, MD	Los Angeles, CA
1950	Harry C. Blair, MD	Portland, OR
1951	William F. Holcolmb, MD	Oakland, CA
1952	Vernon P. Thompson, MD	Los Angeles, CA
1953	John F. LeCocq, MD	Seattle, WA
1954	Leonard Barnard, MD	Oakland, CA
1955	J. Warren White, MD	Honolulu, HI
1956	James Lytton-Smith, MD	Phoenix, AZ
1957	Samuel S. Matthews, MD	Los Angeles, CA
1958	Joe B. Davis, MD	Portland, OR
1959	William F. Stanek, MD	Denver, CO
1960	Fraser L. Macpherson, MD	San Diego, CA
1961	Marvin P. Knight, MD	Dallas, TX
1962	Donald E. King, MD	San Francisco, CA
1963	Darrell G. Leavitt, MD	Seattle, WA
1964	Paul E. McMaster, MD	Beverly Hills, CA
1965	Boyd G. Holbrook, MD	Salt Lake City, UT
1966	John R. Schwartzmann, MD	Tucson, AZ
1967	Ivar J. Larsen, MD	Honolulu, HI
1968	Abraham B. Sirbu, MD	San Francisco, CA
1969	Harry C. Hughes, MD	Denver, CO
1970	Lawrence Noall, MD	Portland, OR
1971	G. Wilbur Westin, MD	Los Angeles, CA
1972	Robert A. Murray, MD	Temple, TX
1973	Milo A. Youel, MD	San Diego, CA
1974	William H. Gulledge, MD	Honolulu, HI
1975	Harry R. Walker, MD	Oakland, CA
1976	Thomas H. Taber Jr., MD	Phoenix, AZ
1977	Lloyd W. Taylor, MD	San Francisco, CA
1978	Robert E. Florence, MD	Tacoma, WA
1979	Harold LaBriola, MD	Los Angeles, CA
1980	John S. Smith, MD	Honolulu, HI
1981	Rodney K. Beals, MD	Portland, OR
1982	George E. Omer Jr., MD	Albuquerque, NM
1983	Wallace Hess, MD	Salt Lake City, UT
1984	Philip H. Dickinson, MD	San Diego, CA
1985	Richard E. Eppright, MD	Houston, TX
1986	George C. Beattie, MD	Burlingame, CA
1987	Ralph L. Cotton, MD	Wheat Ridge, CO
1988	Donald A. Jones, MD	Honolulu, HI
1989	Sanford H. Anzel, MD	Orange, CA
1990	Lorence W. Trick, MD	San Antonio, TX
1991	C. Harold Willingham, MD	Tucson, AZ
1992	William W. Tipton Jr., MD	Sacramento, CA
1993	St. Elmo Newton III, MD	Seattle, WA
1994	Charles R. Ashworth, MD	Los Angeles, CA
1995	Thomas G. Grace, MD	Albuquerque, NM
1996	Thomas B. Grollman, MD	Lihue, HI
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July ’10 to May ’11

Sanford H. Anzel, MD Fund

Michael W. Abdalla, MD $1,000
Mrs. Darlene J. Anzel. $200

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Thomas G. Grace, MD $500

WOA President’s Fund

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WOA Resident Endowment Fund

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WOA Annual Campaign

Orthopaedic Surgeons Network of Arizona $3,750
Gerard L. Glancy, MD $1,000
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Blair C. Filler, MD $500
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Thank you for your generous contributions!

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WOA Business Meetings

Western Orthopaedic Association

Kauai Room
Sheraton Waikiki
Honolulu, Hawaii

Thursday, July 28, 2011
6:15am–6:35am

First Business Meeting

Theodore L. Stringer, MD, President, Presiding

AGENDA

I. Call to Order

II. Report of the President, Theodore L. Stringer, MD

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

IV. Report of the Treasurer/Historian, Valerae O. Lewis, 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 2011 Nominating Committee and Proposed Slate of Officers for 2011-2012, William C. McMaster, MD

VII. Election of the 2012 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.

2011 Committee—Ineligible

William C. McMaster, MD, *Chair*
Paul C. Collins, MD
Michael P. Dohm, MD
Robert E. Eilert, MD
Gerard L. Glancy, MD
Ramon L. Jimenez, MD
Richard F. Santore, MD

2012 Committee

Theodore L. Stringer, MD, *Chair*
Marc J. Rosen, MD
1. Nominee
2. Nominee
3. Nominee
4. Nominee

VIII. Old Business

IX. New Business

X. Announcements

XI. Adjournment

Minutes of the 2010 First Business Meeting of the Western Orthopaedic Association

Portola Hotel & Spa, Monterey, California
Thursday, August 5, 2010

Call to Order and Report of the President

Dr. McMaster addressed the membership and thanked them for their participation. He thanked Dr. Bhatia 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 19 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.

Report of the Treasurer/Historian

Dr. Lewis reported that financially, the WOA is doing very well. A slide presentation that included year-to-date and 2010 forecasted financial data accompanied this report. Meeting participation and industry support is strong. Overall, the WOA is on track to achieve $1 million dollars in assets by 2011. There was a moment of silence to honor those who have passed in 2010.

Report of the Membership Committee

Dr. Collins reported on member statistics for WOA. There are 992 members to date with 188 members due to renew for 2010. Dr. Collins asked that each person in the room recruit at least one new member and gave a special thank you for Dr. Blair Filler for his hard work and dedication.

Report of the 2010 Nominating Committee

Dr. McMaster stated that five members needed to be elected to the 2011 Nominating Committee. He reported the following members are designated to serve on the Committee:

William McMaster, MD
Robert Eilert, MD

Five members were nominated from the floor to serve on the Committee:

Dr. Kim Furry nominated Paul C. Collins, MD from Idaho
Dr. Jeff Nakano nominated Michael P. Dohm, MD from Colorado
Dr. Michael Dohm nominated Gerard L. Glancy, MD from Colorado
Dr. Valerae Lewis nominated Ramon L. Jimenez, MD from California
Dr. David Tuescher nominated Richard F. Santore, MD from California

Action: It was moved and seconded that the nomination for the 2011 Nominating Committee be approved. The motion carried.

Dr. Rasmussen presented the proposed Slate of Officers for 2010-2011

President	Theodore L. Stringer, MD
Vice President	Peter J. Mandell, MD
Second Vice President	Ellen M. Raney, MD
Secretary	Kim L. Furry, MD
Treasurer	Valerae O. Lewis, MD
Member at Large	Kevin L. Smith, MD
Junior Board Member (2)	Omer A. Ilahi, MD
	Steven J. Morgan, MD
Membership Committee	James P. Duffey, MD

Dr. Rasmussen asked if there are any other nominations from the floor.

Action: It was moved and seconded that the nominations be closed. The motion carried.

Announcements

Dr. McMaster asked that you please visit with the exhibitors throughout the week. The opportunity to win Raffle prizes is available. Tonight, a fun evening has been planned at the Monterey Aquarium. Bus transportation to the aquarium is located at the front entrance of the hotel, 7 pm.

There being no other business to discuss, Dr. McMaster adjourned the meeting.

Western Orthopaedic Association

Kauai Room
Sheraton Waikiki
Honolulu, Hawaii

Saturday, July 30, 2011
6:15am–6:30am

Second Business Meeting

Theodore L. Stringer, MD, President, Presiding

AGENDA

I. Call to Order
II. Presentation of the Proposed Slate of Officers for 2011-2012, William C. McMaster, MD
III. Election of Officers, Theodore L. Stringer, MD
IV. Old Business
V. New Business
VI. Announcements
VII. Installation of Peter J. Mandell, MD, 2011-2012 by President, Theodore L. Stringer, MD
VIII. Adjournment

Minutes of the 2010 Second Business Meeting of the Western Orthopaedic Association

Portola Hotel & Spa
Monterey, California
Saturday, August 7, 2010

Call to Order

Dr. McMaster addressed the membership and thanked them for their participation.

2010-2011 Proposed Slate

Dr. Rasmussen presented the proposed Slate of Officers for 2010-2011:

President	Theodore L. Stringer, MD
Vice President	Peter J. Mandell, MD
Second Vice President	Ellen M. Raney, MD
Secretary	Kim L. Furry, MD
Treasurer	Valerae O. Lewis, MD
Member at Large	Kevin L. Smith, MD
Junior Board Member (2)	Omer A. Ilahi, MD
	Steven J. Morgan, MD
Membership Committee	James P. Duffey, MD

Action: A motion was received by the floor to approve the slate as presented. The motion was seconded, a unanimous vote was received and the slate was approved.

Installation

Installation of Dr. Theodore Stringer, 2010-2011 President. Dr. McMaster presented The Presidents Medal and wished him well for a successful 75th Anniversary year. Dr. Stringer thanked Dr. McMaster and congratulated him for his success through 2010.

Adjournment

With no new business to address, the meeting adjourned at 7:30 am PST.

Western Orthopaedic Association

Scientific Program

75th Annual Meeting

July 28-30, 2011

Sheraton Waikiki

Honolulu, Hawaii

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

2011 Program Co-Chairmen

Michael P. Dohm, MD

Grand Junction, Colorado

James P. Duffey, MD

Colorado Springs, Colorado

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 Program Co-Chairmen

Michael P. Dohm, MD
Grand Junction, Colorado

James P. Duffey, MD
Colorado Springs, Colorado

Michael P. Dohm, MD graduated from the University of Arizona College of Medicine Medical School followed by an Orthopaedic Surgery Residency there. He has been in Clinical Orthopaedic Practice in Grand Junction, Colorado for almost 20 years.

Dr. Dohm learned to appreciate Orthopaedic History through Leonard F. Peltier, MD, the Chairman and Historian for Clinical Orthopaedics and Related Research. He learned to challenge what is "known" through Donald Speer, MD. He learned to enjoy life, and live with exuberance through James Benjamin, MD and learned to be competent and compassionate through Robert Volz, MD.

Dr. Dohm has been involved in the Evidence-Based Practice Committee for the AAOS and is an active member in the American Joint Replacement Registry, the International Society for Arthroplasty Registers, and the International Consortium of Orthopaedic Registries. Dr. Dohm actively engages in incorporating evidence and outcomes in his clinical practice. He works toward best practice policies and tries to share that with all.

James P. Duffey, MD was raised in Tucson, Arizona where he returned for Medical School at the University of Arizona College of Medicine. He did his surgical internship at the University of California San Francisco, then came back once again to the University of Arizona for his orthopaedic residency. He has been in practice with the Colorado Springs Orthopaedic Group since 1995, focusing on joint reconstruction and sports medicine.

Dr. Duffey has previously participated on the Board of the WOA and is a member of the American Association of Hip and Knee Surgeons. He has done sideline coverage for Air Academy High School for the past ten years. In his free time, he enjoys golf, tennis, and singing. Jim and his wife Chris have two children, Lauren and Jordan.

2011 Presidential Guest Speaker

G. Paul DeRosa, MD

Durham, North Carolina

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 Presidential Guest Speaker

G. Paul DeRosa, MD
Durham, North Carolina

It is WOA's great pleasure to have Dr. G. Paul DeRosa as the Presidential Guest Speaker for the 2011 Annual Meeting in Hawaii. He is a long-term teacher, mentor, and friend of the President, Dr. Ted Stringer. He retired from the Duke University faculty in 2006, but remains Professor Emeritus. He also retired from the ABOS in 2008, but retains Emeritus status on the Board.

Dr. DeRosa was born in Napolean, Ohio. He received a BS degree from the University of Notre Dame followed by medical school at Indiana University School of Medicine. Upon completion of his orthopaedic residency, Dr. DeRosa relocated to London, England for a pediatric fellowship at the Hospital for Sick Children. After his fellowship, he went back to the states for a two-year stint in the US Air Force. He then returned to Indiana University as an Assistant Professor in Orthopaedic Surgery, followed by Associate Professor, Professor, and finally Chair of the Department of Orthopaedic Surgery from 1986 to 1995. He then relocated to North Carolina to become Executive Director of the American Board of Orthopaedics in Chapel Hill as well as Professor of Surgery at Duke University School of Medicine.

During his active years, Dr. DeRosa served as President of the Mid-America Orthopaedic Association, President of the Pediatric Orthopaedic Society of North America, and President of the American Orthopaedic Association, chair of the ACGME/RRC for Orthopaedic Surgery, as well as President of the National Residency Marketing Program in 2007. In 1990, he was elected to the American Board of Orthopaedic Surgery where he became involved with the certification and recertification of Orthopaedic Surgeons, where he focused efforts on ethics and professionalism until his retirement in 2008.

On a personal note, Dr. DeRosa is married to his wife Mary Ann. They have five children and twelve grandchildren who keep them very busy. His hobbies include golf, snow skiing, and making chocolates.

2011 WOA Resident Award Winners

Lloyd Taylor Award Winner
Protective Role of IL-1β Against Post-Arthroplasty *Staphylococcus Aureus* Infection
Nicholas M. Bernthal, MD, UCLA Medical Center, Los Angeles, CA
(Saturday, July 30, 9:40am–9:50am)

Vernon Thompson Award Winner
Distinct Gene Expression Patterns in the Surface, Middle, and Deep Zones of Bovine Articular Cartilage
Derek F. Amanatullah, MD, PhD, University of California Davis, Sacramento, CA
(Saturday, July 30, 9:50am–10:00am)

Harold and Nancy Willingham Award Winner
Margin Convergence to Bone for Reconstruction of the Anterior Attachment of the Rotator Cable
Michael L. Nguyen, MD, VA Medical Center Orthopaedic Biomechanics Laboratory, Long Beach, CA
(Saturday, July 30, 10:00am–10:10am)

Sanford and Darlene Anzel Award Winner
The Biomechanical Consequences of Rod Reduction on Pedicle Screws: Should It Be Avoided?
Daniel G. Kang, MD, Walter Reed Army Medical Center, Washington, DC
(Saturday, July 30, 10:10am–10:20am)

WOA Resident Award Winners
Transfer of the Coracoid Attachment of the Coracoacromial Ligament to the Distal Clavicle Improves Anterior-Posterior Stability of Acromioclavicular Joint Reconstruction
Beatrice Shu, MD, Stanford University Hospital and Clinics, Stanford, CA / Veterns Administration Research Department, Palo Alto, CA
**Presented by Tyler Johnston, MS*
(Saturday, July 30, 10:20am–10:30am)

Medical Management of Osteoporosis After Hip Fractures: Are We Meeting National Guidelines?
CPT David A. Crawford, MD, Madigan Army Medical Center, Tacoma, WA
(Saturday, July 30, 10:30am–10:40am)

A Biomechanical Comparison of Multi-Directional Nail and Locking Plate Fixation in Unstable Olecranon Fractures
Evan Argintar, MD, Georgetown University Hospital, Washington, DC
**Presented by Anna Babushkina, MD*
(Saturday, July 30, 10:40am–10:50am)

Accreditation Information for the Scientific Program

PROGRAM COMMITTEE

The Western Orthopaedic Association gratefully acknowledges these orthopaedic surgeons for their contribution to the development of the scientific program:

Michael P. Dohm, MD, *Co-Chair*
James P. Duffey, MD, *Co-Chair*
Nitin N. Bhatia, MD, FACS
Brian A. Jewett, MD
Valerae O. Lewis, MD
Steven J. Morgan, MD

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 provide educational programs that are based upon the practice and developmental needs of its members, to foster collegiality among its members, and to encourage and support their professional development while maintaining the unique qualities of a western regional organization. By addressing the above, the WOA provides the means by which its members are able to provide optimal high quality and ethical care for the musculoskeletal patients in the western region of the United States.

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.

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. Participation in this program will afford orthopaedic physicians the opportunity to:

- Describe and utilize the latest advances in operative and non-operative management of disorders affecting the musculoskeletal system.
- Discuss the role of the orthopaedic surgeon in the diagnosis and treatment of metastatic disease to the skeleton.
- Obtain education in the most current methods for management of fractures and soft tissue disorders affecting patients who have sustained isolated or multiple traumatic injuries.
- Understand the latest techniques in upper extremity nerve disorders.
- Discuss the current trends in orthopaedic oncology.
- Describe and utilize appropriate treatments for orthopaedic maladies affecting the pediatric population.
- Learn about advanced basic science developments including stem cells and orthopaedic surgery.
- Discuss foot and ankle pathology and treatments.
- Discuss spinal surgery advancements and current techniques.
- Understand the basic principals in practice management.
- 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, July 28-30. Please plan to visit the Scientific Posters.

MULTIMEDIA EDUCATION

Multimedia education materials will be offered on Thursday, Friday, and Saturday, July 28-30. 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 30.5 *AMA PRA Category 1 Credits™*. Physicians should only claim credit commensurate with the extent of their participation in the activity.

* 20.5 CME credits for Scientific Program
* 5.5 CME credits for Multimedia Education Sessions
* 4.5 CME credits for Scientific Poster Sessions

CEC CREDIT

Physicians Assistants can receive up to 30.5 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 on pages 113-121.)**

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, including audiotapes, videotapes, and digital recordings, 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 drugs 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 each drug or medical devices he or she wishes to use in clinical practice.

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

Financial Disclosure Information

Western Orthopaedic Association has identified the option to disclose as follows:

The following participants have disclosed whether they or immediate family have received something of value from any pharmaceutical, biomaterial, orthopaedic device or equipment company or supplier.

1. Royalties;
2. Served on a speakers' bureau or have been paid an honorarium to present, within the past twelve months;

3a. Employee;
3b. Paid Consultant;
3c. Unpaid Consultant;

4. Any other financial/material support;
5. Own stock or stock options (excluding mutual funds);
6. Research or institutional support;
7. Department/division/practice receives research or institutional support.

The following participants have disclosed whether they or immediate family have received something of value from any medical and/or orthopaedic publishers:

8. Financial/material support;
9. Research or institutional support from any publisher;
10. Department/division/practice receives research or institutional support from any publisher.

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.

Stephen P. Abelow, MD *(n.)*
Derek F. Amanatullah, MD, PhD *(5. Merck, Stryker; 6. Synthes)*
Sean Amann, MD *(n.)*
Divya V. Ambati, BS *(n.)*
David Amiel, PhD *(3b. Smith & Nephew, ArthroCare Corp.; 6. Smith & Nephew, ArthroCare Corp.)*
Harlan Amstutz, MD *(1. Wright Medical Technology, Inc.; 6. Wright Medical Technology, Inc.; 7. Wright Medical Technology, Inc.)*
Evan Argintar, MD *(n.)*
Alexandre Arkader, MD *(3b. Biomet Trauma)*
Grant A. Armour, MD *(n.)*
Robert E. Atkinson, MD *(n.)*
Anna Babushkina, MD *(n.)*
Allan Bach, MD *(2. Synthes; 5. Delpalma Orthopedics)*
Michael J. Bade, MPT *(n.)*
Neil Badlani, MD *(n.)*
Scott T. Ball, MD *(3c. DePuy)*
C. Lowry Barnes, MD *(1. Wright Medical Technology, Inc.; 6. DePuy, Wright Medical Technology, Inc., ConforMIS)*
Nicole M. K. Behnke, MD *(n.)*

James A. Benjamin, MD *(n.)*
Nicolas Bernat, BA *(n.)*
Nicholas M. Bernthal, MD *(n.)*
Daniel J. Berry, MD *(1. DePuy; 6. DePuy; 7. DePuy, Zimmer, Stryker, Biomet, Smith & Nephew)*
Nitin N. Bhatia, MD, FACS *(1. Alphatec, Seaspine; 2. Alphatec, Seaspine, Biomet; 3b. Alphatec, Seaspine, Biomet; 5. DiFusion; 6. Alphatec, Seaspine)*
Fabrizio Billi, PhD *(n.)*
J. David Blaha, MD *(1. Wright Medical Technology, Inc.; 3b. Wright Medical Technology, Inc.)*
Scott D. Boden, MD *(1. Medtronic; 7. Nuvasive, Medtronic, Synthes)*
Kevin J. Bozic, MD, MBA *(n.)*
Chad Brockardt, MD *(n.)*
Jenni M. Buckley *(6. Stryker, Synthes, Biomet, DePuy Spine, Arthrex)*
William D. Bugbee, MD *(1. DePuy, Zimmer, Smith & Nephew; 3b. Joint Restoration Foundation, Zimmer, DePuy, Smith & Nephew, Biomimetics, Advanced Biohealing, Moximed; 5. Orthalign; 6. Orthalign)*
William Bunnell, MD *(n.)*
David R. Burke, BS *(n.)*
Stephen S. Burkhart, MD *(1. Arthrex; 3b. Arthrex)*

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

Miguel E. Cabanela, MD *(2. Stryker Orthopaedics; 3b. Stryker Orthopaedics; 6. Zimmer, Johnson & Johnson, Stryker, Biomet; 7. Zimmer, Johnson & Johnson, Stryker, Biomet)*
William Capello, MD *(1. Stryker; 3b. Stryker; 5. Stryker)*
Mario T. Cardoso, MD *(n.)*
Charles C. Chang, MD *(n.)*
Albert C. Chen, PhD *(n.)*
Wayne K. Cheng, MD *(3b. Lanx, Aesculap USA)*
John S. Cho, PhD *(n.)*
Paul D. Choi, MD *(n.)*
Kevin Christensen, MD *(n.)*
Kyle F. Chun, MD *(n.)*
Mark Cinque, BA *(n.)*
Amy M. Cizik, MPH *(6. Synthes; 7. Synthes)*
Richard Cotugno, BS *(n.)*
CPT David A. Crawford, MD *(n.)*
Nick S. Crawford, MD *(n.)*
Shane B. Curtiss, AS *(n.)*
Yu-Xuan Dang *(n.)*
Michael R. Dayton, MD *(2. Smith & Nephew Orthopaedics; 8. Vindico Medical Education)*
John T. Dearborn, MD *(n.)*
G. Paul DeRosa, MD *(n.)*
Allison J. De Young, BS *(n.)*
Paul E. Di Cesare, MD *(3b. Stryker 6. GlaxoSmithKline)*
Anton E. Dmitriev, PhD *(n.)*
Joshua Doan, MD *(n.)*
Michael P. Dohm, MD *(7. Kyphon/Medtronic Randomized Clinical Trial)*
Jonathan Dubin, MD *(n.)*
James P. Duffey, MD *(n.)*
John J. Eager, MS *(3b. Biocomposites, LLC)*
Mark A. Eckardt *(n.)*
Eric W. Edmonds, MD *(7. DePuy)*
Scott G. Edwards, MD *(5. Mylad)*
Christopher J. Egan, RPA-C *(n.)*
Eric Owen Eisemon, MD *(n.)*
Kristine D. Estrada *(n.)*
Ashraf M. Fansa, MD *(n.)*
Brian T. Feeley, MD *(n.)*
John J. Finneran IV *(n.)*
Kristen Fleager, MD *(n.)*
Orrin I. Franko, MD *(n.)*
Chuck Freitag *(8. Data Trace Publishing Company; 9. Data Trace Publishing Company; 10. Data Trace Publishing Company)*
Varun Gajendran, MD *(n.)*
Seth Gamradt, MD *(2. DePuy Mitek; 3b. DePuy Mitek)*
Jonathan P. Garino, MD *(1. Smith & Nephew; 2. Smith & Nephew; 3b. Smith & Nephew)*

Rachel E. Gaume, BS *(n.)*
Jonathan Gelber, MD *(n.)*
George Gendy, MD *(n.)*
Diana A. Glaser, PhD *(6. K2M, KCI, EOS; 7. DePuy Spine, KCI, K2M)*
Simon Görtz, MD *(6. Joint Restoration Foundation)*
Hilton P. Gottschalk, MD *(1. Biogen Idec; 3a. Biogen Idec; 4. Biogen Idec; 5. Biogen Idec)*
Ray A. Grijalva, MD *(n.)*
Todd Grunander, MD *(n.)*
Pedro Guillen *(n.)*
Ranjan Gupta, MD *(2. Arthrex; 7. Arthrex, Synthes, Smith & Nephew; 8. Lange)*
Alexander G. Hadjipavlou, MD *(n.)*
Radek Hart, Prof., MD, PhD, FRCS *(n.)*
Dominik R. Haudenschild, PhD *(n.)*
Richard J. Haynes, MD *(5. Pfizer)*
Eric R. Hentzen *(n.)*
Nasser Heyrani, BS *(n.)*
Mignon A. Hills, BS *(n.)*
Alan M. Hirahara, MD, FRCSC *(2. Arthrex, Inc., SonoSite, Inc.; 3b. Arthrex, Inc.)*
Aaron K. Ho, MD *(n.)*
Bang H. Hoang, MD *(n.)*
M. Mark Hoffer, MD *(n.)*
Lawrence R. Housman, MD *(3b. Smith & Nephew, Stryker; 6. Smith & Nephew, Stryker, Zimmer; 7. Smith & Nephew, Stryker, Zimmer, DePuy)*
Richard S. Idler, MD *(5. Baxter, Bristol-Myers Squibb, Eli Lilly, Medtronic, Amgen, Johnson & Johnson, Roche, 3M)*
Meghan Imrie, MD *(n.)*
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2011 Scientific Program

Thursday, July 28, 2011

(Presenters and times are subject to change)

6:00am–6:30am **Poster Session**
(Poster Presenters Available)

6:15am–6:30am **First Business Meeting**

6:30am–6:35am **Welcome**
Michael P. Dohm, MD, Co-Chair
James P. Duffey, MD, Co-Chair
Theodore L. Stringer, MD, President

SYMPOSIUM 1: Spine 1 — Biologics in Spine

Moderator: Michael P. Dohm, MD

6:35am–7:15am Update on the Use of BMPs in Spine Surgery and Future Developments
Scott D. Boden, MD, Emory University, Atlanta, GA

7:15am–7:25am **Discussion**

SYMPOSIUM 2: Spine 2 — Spine Pain Management

Moderator: Anthony T. Yeung, MD

7:25am–7:40am Pathophysiology of Disc Degeneration
Alexander G. Hadjipavlou, MD, Galveston, TX

7:40am–7:55am Identification of the Pain Generator
Alexander G. Hadjipavlou, MD, Galveston, TX
Anthony T. Yeung, MD, Phoenix, AZ

7:55am–8:10am Spinal Injections/Radiofrequency — Rhizolysis
Michael P. Dohm, MD, Grand Junction, CO
Alexander G. Hadjipavlou, MD, Galveston, TX
Anthony T. Yeung, MD, Phoenix, AZ

8:10am–8:25am Endoscopic Denervation Facet Arthropathy
Anthony T. Yeung, MD, Phoenix, AZ

8:25am–8:40am Panel Discussion
Scott D. Boden, MD, Emory University, Atlanta, GA
Alexander G. Hadjipavlou, MD, Galveston, TX
Anthony T. Yeung, MD, Phoenix, AZ
Michael P. Dohm, MD, Grand Junction, CO

8:40am–9:00am ***Break — Please visit exhibitors***

SYMPOSIUM 3: Practice Management 1

Moderator: Michael P. Dohm, MD

9:00am–9:20am OA Knee Development and Utilization of Guidelines: What is the Evidence?
John C. Richmond, MD, Boston, MA

9:20am–9:40am From Guidelines to Registries: Incorporation of Evidence and Update on AJRR
Daniel J. Berry, MD, Mayo Clinic Rochester, Rochester, MN

9:40am–10:00am National Spine Network
Scott D. Boden, MD, Emory University, Atlanta, GA

10:00am–10:20am Spine Outcomes and Guidelines: Quality Improvement Cycle
David A. Wong, MD, Denver Spine Center, Greenwood Village, CO

10:20am–10:40am International Society for Arthroplasty Registries
Michael P. Dohm, MD, Grand Junction, CO/Harlan Amstutz, MD, UCLA, Los Angeles, CA

10:40am–10:55am **Discussion**

10:55am–11:15am ***Break — Please visit exhibitors***

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

Thursday, July 28, 2011

(Presenters and times are subject to change)

GENERAL SESSION 1: AAOS Report & Howard Steel Lecture

Moderator: Theodore L. Stringer, MD

11:15am–11:30am **AAOS Report**
Daniel J. Berry, MD, President, Mayo Clinic Rochester, Rochester, MN

11:30am–12:00pm **Howard Steel Lecture**
Lessons in Leadership from a Sports Perspective
Harvey W. Schiller, PhD, Global Options Group, New York, NY

GENERAL SESSION 2: Special Lectures

Moderator: Michael P. Dohm, MD

12:00pm–12:20pm History of WOA — 75th Anniversary
Lawrence R. Housman, MD, Tucson Orthopaedic Institute PC, Tucson, AZ

12:20pm–12:50pm Practice Implications of Current Health Policy
David A. Wong, MD, Denver Spine Center, Greenwood Village, CO

12:50pm–1:00pm **Discussion**

1:00pm–1:20pm ***Break — Please visit exhibitors***

CONCURRENT SESSION 1: Spine, Sports Medicine & Pediatrics *(Kauai Room)*

Moderators: Scott D. Boden, MD
James P. Duffey, MD

1:20pm–1:26pm Do Stand-Alone Interbody Spacers with Integrated Screws Provide Adequate Segmental Stability for Multi–Level Cervical Arthrodesis?
Daniel G. Kang, MD, Walter Reed Army Medical Center, Washington, DC

1:26pm–1:32pm The Accuracy of Midline Placement of Artificial Disc Using Different Anatomic Landmarks Under Fluoroscopy
Mark Mikhael, MD, Loma Linda University Medical Center, Loma Linda, CA

1:32pm–1:38pm **Discussion**

1:38pm–1:44pm Influence of the Anteromedial and Posterolateral Bundles of the ACL on the Stability of the Knee — A Cadaver Study
Radek Hart, Prof., MD, PhD, FRCS, General Hospital, Znojmo, Czech Republic

CONCURRENT SESSION 2: Basic Science *(Honolulu and Kahuku Rooms)*

Moderator: Ross M. Wilkins, MD

1:20pm–1:26pm Reconstruction of the Anterior Cruciate Ligament with Autologous Fibroblasts or Mesenchymal Cells Seeded on a Type I/III Collagen Membrane
Stephen P. Abelow, MD, Clinica CEMTRO, Madrid, Spain

1:26pm–1:32pm Establishing a Mouse Model of Chronic Post-Arthroplasty Staphylococcus Aureus Infection
Nicholas M. Bernthal, MD, UCLA Medical Center, Los Angeles, CA

1:32pm–1:38pm Effects of Denervation on Murine Muscle Intra-Cellular Signal Cascades
Orrin I. Franko, MD, University of California San Diego, San Diego, CA

1:38pm–1:44pm Bioactive Sutures for Tendon Repair: Efficacy of Delivering Stem Cells In-Vivo
Varun Gajendran, MD, Stanford University Hospitals and Clinics, Stanford, CA/ Veterans Administration Medical Center, Palo Alto, CA
**Presented by Don Young Park, MD*

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1:44pm–1:50pm Platelet-Rich Plasma vs. Cortisone Injections for the Non-Surgical Treatment of Shoulder Pain
Alan M. Hirahara, MD, FRCSC, Sacramento, CA

1:50pm–1:56pm MRI Analysis of Fatty Infiltration and Muscle Atrophy Following Massive Rotator Cuff Tears in a Novel Rat Model
Dominique Laron, BS, San Francisco VA/UCSF, San Francisco, CA

1:56pm–2:02pm Treatment of Shoulder Impingement Syndrome: Subacromial Injection of Ketorolac Versus Triamcinolone
Kyong S. Min, MD, Madigan Army Medical Center, Tacoma, WA
**Presented by CPT David A. Crawford, MD*

2:02pm–2:09pm **Discussion**

2:09pm–2:15pm Non-Operative vs. Operative Treatment for Radial Neck Fractures in Children — Multicenter Study
Paul D. Choi, MD, Children's Hospital Los Angeles University of Southern California/Keck School of Medicine, Los Angeles, CA

2:15pm–2:21pm Shortening in Pediatric Femur Fractures
M. Mark Hoffer, MD, Los Angeles County/University of Southern California Hospital, Los Angeles, CA

2:21pm–2:27pm Diagnosis and Initial Management of Musculoskeletal Coccidiodomycosis in Children
M. Wade Shrader, MD, Phoenix Children's Hospital, Phoenix, AZ
**Presented by Aaron K. Ho, BS*

2:27pm–2:33pm Is It Safe to Reduce a Pediatric Type II Supracondylar Humeral Fracture (SCHF) More than 7 Days After the Injury?
Mauricio Silva, MD, Los Angeles Orthopaedic Hospital, Los Angeles, CA
**Presented by Nicholas M. Bernthal, MD*

2:33pm–2:40pm **Discussion**

2:40pm–3:40pm **Poster Session**
(Poster Presenters Available)

3:40pm–5:10pm **Multimedia Education Session**

1:44pm–1:50pm Does Applying Normal Saline Significantly Change the Wound Bursting Strength of Cyanoacrylates?
George Gendy, MD, Loma Linda University, Loma Linda, CA

1:50pm–1:56pm Function and Structure of Cartilage Defect Repair with Frozen and Fresh Osteochondral Allografts in the Goat
Simon Görtz, MD, University of California San Diego, San Diego, CA

1:56pm–2:03pm **Discussion**

2:03pm–2:09pm A Novel Murine Model of Delayed Long Bone Healing
Thomas Kremen, MD, University of California, Los Angeles, CA

2:09pm–2:15pm A Novel Murine Model of Muscle Atrophy and Fatty Infiltration After Massive Rotator Cuff Tears
Xuhui Liu, MD, Veterans Affairs Medical Center/UCSF, San Francisco, CA

2:15pm–2:21pm Low-Energy Femur Fractures: Correlations with Bone Mineral Density and Bisphosphonates
Daniel J. Song, MD, Tripler Army Medical Center & Queens Medical Center, Honolulu, HI

2:21pm–2:27pm Surgeon Owned Implant Distribution: Analysis of a Legally Compliant Model
John C. Steinmann, DO, Arrowhead Orthopedics, Redlands, CA

2:27pm–2:33pm Monitoring Gene Expression in Articular Chondrocytes and Bone Marrow Derived Stem Cells During Dynamic Compression
Derek F. Amanatullah, MD, PhD, University of California, Davis, Sacramento, CA

2:33pm–2:40pm **Discussion**

2:40pm–3:40pm **Poster Session**
(Poster Presenters Available)

3:40pm–5:10pm **Multimedia Education Session**

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Friday, July 29, 2011

(Presenters and times are subject to change.)

6:00am–6:30am **Poster Sessions**
(Poster Presenters Available)

SYMPOSIUM 4: Non-Arthritic Hip Pain and Hip Arthroscopy — State of the Art (and Science)

Moderator: Dean K. Matsuda, MD

6:30am–6:35am Introduction and Overview
Dean K. Matsuda, MD, Kaiser Permanente West Los Angeles Medical Center, Los Angeles, CA

6:35am–6:50am Hip Labral Tears and Femoroacetabular Impingement
Thomas G. Sampson, MD, San Francisco, CA

6:50am–7:05am Snapping Hips: Who Needs What...and When?
Dean K. Matsuda, MD, Kaiser Permanente West Los Angeles Medical Center, Los Angeles, CA

7:05am–7:20am Hip Dysplasia and the PAO
Joel M. Matta, MD, Hip and Pelvis Institute at St. John's, Santa Monica, CA

7:20am–7:35am Advances in Hip Arthroscopy (Labral Reconstruction, Athletic Pubalgia, Hip Arthroscopy in Trauma)
Dean K. Matsuda, MD, Kaiser Permanente West Los Angeles Medical Center, Los Angeles, CA

7:35am–7:50am **Panel Discussion & Questions**

SYMPOSIUM 5: Spine 3 — Less Invasive Spine Surgery

Moderator: Anthony T. Yeung, MD

7:50am–8:05am Anatomy and Histopathology of Disc Disease
Alexander G. Hadjipavlou, MD, Galveston, TX

8:05am–8:20am Pathophysiology of Disc Degeneration
Alexander G. Hadjipavlou, MD, Galveston, TX

8:20am–8:35am Endoscopic Spine Care
Anthony T. Yeung, MD, Phoenix, AZ

8:35am–8:50am Future of Less Invasive Spine Care
Hansen A. Yuan, MD, Syracuse, NY

8:50am–9:05am Panel Discussion
Alexander G. Hadjipavlou, MD, Galveston, TX
Anthony T. Yeung, MD, Phoenix, AZ
Hansen A. Yuan, MD, Syracuse, NY

9:05am–9:25am ***Break — Please visit exhibitors***

GENERAL SESSION 3: Board of Councilor's Report & Presidential Guest Speaker

Moderator: Theodore L. Stringer, MD

9:25am–9:35am **Board of Councilor's Report**
Robert R. Slater Jr., MD, Folsom, CA

9:35am–10:05am **Presidential Guest Speaker**
The Ruminations of an Orthopaedic Surgeon: The Evolution of Orthopaedic Surgery
G. Paul DeRosa, MD, Chapel Hill, NC

SYMPOSIUM 6: Angles and Evidence — Acceptable Alignment for Upper Extremity Fractures

Moderator: Richard S. Idler, MD

10:05am–10:20am Radial Head and Both Bone Forearm Fractures
Allan Bach, MD, Audubon Medical, Colorado Springs, CO

10:20am–10:35am Midshaft and Distal Humeral Fractures
Robert E. Atkinson, MD, Honolulu, HI

10:35am–10:50am Distal Radius Fractures
Robert R. Slater Jr., MD, Folsom, CA

10:50am–11:05am Metacarpal and Phalangeal Fractures
Richard S. Idler, MD, Colorado Springs, CO

11:05am–11:20am **Discussion**

11:20am–11:40am ***Break — Please visit exhibitors***

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Friday, July 29, 2011

(Presenters and times are subject to change.)

GENERAL SESSION 4: Medical Legal Forum

Moderator: David D. Teuscher, MD

11:40am–12:25pm Panel Discussion
Ramon L. Jimenez, MD, Monterey Peninsula Orthopaedics and Sport Medicine Institute, Monterey, CA
Peter J. Mandell, MD, Industrial Medical Clinic, Burlingame, CA
David D. Teuscher, MD, Beaumont Bone & Joint Institute, Beaumont, TX

12:25pm–12:35pm **Discussion**

12:35pm–12:55pm ***Break — Please visit exhibitors***

CONCURRENT SESSION 3: Trauma, Foot & Ankle, Tumors, and Pain Management *(Kauai Room)*

Moderator: James P. Duffey, MD

12:55pm–1:01pm The Incidence of Radiographic Atypical Femur Fractures and Bisphosphonate Use Among Operatively Treated Femur Fractures in a Community Setting
Eric Owen Eisemon, MD, Maimonides Medical Center, Brooklyn, NY

1:01pm–1:07pm A Comparison of Hybrid Fixation and Dual Plating for Diaphyseal Both Bone Forearm Fractures
Nicole M. K. Behnke, MD, LA County-Harbor UCLA Medical Center, Los Angeles, CA

1:07pm–1:13pm Results of a New Multi-Planar Intramedullary Implant Treating Transverse and Comminuted Olecranon Fractures and Nonunions
Scott G. Edwards, MD, Georgetown University Hospital, Washington, DC

1:13pm–1:20pm **Discussion**

1:20pm–1:26pm Anteromedial Impingement in the Ankle Joint — Outcomes Following Arthroscopy in the First One Hundred Cases
Christopher D. Murawski, Hospital for Special Surgery, New York, NY

CONCURRENT SESSION 4: Total Joint, Upper Extremity, and Miscellaneous *(Honolulu and Kahuku Rooms)*

Moderator: Miguel E. Cabanela, MD

12:55pm–1:01pm Comparison of Surgical Outcomes and Implant Wear Between Ceramic-on-Ceramic and Ceramic-on-Polyethylene Articulations in Total Hip Arthroplasty
Derek F. Amanatullah, MD, PhD, University of California, Davis, Sacramento, CA

1:01pm–1:07pm Results of Modern Hybrid Primary Total Hip Replacement Within a Comprehensive Joint Replacement Program
Alexander Sah, MD, Washington Hospital, Fremont, CA

1:07pm–1:13pm Adverse Reactions to Metal-on-Metal THA's — What's in All That Fluid Around the Joint?
Scott T. Ball, MD, University of California, San Diego, San Diego, CA

1:13pm–1:19pm Cemented Versus Cementless Femoral Fixation in Primary THA in Patients Aged 75 and Older
Alexander Sah, MD, Washington Hospital, Fremont, CA

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

1:26pm–1:32pm A Hybrid Anatomic Lateral Ankle Reconstruction: ATFL Autograft with Plication of the CFL
John G. Kennedy, MD, FRCS (Orth), Hospital for Special Surgery, New York, NY
**Presented by Christopher D. Murawski*

1:32pm–1:38pm Functional and T2-Mapping MRI Results of Autologous Osteochondral Transplantation of the Talus in 72 Patients
Christopher D. Murawski, Hospital for Special Surgery, New York, NY

1:38pm–1:44pm Long Term Results for the Treatment of Giant Cell Tumor of Bone
Thomas Kremen, MD, University of California, Los Angeles, CA

1:44pm–1:50pm Concerns About Assessment of Postoperative Pain in Children with Cerebral Palsy: Are We Undertreating Pain in the Children?
M. Wade Shrader, MD, Phoenix Children's Hospital, Phoenix, AZ

1:50pm–2:00pm **Discussion**

2:00pm–3:00pm **Poster Session**
(Poster Presenters Available)

3:00pm–5:00pm **Multimedia Education Session**

1:19pm–1:25pm Listen to the Patients: Patient Factors Are Best at Predicting Favorable Outcomes After UKA
Michael P. Dohm, MD, Western Slope Study Group, Grand Junction, CO

1:25pm–1:31pm Local Elution Profiles of a Highly Purified Calcium Sulfate Pellet at Physiologic PH, Loaded with Vancomycin and Tobramycin, in the Treatment of Infected Total Joints
Gerhard E. Maale, MD, Dallas Ft. Worth Sarcoma Group/Presbyterian Hospital Dallas, Dallas, TX
**Presented by John J. Eager, MS*

1:31pm–1:37pm **Discussion**

1:37pm–1:43pm Reconstruction of Chronic Distal Biceps Tendon Rupture Using Fascia Lata Autograft
Deana Mercer, MD, University of New Mexico, Albuquerque, NM
**Presented by Nathan Morrell, MD*

1:43pm–1:49pm Trends in the Orthopaedic Job Market and the Importance of Fellowship Subspecialty Training
Nathan Morrell, MD, University of New Mexico Albuquerque, NM

1:49pm–1:55pm Predictors of Osteochondral Allograft Failure
Simon Görtz, MD, University of California, San Diego, CA/Scripps Clinic, La Jolla, CA

1:55pm–2:00pm **Discussion**

2:00pm–3:00pm **Poster Session**
(Poster Presenters Available)

3:00pm–5:00pm **Multimedia Education Session**

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

Saturday, July 30, 2011

(Presenters and times are subject to change.)

6:00am–6:30am **Poster Session**
(Poster Presenters Available)

6:15am–6:30am **Second Business Meeting**

SYMPOSIUM 7: Osteoarthritis Management 1 — Adult Reconstruction Hip

Moderator: Theodore L. Stringer, MD

6:30am–6:45am Modularity in THR/Femoral Component
William Capello, MD, Indiana University, Indianapolis, IN

6:45am–7:00am ALTR Recognition and Evaluation
Thomas P. Schmalzried, MD, Joint Replacement Institute at St. Vincent Medical Center, Los Angeles, CA

7:00am–7:15am Hip Preservation/Osteotomy
Richard Santore, MD, San Diego, CA

7:15am–7:30am Point – Counter Point: Hip Resurfacing
Thomas P. Schmalzried, MD, Joint Replacement Institute at St. Vincent Medical Center, Los Angeles, CA
William Capello, MD, Indiana University, Indianapolis, IN

7:30am–7:45am Ceramic to Ceramic Articulation at Ten Years
William Capello, MD, Indiana University, Indianapolis, IN

7:45am–7:55am **Discussion**

GENERAL SESSION 5: Special Lectures

Moderator: James P. Duffey, MD

7:55am–8:40am Allografts: What's New with Stem Cells, Fresh Cartilage, and Scar Tissue Prevention
Ross M. Wilkins, MD, Evergreen, CO

8:40am–9:10am Classics in Orthopaedics: "My 40 Year Experience with Hip Resurfacing"
Harlan Amstutz, MD, UCLA, Los Angeles, CA

9:10am–9:15am **Discussion**

9:15am–9:40am ***Break — Please visit exhibitors***

GENERAL SESSION 6: Resident Awards

Moderators: James P. Duffey, MD
Michael P. Dohm, MD

9:40am–9:50am **Lloyd Taylor Award**
Protective Role Of IL-1β Against Post-Arthroplasty Staphylococcus Aureus Infection
Nicholas M. Bernthal, MD, UCLA Medical Center, Los Angeles, CA

9:50am–10:00am **Vernon Thompson Award**
Distinct Gene Expression Patterns in the Surface, Middle, and Deep Zones of Bovine Articular Cartilage
Derek F. Amanatullah, MD, PhD, University of California Davis, Sacramento, CA

10:00am–10:10am **Harold and Nancy Willingham Award**
Margin Convergence to Bone for Reconstruction of the Anterior Attachment of the Rotator Cable
Michael L. Nguyen, MD, VA Medical Center Orthopaedic Biomechanics Laboratory, Long Beach, CA

10:10am–10:20am **Sanford and Darlene Anzel Award**
The Biomechanical Consequences of Rod Reduction on Pedicle Screws: Should It Be Avoided?
Daniel G. Kang, MD, Walter Reed Army Medical Center, Washington, DC

10:20am–10:30am **Resident Award**
Transfer of the Coracoid Attachment of the Coracoacromial Ligament to the Distal Clavicle Improves Anterior-Posterior Stability of Acromioclavicular Joint Reconstruction
Beatrice Shu, MD, Stanford University Hospital and Clinics, Stanford, CA/Veterns Administration Research Department, Palo Alto, CA
**Presented by Tyler Johnston, MS*

10:30am–10:40am **Resident Award**
Medical Management of Osteoporosis After Hip Fractures: Are We Meeting National Guidelines?
CPT David A. Crawford, MD, Madigan Army Medical Center, Tacoma, WA

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

Saturday, July 30, 2011

(Presenters and times are subject to change.)

10:40am–10:50am **Resident Award**
A Biomechanical Comparison of Multi-Directional Nail and Locking Plate Fixation in Unstable Olecranon Fractures
Evan Argintar, MD, Georgetown University Hospital, Washington, DC
**Presented by Anna Babushkina, MD*

10:50am–11:05am **Discussion**

11:05am–11:15am ***Break***

SYMPOSIUM 8: Osteoarthritis Management 2 — Adult Reconstruction Knee

Moderator: Theodore L. Stringer, MD

11:15am–11:35am Top Ten List for Successful TKA
James A. Benjamin, MD, University Orthopedic Specialists, Tucson, AZ

11:35am–11:55am Kinematics in TKA
C. Lowry Barnes, MD, Arkansas Specialty Orthopaedics, Little Rock, AR

11:55am–12:15pm Unicompartmental Knee Update
Michael P. Dohm, MD, Grand Junction, CO

12:15pm–12:35pm **Discussion**

GENERAL SESSION 7: Updates & Presidential Address

Moderator: James P. Duffey, MD

12:35pm–1:05pm Maintenance of Certification
Richard J. Haynes, MD, Phoenix, AZ

1:05pm–1:15pm **Discussion**

1:15pm–1:25pm **OREF Update**
Richard J. Haynes, MD, Phoenix, AZ

1:25pm–1:55pm **Presidential Address**
Achieving Optimism in Difficult Times
Theodore L. Stringer, MD, Colorado Springs Orthopedic Group, Colorado Springs, CO

1:55pm–2:55pm **Poster Session**
(Poster Presenters Available)

2:55pm–4:55pm **Multimedia Education Session**

Disclosure information is located on pages 33–36.

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

2011 WOA Presenters and Moderators

Page(s)	
38, 51	Stephen P. Abelow, MD
39, 41, 43, 57, 63, 68	Derek F. Amanatullah, MD, PhD
37, 43	Harlan Amstutz, MD
40	Robert E. Atkinson, MD
44, 71	Anna Babushkina, MD
40	Allan Bach, MD
41, 64	Scott T. Ball, MD
44	C. Lowry Barnes, MD
41, 59	Nicole M. K. Behnke, MD
44	James A. Benjamin, MD
38, 39, 43, 51, 52, 68	Nicholas M. Bernthal, MD
37, 38	Daniel J. Berry, MD
37, 38, 46	Scott D. Boden, MD
41	Miguel E. Cabanela, MD
43	William Capello, MD
39, 49	Paul D. Choi, MD
39, 43, 49, 71	CPT David A. Crawford, MD
40	G. Paul DeRosa, MD
37, 38, 43, 44, 63, 65, 68	Michael P. Dohm, MD
38, 41, 43, 44, 46, 58, 68	James P. Duffey, MD
42, 65	John J. Eager, MS
41, 59	Scott G. Edwards, MD
41, 58	Eric Owen Eisemon, MD
38, 53	Orrin I. Franko, MD
39, 54	George Gendy, MD
39, 42, 54, 67	Simon Görtz, MD
37, 40	Alexander G. Hadjipavlou, MD
38, 47	Radek Hart, Prof., MD, PhD, FRCS
44	Richard J. Haynes, MD
39, 47	Alan M. Hirahara, MD, FRCSC
39	Aaron K. Ho, BS
39, 50	M. Mark Hoffer, MD

Page(s)	
38	Lawrence R. Housman, MD
40	Richard S. Idler, MD
41	Ramon L. Jimenez, MD
43, 70	Tyler Johnston, MS
38, 43, 46, 69	Daniel G. Kang, MD
39, 42, 55, 62	Thomas Kremen, MD
39, 48	Dominique Laron, BS
39, 55	Xuhui Liu, MD
41	Peter J. Mandell, MD
40	Dean K. Matsuda, MD
40	Joel M. Matta, MD
38, 46	Mark Mikhael, MD
42, 66	Nathan Morrell, MD
41, 42, 60, 61	Christopher D. Murawski
43, 69	Michael L. Nguyen, MD
38, 53	Don Young Park, MD
37	John C. Richmond, MD
41, 63, 64	Alexander Sah, MD
40	Thomas G. Sampson, MD
43	Richard Santore, MD
38	Harvey W. Schiller, PhD
43	Thomas P. Schmalzried, MD
42, 50, 62	M. Wade Shrader, MD
40	Robert R. Slater Jr., MD
39, 56	Daniel J. Song, MD
39, 57	John C. Steinmann, DO
40, 43, 44	Theodore L. Stringer, MD
41	David D. Teuscher, MD
38, 43, 51	Ross M. Wilkins, MD
37, 38	David A. Wong, MD
37, 40	Anthony T. Yeung, MD
40	Hansen A. Yuan, MD

2011 Scientific Program Abstracts — Thursday

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

Thursday, July 28, 2011

CONCURRENT SESSION 1: Spine, Sports Medicine, & Pediatrics *(Kauai Room)*

Moderators: Scott D. Boden, MD
James P. Duffey, MD

1:20pm–2:40pm

1:20pm–1:26pm

Do Stand-Alone Interbody Spacers with Integrated Screws Provide Adequate Segmental Stability for Multi-Level Cervical Arthrodesis?

Daniel G. Kang, MD
Mario T. Cardoso, MD
Anton E. Dmitriev, PhD
Rachel E. Gaume, BS
Ronald A. Lehman Jr., MD
Haines Paik, MD
Michael Rosner

Introduction: Postoperative complications after anterior cervical fusions have been attributed to anterior cervical plate profiles and the necessary wide operative exposure for their insertion. Consequently, low-profile stand-alone interbody spacers with integrated screws have been developed. While they have demonstrated similar biomechanical stability to the anterior plate in single-level fusions, their role as a stand-alone device in multi-level reconstructions has not yet been established.

Methods: Thirteen human cadaveric cervical spines (C2-T1) were non-destructively tested with a custom six-degree-of-freedom spine simulator under axial rotation, flexion-extension, and lateral bending loading. After intact analysis, eight single-levels (C4-5 & C6-7) from four specimens were instrumented and tested with: 1) anterior cervical plate (ACP) and 2) stand-alone spacer (SAS). Nine specimens were tested with: 1) C5-7 SAS, 2) C5-7 ACP, 3) C4-7 ACP, 4) C4-7 ACP & posterior fixation, 5) C4-7 SAS, and 6) C4-7 SAS & posterior fixation.

Results: No significant difference in ROM was noted between the ACP and SAS for single-level fixation. However, only ACP significantly reduced operative level ROM compared to intact. For multi-segment reconstructions (two and three levels) the ACP proved superior to SAS and intact condition, with significantly lower ROM in all planes. In spite of this, when either the three-level SAS or ACP constructs were supplemented with posterior lateral mass fixation, there was a greater than 80% reduction in ROM under all testing modalities with no significant difference between the ACP and SAS constructs.

Discussion and Conclusion: Stand-alone interbody spacers with integrated screws may be a reasonable option for single-level fixation. However, stand-alone interbody spacers should be used with careful consideration in the setting of multi-level cervical fusion. In the setting of supplemented posterior fixation, stand-alone interbody spacers are a sound biomechanical alternative to the anterior cervical plate.

Notes:

1:26pm–1:32pm

The Accuracy of Midline Placement of Artificial Disc Using Different Anatomic Landmarks Under Fluoroscopy

Mark Mikhael, MD
Wayne K. Cheng, MD

Background: Total disc arthroplasty can be a viable alternative to fusion for degenerative disc disease of the lumbar spine. Correct placement of the prosthesis is critical for optimal function. Malposition of greater than 3mm predisposes to asymmetric loading, implant wear, implant loosening, and

non-physiological stresses on adjacent vertebral segments. Our objective is to measure the visual accuracy of midline placement of artificial disc using four different anatomic landmarks (pedicle, vertebral body waist, vertebral body endplate, spinous process) under fluoroscopy.

Methods: Artificial discs were implanted into three cadaver specimens at L23, L34, and L45. An AP image was obtained by fluoroscopy. The fluoroscopy machine was then rotated in the axial plane to 2.5, 5, 7.5, 10, and 15 degrees. We then obtained CT scans of the cadavers. We measured the distances from each of the anatomic landmarks studied to the midline of the implant on both fluoroscopy and CT. The means were then compared to evaluate which landmark had the least variability on fluoroscopy when compared to CT.

Results: The difference in the measurements from the medial border of the pedicle to the midline of the implant when comparing fluoroscopy to CT was the smallest of all of the landmarks examined in the study (1.07mm). This difference was statistically significant. When the angle of the fluoroscopy machine was greater than 7.5 degrees, a mean difference of greater than 3mm when compared to CT was obtained for all anatomic landmarks.

Conclusion: The pedicle is the most consistently identifiable and accurate of the anatomic landmarks studied for placement of total artificial discs in the lumbar spine. Error in rotation of the fluoroscopy machine of greater than 5 degrees in the axial plane can lead to implant malposition.

Notes:

1:38pm–1:44pm

Influence of the Anteromedial and Posterolateral Bundles of the ACL on the Stability of the Knee — A Cadaver Study

Radek Hart, Prof., MD, PhD, FRCS

Introduction: Anterior cruciate ligament (ACL) consists of the anteromedial (AM) and the posterolateral (PL) bundle. The purpose of this study is to evaluate the influence of both-bundles on the knee stability — anterior-posterior translation (APT) and internal (IR) and external (ER) rotation.

Methods: Knee stability was measured on 48 knees of 24 fresh whole-body cadavers using an image-free computer navigation system. APT, IR, and ER of the tibia in relation to the femur were recorded in the intact condition, in the AM-deficient condition, in the PL-deficient condition, and in the ACL-deficient condition. KT-1000 was used to evaluate APT. Rotation measurements were done with the rollimeter by torsion moment of 2.5 Nm. All testings were performed at 30°, 60°, 90°, and 120° of flexion.

Results: Results were evaluated statistically. Results at 30° of flexion: In the intact knee APT was 6.3 mm on average. After AM cut APT increased to 9.1 mm and after PL cut APT increased to 6.4 mm. After AM and PL cuts mean APT was 10.2 mm. In the intact knee IR was 11.1° on average. After AM cut IR increased to 13.9° and after PL cut IR increased to 13.1°. After AM and PL cuts mean IR was 15.7°. In the intact knee ER was 10.1° on average. After AM cut ER increased to 12.6° and after PL cut ER increased to 10.6°. After AM and PL cuts mean ER was 12.9°. At 60°, 90°, and 120° of flexion similar values were measured without statistically significant difference; all values gradually decreased with increased flexion.

Discussion and Conclusions: AM is more important for APT then PL (with statistical significance). IR is more controlled by both bundles then ER—it is generally accepted. But we cannot agree with many other authors that PL controls IR more than AM.

Notes:

1:44pm–1:50pm

Platelet-Rich Plasma vs. Cortisone Injections for the Non-Surgical Treatment of Shoulder Pain

Alan M. Hirahara, MD, FRCSC

Introduction: To evaluate pain and functional improvement in shoulder pain with PRP injections versus cortisone.

Methods: This is a case-control, non-randomized study using 134 study patients who received a PRP injection and 150 con-

trol patients who received a cortisone injection for shoulder pain. Inclusion criteria were any patients having shoulder pain during the collection period already having tried NSAID's and physical therapy. Patients were evaluated clinically with pain scores and ASES scores for six months. Exclusion criteria were non-compliance with the physical therapy regimen or post-injection trauma.

Results: Overall pain and ASES scores improved for both study and control groups (Study: 6.3 to 3.2 & 45.1 to 66.5 and Control: 6.8 to 3.7 & 40.1 to 63.3) with statistically significant improvement starting at days 2 and 1 (pain) and days 4 and 3 (ASES), respectively. However, there was no statistical significance between the study and control groups. Patients with adhesive capsulitis, tendonopathy, and PASTA lesions all showed significant improvement in all measures but were not significantly different between study and control groups; however, there was a tendency toward recurrence in the cortisone group. Patients with DJD did improve initially by week 1 then slowly deteriorated after 2 months with PRP, but the cortisone group showed continued improvement significantly over pre-injection throughout the study. Full thickness rotator cuff tears did improve mildly with statistical significance in both groups.

Conclusions: This study shows that PRP injections are equivalent to cortisone injections to help decrease pain and improve functionality in adhesive capsulitis, tendonopathy, and PASTA lesions. While pain in the cortisone group usually returns, it did not with PRP. Cortisone does have a faster onset than PRP, and cortisone did diminish pain longer in DJD patients over PRP. Patients with full thickness RC tears had only mild relief from PRP and cortisone.

** The FDA has not cleared this drug and/or medical device for the use described in the presentation.* *(Refer to page 32.)*

Notes:

1:50pm–1:56pm

MRI Analysis of Fatty Infiltration and Muscle Atrophy Following Massive Rotator Cuff Tears in a Novel Rat Model

Dominique Laron, BS
Yu–Xuan Dang
Brian T. Feeley, MD
Hubert Kim
Xuhui Liu

Introduction: Two predictors of poor surgical repair and functional status following massive rotator cuff tears (RCT) are muscle atrophy and fatty infiltration (FI). The pathophysiology of degeneration is poorly understood. We have developed a novel rat model that reproduces quantifiable histologic and radiographic evidence of atrophy and FI.

Methods: Female Sprague-Dawley rats had supraspinatus (SS) and infraspinatus (IS) tendons exposed and transected from the humerus with removal of 5mm of tendon. Sham surgery was performed on the contralateral shoulder to serve as control. Rats were harvested 12 weeks after surgery and IS and SS were flash frozen and cross-sectioned (10um) for Oil Red O staining (N=12). Three animals' complete shoulders were scanned with 7T MRI and analyzed with ITK-SNAP software.

Results: There was a 44% decrease in muscle volume in the RCT IS (289.2637mm^3) versus control (517.2573mm^3). A 75% increase in fat volume in the RCT IS (47.5764 mm^3) versus control (11.9653mm^3). A 70% increase in total fat volume in RCT (104.4861mm^3) versus control (31.5348mm^3). Similar findings were found within the SS RCT with a decrease in total muscle volume and an increase in the amount of fat. Significant Oil Red O fat staining was seen in the IS with small amounts of fat in the SS.

Conclusion: We have developed a novel rat model of massive RCT that demonstrates histologic and radiographic FI and atrophy as seen in human injury. We have demonstrated significant muscle volume reduction and increase in fat, particularly in the IS muscle. This may be due to the greater length of the IS tendon compared to the SS tendon resulting in a greater degree of muscle retraction following injury. This is a reproducible and reliable model that can be used to study the pathophysiology involved in the development of massive RCT.

Notes:

1:56pm–2:02pm

Treatment of Shoulder Impingement Syndrome: Subacromial Injection of Ketorolac Versus Triamcinolone

Kyong S. Min, MD
*CPT David A. Crawford, MD

Introduction: Subacromial impingement syndrome is commonly treated with corticosteroid injections; however, corticosteroids have been associated with tendon rupture, subcutaneous atrophy and articular cartilage changes. There has been evidence to support that NSAID injections are effective in treating impingement. This study hypothesizes that an injection of ketorolac is as effective as triamcinolone in treating subacromial impingement syndrome.

Methods: Patients diagnosed with subacromial impingement syndrome that met the inclusion and exclusion criteria were included in this double-blinded randomized controlled clinical trial. The Steroid syringe contained 6 cc of 1% lidocaine with epinephrine and 40 mg triamcinolone; and the NSAID syringe contained 6 cc of 1% lidocaine with epinephrine and 60 mg ketorolac. After a single injection, the patients were evaluated and instructed to follow-up in four weeks.

Results: The mean improvement in the UCLA Shoulder Assessment Score was 7.15 for the NSAID group and 2.13 for the Steroid group. The NSAID group showed an increase in forward flexion strength (NSAID: 0.26, Steroid: -0.07) and patient satisfaction (NSAID: 2.94, Steroid).

Discussion and Conclusion: In this study, a single injection of ketorolac is more effective than triamcinolone in the treatment of subacromial impingement. Arguably, the relief provided by both ketorolac and triamcinolone is a function of their anti-inflammatory action. By decreasing pain, the patient is able to strengthen the rotator cuff, and thereby increase the subacromial space. We believe that ketorolac is an effective alternative to triamcinolone because it appears to increase shoulder function and does not risk the potential side-effects of corticosteroids.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation.* *(Refer to page 32.)*

Notes:

2:09pm–2:15pm

Non-Operative vs. Operative Treatment for Radial Neck Fractures in Children — Multicenter Study

Paul D. Choi, MD
Alexandre Arkader, MD
Wudbhav N. Sankar, MD

Introduction: To determine the best treatment modality for pediatric radial neck fractures in a large cohort of patients.

Methods: Retrospective, comparative study of all children treated for radial neck fractures at two level-1 pediatric trauma centers between 1995 and 2005. The data collected included demographics, mechanism of injury, fracture characteristics, associated fractures, radiographic parameters, treatment, complications and outcome utilizing the Radomisli criteria.

Results: Eighty-five children were identified, 39 males and 46 females, at an average age of 7.6 years (range: 9 months to 6 years). 33/85 (38%) had associated injuries, most commonly ipsilateral ulna fractures in 22, and elbow instability in 7. 38/85 (45%) patients underwent non-operative treatment, including casting in 22/38 and closed reduction + casting in 16/38; 47/85 (62%) underwent operative treatment, including percutaneous reduction in 24 and open reduction in 23. Complications occurred in 29/85 (34%), including stiffness (24), pain (1), synostosis (2), osteonecrosis of the radial head (2), neuropraxia (1), and heterotopic ossification (1). 31/38 (82%) patients treated non-operatively had fair to good outcome; including 21/22 treated by casting alone, and 10/16 treated by closed reduction and casting. Among children treated operatively, 26/47 (55%) had fair to good outcome; 15/24 among patients who underwent percutaneous reduction, and 11/23 among children who underwent open reduction. Treatment method did correlate with outcome. Compared to patients who required operative treatment, patients treated non-operatively had higher rate of fair to good outcome. In particular, patients who underwent casting alone had improved outcome. There was no significant difference in outcomes between other treatment groups.

Discussion and Conclusion: Children with radial neck fractures amenable to conservative treatment fare well, especially if no reduction is needed. Operative treatment of these fractures, in particular when an open (not percutaneous) reduction is needed, is associated with a higher risk of poor outcome.

Notes:

2:15pm–2:21pm

Shortening in Pediatric Femur Fractures

M. Mark Hoffer, MD
Todd Grunander, MD

Introduction: Diaphyseal femur fractures in children ages 6 months to 5 years are currently treated with immediate hip spicas. Two cms is the accepted initial shortening by most authors.

Methods: 42 children with such fractures in this age group were treated by immediate hip spica without regard for degree of shortening. They were followed for 2 years with measurements using the Synapse ruler on x-rays initially, after healing and in some cases at the final 2 year exam.

Results: The initial shortening was less than 2 cms in 35 children and over 2 cms in 7. In the group as a whole there was additional shortening of 46% upon healing with a shortening of up to 3.6 cms in one of the fractures. At follow-up clinical exams all leg lengths were less than 1 cm. In the 7 children with initial displacement exceeding 2 cms final x-rays over 1 year post fracture did not exceed 1.1 cms. Clinically and radiologically all fractures healed with angulation of less than 10 degrees in all planes. Two patients required change of initial cast due to loss of position early in the course of treatment.

Conclusion: These fractures treated in initial hip spica heal in good alignment and regain loss of initial length.

Notes:

2:21pm–2:27pm

Diagnosis and Initial Management of Musculoskeletal Coccidiodomycosis in Children

M. Wade Shrader, MD
*Aaron K. Ho, MD
Lee S. Segal, MD

Introduction: Coccidioidomycosis is an invasive fungal infection caused by inhalation of aerosolized spores of Coccidioides, which grow in the arid soil of the southwestern United States and Mexico. Approximately two-thirds of cases are asymptomatic, and the remainder usually present with mild flu-like symptoms. Dissemination of Coccidioides can lead to extrapulmonic diseases including meningitis, osteomyelitis, hematogenous infection, and skin and soft tissue involvement. The purpose of this study is to report our experience with musculoskeletal coccidioidomycosis in children.

Methods: This is a retrospective review of patients with musculoskeletal infection with Coccidioides at our institution from 1997 - 2007. Demographic and clinical data were collected from the medical records, including the age of patient, gender, length of stay, method of diagnosis, and initial treatment. Clinical data collected included sites of infection, white cell count and differential, serology (including cocci titres), surgical treatment if necessary, associated illnesses, relapse or recurrence, complications, and immunocompetence.

Results: Twenty one children were identified as having musculoskeletal coccidioidomycosis infections (14 males and 7 females). The mean age was 10.5 (range, 2 to 16) at the time of diagnosis. Diagnostic criteria included positive imaging tests (usually MRI), serological positive Cocci titres, and/or biopsy with positive cultures. Locations of infection included the foot (30%), spine (21%), knee (21%), upper extremity (16%), and other sites (12%) Surgical debridement of infected tissue was required 10 times (48%). All patients were treated with antifungal medication with appropriate initial responses**.**

Discussion/Conclusions: This is the first series that has described musculoskeletal infection with coccidiodes exclusively in children. Musculoskeletal infection with coccidiodes can be difficult to recognize, but must be diagnosed quickly and accurately for appropriate treatment and full functional recovery for these children. Orthopedic surgeons should consider this diagnosis when faced with a musculoskeletal infection in children from the southwestern United States and Mexico.

Notes:

2:27pm–2:33pm

Is It Safe to Reduce a Pediatric Type II Supracondylar Humeral Fracture (SCHF) More Than 7 Days After the Injury?

Mauricio Silva, MD
*Nicholas M. Bernthal, MD

Introduction: Slightly extended type II pediatric supracondylar humeral fractures (SCHF) are often treated with closed reduction and casting. A small percentage of these fractures can re-displace in the cast within the first two weeks of follow-up. While a closed reduction and pinning (CRPP) would then be desirable, there is no available information on the outcome of performing surgery in such a delayed fashion. The purpose of this study is to prospectively evaluate whether performing the pinning of these fractures after more than 7 days affects the outcome or number of complications.

Methods: We prospectively reviewed 143 type II pediatric SCHF that were treated by CRPP. To determine the effect of late treatment, we compared a group of fractures that underwent surgery more than 7 days after the injury (Group A, n=42) with a group that underwent surgery within the first 7 days (Group B, n=101).

Results: The mean time from injury to surgery was 9.8 days (range, 7-15 days) and 2.1 days (range, 0-5 days) for fractures in Groups A and B, respectively. There was no need for an open reduction in either group. An anatomic reduction was obtained in all fractures. There were no iatrogenic nerve injuries, vascular complications, or compartment syndromes in either group. Surgical time was similar in both groups (41.9 min vs. 43.7 min. respectively). There were no significant differences in final carrying angle (7.2° vs. 5.7°, respectively) or ROM of the treated side as compared to the normal contralateral side (98.3% vs. 100.2% respectively). Interestingly, avascular necrosis (AVN) of the humeral trochlea was identified in two fractures that were treated surgically 8 days after the original injury (Group A), four months after the surgical procedure. No cases of AVN were noted in the group undergoing early surgical intervention.

Discussion and Conclusion: This study suggests that it is possible to obtain an anatomic reduction of a type II SCHF even after 7 days of the injury. Such a delay in surgery does not appear to lead to longer surgeries, a higher incidence of open reduction, or to alter the final alignment or ROM of the elbow. Further evaluation of the risk of developing an AVN of the humeral trochlea is needed.

Thursday, July 28, 2011

CONCURRENT SESSION 2: Basic Science
(Honolulu and Kahuku Rooms)

Moderator: Ross M. Wilkins, MD

1:20pm–2:40pm

1:20pm–1:26pm

Reconstruction of the Anterior Cruciate Ligament with Autologous Fibroblasts or Mesenchymal Cells Seeded on a Type I/III Collagen Membrane

Stephen P. Abelow, MD
Pedro Guillen

Introduction: A cell based therapy method has been developed to reconstruct the ACL focused on the treatment with autologous fibroblasts extracted from the ACL and mesenchymal cells extracted from adipose tissue seeded on a type I/III collagen membrane to examine the use of cell types and use of new biomaterials promoting ACL repair and regeneration in Human and Merino Sheep model.

Methods: Beginning in 2007, 62 patients who underwent ACL surgery or other lesions of the knee have been processed in our laboratory. (Median age 32 years; range 15-74 years) Lesions were classified as Acute (elapsed time from ACL rupture was shorter than one month), Chronic (longer than one month), and Normal (ACL biopsies taken from patients who had a knee surgery other than ACL). The cells were isolated by enzymatic digestion of the ACL samples.Histologic analysis by H&E, Mason's trichrome stain and electron microsopy of all samples will be performed. Total RNA from the cells will be isolated. Expression of type I collagen, type III collagen, SOX 9, and Tenascin-C genes will be analyzed.

Results: Among the first 62 samples, primary culture could only be established in 43. Initial results show: 1) The elapsed time between obtaining of the sample and its enzymatic treatment could not be more than 2 days. 2) The sample size seems to be important and should be big enough to render at least 20,000 cells. 3) Primary culture is more difficult in older than younger patients. In 19 cases a culture could not be established. The characteristics of the cases and samples were: a) 13 samples were processed at 12 days (mean time) after harvesting. b) 4 cases the number of isolated cells was lower than 20,000. c) 2 cases the patients were 74 years old. The growth

rate of the cultured cells and the age of the patient were inversely proportional. This appears to be only a trend because the negative correlation was not statistically significant (probably due to the low number of patients included so far) (R=-0.226; p=0.146) Cell growth rate was greater in the acute ACL, followed by normal ACL, and finally the chronic ACL (not statistically significant, see above). In randomly selected patients histological study of these membranes have been carried out. The histological studies showed that the fibroblasts are included on the membrane. Our results indicate that it is possible to isolate and culture fibroblasts from the ACL and mesenchymal cells from the fat pad and after reaching the appropriate number including them on a collagen membrane. A separate study in 12 Merino sheep to see if treatment of ruptured ACL with autologous fibroblasts and mesenchymal cells seeded on a collagen type I/III membrane improves the regeneration of ACL in comparison with non-treated ACL and to estimate the number of viable cells needed for the treatment of ACL injuries (5 million vs. 10 million fibroblasts).

Conclusion: A cell-based therapy method has been developed to reconstruct and regenerate the ACL with autologous fibroblasts (tenocytes) extracted from ACL and mesenchymal cells extracted from adipose tissue seeded on o type I/III collagen membrane.

Notes:

1:26pm–1:32pm

Establishing a Mouse Model of Chronic Post-Arthroplasty *Staphylococcus Aureus* Infection

Nicholas M. Bernthal, MD
Fabrizio Billi, PhD
John S. Cho, PhD
Lloyd S. Miller, MD, PhD
Jonathan R. Pribaz, MD
Alexandra I. Stavrakis, MD

Introduction: In previously published work, a mouse model of post-arthoplasty infection was developed that provided longitudinal tracking of bacterial burden, neutrophil recruitment, and biofilm formation for up to 14 days after surgery. In the present study, we aimed to develop a model that would allow tracking out to 6 weeks after surgery, more closely replicating the clinical scenario of chronic infection.

Methods: Using an established mouse model of post-arthroplasty *S. aureus* infection, we compared the previously utilized SH1000 bioluminescent strain (with a bioluminescent lux operon on a chloramphenicol selection plasmid) with Xen29 and Xen36 bioluminscent strains (lux operon embedded in the bacterial chromosome or within a stable plasmid, respectively) to determine which *S. Aureus* strain would provide the most consistent and accurate bioluminescent signals up to 6 weeks post-operatively. We compared bacterial burden, biofilm formation and neutrophil recruitment for each of the three strains using in vivo bioluminescence and fluorescence imaging, histology, and variable-pressure scanning electron microscopy (VP-SEM).

Results: Xen36 had the highest bioluminescent signals for the entire 42-day experiment, remaining at least 1 log higher than background signal throughout. Similarly, Xen29 also had bioluminescent signals above background signals for 42 days. The SH1000 strain, with the lux operon in a chloramphenicol selection plasmid, had bioluminescent signals that decreased to background levels after day 14. With all three bacterial strains, bacterial counts and variable-pressure scanning electron microscopy (VP-SEM) confirmed the presence of bacteria in a quantity that directly correlated with the bioluminescence measured.

Discussion: Based on these data, the use of a *S. aureus* strain with a more stable lux operon construct, either in a stable plasmid or within the bacterial chromosome, provides a better approximation of bacterial burden beyond 14 days. A bacterial strain that will continue to produce a detectable signal over a 6-week infection course will allow us to establish and monitor a chronic post-arthroplasty infection.

Notes:

1:32pm–1:38pm

Effects of Denervation on Murine Muscle Intra-Cellular Signal Cascades

Orrin I. Franko, MD
Richard L. Lieber, PhD

Purpose: *In vitro* or cell culture specimens are used to study mechanotransduction; however, the effect of denervation on signaling cascades has not been examined. This study determined whether p70 and c-Jun N-terminal kinase (JNK) are influenced by denervation.

Methods: Extensor digitorum longus (EDL) muscles from 8 male mice (strain 129/SV) were assigned to either a control condition (A; no tendon or nerve injury) or one of the following: B) release of the distal tendon (unloading), C) denervation with tendons left intact, and D) release and denervation. The EDL was left either *in situ* (A-C) or *in vitro* (D) for 8 minutes before frozen in liquid nitrogen. Activation of phosphorylated p70 and JNK was measured by Western blot analysis. Student t-tests were performed between conditions with a Bonferroni correction of $p<0.016$ accepted for statistical significance.

Results: Four muscles underwent each condition (A-D: 16 muscles total). Unloading of the distal EDL tendon (condition B) did not result in activation of either p70 or JNK ($p=0.8$ and $p=0.55$, respectively). However, denervation resulted in a significant increase in p70 ($p=0.001$) but not JNK ($p=0.019$), and the *in vitro* conditions demonstrated no significant activation for either protein ($p=0.15$ and $p=0.05$, respectively).

Conclusions: Using *in vitro* experimentation, p70 and JNK have been implicated in the early intracellular signaling cascades of skeletal muscle mechanotransduction. However, in this study, we demonstrate that p70 is activated early (within 8 minutes) after denervation of the muscle without any other manipulation. These results are alarming, and researchers studying early mechanotransduction signaling cascades must consider this limitation.

Notes:

1:38pm–1:44pm

Bioactive Sutures for Tendon Repair: Efficacy of Delivering Stem Cells In-Vivo

Varun Gajendran, MD
*Don Young Park, MD
Tatiana A. Korotkova, MS
Jeffrey Yao, MD

Introduction: In our previous study, we demonstrated that rat bone marrow-derived stem cells can successfully adhere to suture material and be delivered into acellularized tendons in vitro. However, it has not yet been shown whether these cells can survive implantation into live animals with intact immune systems and repopulate the acellular zone seen around a tendon repair site in-vivo.

Methods: Rat bone marrow-derived mesenchymal stem cells (MSC) were isolated and labeled with PKH26 fluorescent dye to distinguish between implanted and host cells. Polyester sutures were seeded with MSC and cultured for 3 days. Open transection of Sprague-Dawley rat hind tendons was performed in 6 rats, with one limb in each rat randomized to MSC-implanted suture and the other limb randomized to standard suture. Cast immobilization of the rat hind limbs prevented loading of the repairs. The repaired hind tendons were harvested and sectioned at 7 and 14 days. The specimens were evaluated for any host inflammatory response, and cell viability was evaluated with fluorescent microscopy.

Results: Rat hind tendons repaired with PKH26-labeled MSC sutures demonstrated detectable MSC lineage utilizing fluorescent microscopy whereas the controls did not, and no significant inflammatory response was observed. Thus, implanted MSC's were successfully delivered to the tendon repair site and survived the acute phase of healing.

Conclusion: MSC's can successfully adhere to suture and survive the implantation process into a live rat hindpaw tendon in-vivo. Implanted MSC's survive the acute phase of healing at the tendon repair site and appear immunoprivileged. These cells may biologically augment current tendon repair.

Notes:

1:44pm–1:50pm

Does Applying Normal Saline Significantly Change the Wound Bursting Strength of Cyanoacrylates?

George Gendy, MD
Paul A. Williams, MS
Montri D. Wongworawat, MD

Introduction: Several topical adhesives have been on the market. The base of the adhesives is cyanoacrylate. Cyanoacrylate rapidly polymerizes in the presence of water or hydroxide ions to bond surfaces together. In the surgical setting, moisture on the skin surface starts the polymerization. The application of water or saline has been used anecdotally to speed the curing time. Previous studies have looked at wound bursting strengths between different products, but none have looked at whether applying saline changes wound bursting strength.

Methods: Full thickness incisions were made to porcine skin. Specimens were randomized into two groups: Control or Saline (n=27 and 26, respectively). Both groups had a topical adhesive applied as instructed by industry in two layers at 30 second intervals. The Saline group had 5 cc of normal saline applied in drip fashion from a syringe after the second layer of topical adhesive was applied, the Control group had no saline applied. After final cure of 120 minutes, one centimeter wide sections of skin-adhesive-skin constructs were then cut and tested on a materials testing machine until failure. Load at failure was determined and stress at failure was calculated based on specimen dimensions. Load at failure was measured and stress at failure was calculated. The means were compared with a Two-Sample t-test.

Results: Application of saline resulted in significantly weaker repair constructs. For the control group, stress at failure was 34.52 ± 12.28 N/in², whereas that of the Saline group was 23.71 ± 8.49 N/in² (p less than 0.0001).

Discussion and Conclusion: Although the hydroxyl group is needed to activate curing of a topical adhesive, adding saline does so at a detriment to the strength of the final cured compound. Applying saline to the topical adhesive is not recommended.

Notes:

1:50pm–1:56pm

Function and Structure of Cartilage Defect Repair with Frozen and Fresh Osteochondral Allografts in the Goat

Simon Görtz, MD
David Amiel, PhD
Scott T. Ball, MD
William D. Bugbee, MD
Albert C. Chen, PhD
Robert L. Sah MD, ScD

Introduction: Fresh-vs-frozen allografts represent best-vs-worst cases with respect to cell viability, but difficult-vs-simple with respect to acquisition and distribution. The objective of this study was to compare load-bearing, geometrical, biochemical, and cellular properties of such allografts for defect restoration in the adult goat model.

Methods: Adult Boer goats (n of 7, 3yo) were operated in one knee, with one FROZEN and one FRESH site-matched osteochondral allograft (8mm diameter, 5mm height) implanted into alternating medial femoral condyle (MFC) and lateral trochlea (LT) sites. Contralateral knees were non-operated controls. At 6 months, joint structure was assessed by micro-Computed Tomography (mCT), quantifying cartilage thickness, cartilage contour-fill at the defect site, cartilage surface location, and cartilage-bone interface location. Cartilage stiffness was assessed by indentation testing at the allograft center and matched Non-Op site. Cellularity was assessed by Live/Dead staining overall and in superficial, middle, and deep zones. Matrix fixed charge was assessed (inversely) with HexabrixTM-enhanced-mCT (HE-mCT). Effects of treatment (NON-OP, FRESH, FROZEN), site (and zone) were assessed by ANOVA.

Results: Cartilage cellularity varied with treatment (p less than 0.001), being similarly high in NON-OP and FRESH, and ca. 99% lower in FROZEN allografts. Cellularity also varied with zone (p less than 0.001), decreasing with depth. Cartilage stiffness and HE-mCT absorption varied with treatment (p less than 0.001). Cartilage stiffness was ca. 80% lower in FROZEN than NON-OP or FRESH allografts. Concomitantly, deep zone HE-mCT absorption was ca. 60% higher in FROZEN than NON-OP and FRESH. Cartilage thickness varied with site (MFC equaled 1.44mm, LT equaled 0.86mm), but was not affected by treatment (p equaled 0.4). Other allograft geometry parameters were affected by treatment (p less than 0.01). In FROZEN MFC allografts, cartilage fill was less (ca. 50%) in association with surface depression (ca. 0.7mm), and

the cartilage-bone interface tended to be depressed (ca. 0.9mm, p equaled 0.06).

Discussion and Conclusion: Maintenance of cartilage load-bearing properties in allografts is associated with maintenance of cartilage cellularity and fixed charge. Frozen or non-viable allografts may fail due to both cartilage softening and graft subsidence.

Notes:

2:03pm–2:09pm

A Novel Murine Model of Delayed Long Bone Healing

Thomas Kremen, MD
Kristine D. Estrada
Karen M. Lyons, PhD

Introduction: The need for augmentation of bone healing in all orthopaedic surgery subspecialties is well established. Recently, there has been a growing interest in biologic therapeutics such as genetically engineered host cells. One of the best-characterized approaches to investigating the effect of genetic engineering in vivo has been the development of transgenic mouse models, yet there is a paucity of in vivo murine models that accurately and humanely recapitulate the clinical treatment of long bone fracture.

Methods: Thirty-two C57BL/6J mice underwent survival surgery in our IACUC approved research protocol. Twenty-four animals received a unilateral 1.75mm femoral osteotomy (four euthanized at 2 weeks, seven at 6 weeks and thirteen at 12 weeks) and underwent weekly radiographic assessments as well as histologic analysis after completion of the study period. Four control animals received a 0.25mm osteotomy. Internal fixation was performed utilizing a titanium locking plate and screws. Radiographic criteria for union were defined as any cortical bridging on at least one of two orthogonal views. Histologic criteria for union were defined as the presence of bridging cortical bone, osteoid or cartilage nests at the femoral osteotomy site.

Results: All animals that received a 0.25mm osteotomy demonstrated radiographic signs of union by 2weeks and this was confirmed by histologic assessment. Overall, 13 of 20 animals (65%) exhibited non-union. In the group followed for 6 weeks, five of seven (71%) of the animals that underwent 1.75mm osteotomy showed non-union. Eight of thirteen (61.5%) of the animals followed for 12 weeks showed non-union.

Discussion and Conclusion: We have demonstrated a reproducible murine model of delayed healing of long bone fractures that accurately recapitulates human fracture internal fixation and as a result is an excellent preclinical investigation technique. This model is a more humane mode of fixation than previously described and allows researchers to reproducibly investigate transgenic animals, various scaffolds as well as an innumerable amount of pharmacologic or biologic therapies.

Notes:

2:09pm–2:15pm

A Novel Murine Model of Muscle Atrophy and Fatty Infiltration After Massive Rotator Cuff Tears

Xuhui Liu, MD
Brian T. Feeley, MD
Hubert Kim
Dominique Laron, BS
Kyle Natsuhara

Introduction: Muscle atrophy and fatty infiltration are common findings in the setting of massive rotator cuff tears (RCT). They are both believed have a role in the poor outcomes and high failure rates of massive RCT repair. The pathobiology of muscle atrophy and fatty infiltration after RCT remains unknown mainly due to the lack of validated small animal models. In this study, we hypothesized that a mouse model of massive cuff tears would reproducibly demonstrate muscle atrophy and fatty infiltration, similar to the clinical findings of a massive rotator cuff tear.

Methods: Mice were randomly selected to receive supraspinatus (SS) and infraspinatus (IS) tendons transection (TT group), suprascapular nerve transection (DN group) or

both (TT+DN group). Sham surgery was performed on the opposite shoulder to serve as control. Mice were sacrificed 12 weeks after the surgery (N=12). Muscle atrophy and fat infiltration in SS and IS were evaluated by wet weight, histology and high resolution MRI (7T) scanning.

Results: 12 weeks after surgery, the wet weight of SS decreased 24.7%, 54.2%, and 68.7% in TT, DN and TT+DN group ($P<0.01$ vs. control). Wet weight of the IS significantly decreased in a similar manner as well. MRI evaluation demonstrated that intramuscular fat increased 7.94, 10.5 and 13.0 fold in the SS and 6.72, 9.33 and 17.6 fold in IS in TT, DN and TT+DN groups, respectively($P<0.01$ vs. control side). Histology confirmed the presence of fat.

Discussion and Conclusion: In this study, we have successfully developed and validated a novel mouse model for muscle atrophy and fat infiltration after massive RCT. Based on our results, it appears that denervation has a significant role in the progression of both muscle atrophy and fatty infiltration, as denervation of the suprascapular nerve resulted in an increase in the degree of muscle atrophy and fatty infiltration.

Notes:

2:15pm–2:21pm

Low-Energy Femur Fractures: Correlations with Bone Mineral Density and Bisphosphonates

Daniel J. Song, MD
Kevin Christensen, MD
Joseph Orchowski, MD
Aimee Perreira, MD

Introduction: There is a growing concern for an association between low-energy femur fractures and bisphosphonate use. A method of identifying the subset of patients who may be at risk for these atypical fractures would be helpful. We hypothesize that the review of serial dual energy x-ray absorption (DEXA) scans prior to fracture will demonstrate bone mineral density (BMD) changes that can predict the subset of patients at risk for this fracture.

Methods: This study is an IRB approved, multi-center, retrospective case series of low-energy femur fractures presenting to two institutions. Inclusion criteria include age 50 years or greater, bisphosphonate use, low-energy femoral shaft or subtrochanteric fracture with at least two DEXA scans prior to fracture. Data analysis was used to determine if a relationship exists between the time on bisphosphonates and BMD, change in BMD and fracture occurrence, and duration on bisphosphonates and fracture occurrence.

Results: A total of eight patients were identified that satisfied our inclusion criteria. Average time on bisphosphonates before fracture was 6.51 years. A linear regression analysis revealed a statistically significant correlation between the time of bisphosphonates and an increase in BMD. There was not a statistically significant correlation between the time on bisphosphonates and fracture occurrence or between the change of BMD and fracture occurrence.

Discussion and Conclusion: Several recent case reports and case series support an association with alendronate use and atypical femur fractures. Prospective studies have shown a direct correlation between decreasing BMD of the femoral neck and hip and increased fracture risk. In our study, there was no correlation between BMD and fracture occurrence. All patients in our study sustained a low-energy atypical femur fracture despite statistically significantly appropriate response to bisphosphonates. It is likely that the etiology of this atypical fracture is less likely a fragility-type fracture, but a fracture secondary to brittle bone from bisphosphonates. Therefore, monitoring BMD with DEXA is an inappropriate method for detecting patients who are at risk for this atypical fracture.

Notes:

2:21pm–2:27pm

Surgeon Owned Implant Distribution: Analysis of a Legally Compliant Model

John C. Steinmann, DO

Introduction: Surgeon owned and managed distribution is a novel business model that has the potential to substantially reduce hospital implant costs by reducing the need for sales and marketing efforts and improving the efficiency of distri-

bution functions. The purpose of this paper is to describe a legally compliant model for surgeon ownership in implant distribution and determine the economic effects of this model on local hospitals.

Methods: Four Orthopedic surgeons working in conjunction with a nationally recognized healthcare law firm established a model compliant with all Federal Self-Referral and Anti-Kickback laws. Surgeons, sought implants that met their specific design criteria and negotiated the purchase of necessary inventory to support the distribution of these products. Between January 2007 and December 2010, all implant sales to the hospital from the surgeon owned distributorship were compared to the best contracted pricing of like implants provided from other traditional distributors. Utilization of implants were tracked and compared to utilization patterns prior to the formation of the distributorship.

Results: The surgeon owned implant distributorship generated cost savings in excess of $4 million dollars for three participating local hospitals. Implant prices from the distributorship remained stable or decreased through the period of this study. Utilization was not shown to have been influenced as a result of surgeon ownership in distribution.

Discussion and Conclusion: Pharmacy and medical device costs are often cited as significant contributors to the steadily rising burden of healthcare costs in the US. Both industries are largely protected from market forces that would otherwise control cost. Little effective means have been employed to introduce market forces or to improve efficiencies in the delivery of these implants. Surgeon ownership in implant distribution has proven to effectively introduce market controls and reduce the price of orthopedic implants leading to sustainable benefit for hospitals, physicians and the patients they care for.

Notes:

2:27pm–2:33pm

Monitoring Gene Expression in Articular Chondrocytes and Bone Marrow Derived Stem Cells During Dynamic Compression

Derek F. Amanatullah, MD, PhD
Paul E. Di Cesare, MD
Dominik R. Haudenschild, PhD
Jeffery Lu, MS

Introduction: Expression of chondrocyte-specific genes is regulated by mechanical force. However, despite the progress in identifying the signal transduction cascades that activate expression of mechanoresponsive genes, little is known about the transcription factors that activate transcription of mechanoresponsive genes. Adapting traditional promoter analysis, performed mainly on monolayer cultures of immortalized cell lines, to the study the mechanoresponse of primary chondrocytes in three-dimensional culture systems has proven difficult. As a result, the DNA elements that confer mechanoresponsiveness within a cartilage gene promoter have yet to be identified.

Methods: We have established an experimental system to identify the DNA elements and transcription factors that mediate the mechanoresponse of a promoter upon compression of primary human chondrocytes and stem cells in a three-dimensional culture system.

Results: Our secreted luciferase reporter system has identified the proximal 3 kb of the human COMP promoter as sufficient to mediate a mechanoresponse in human articular chondrocytes and stem cells at the RNA and protein level.

Discussion and Conclusion: This information is critical to understanding how mechanical force regulates the transcriptional activation of cartilage genes in three-dimensional culture and will eventually clarify the role of joint loading in cartilage homeostasis and pathology.

Notes:

2011 Scientific Program Abstracts — Friday

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

Friday, July 29, 2011

CONCURRENT SESSION 3: Trauma, Foot & Ankle, Tumors, and Pain Management ***(Kauai Room)***

Moderator: James P. Duffey, MD

12:55pm–2:00pm

12:55pm–1:01pm

The Incidence of Radiographic Atypical Femur Fractures and Bisphosphonate Use Among Operatively Treated Femur Fractures in a Community Setting

Eric Owen Eisemon, MD

Introduction: There is significant debate surrounding bisphosphonate use and 'atypical' femur fractures. Several case reports and case series have been published linking bisphosphonates and 'atypical' femur fractures. Conversely, large population based studies have not shown an increase in subtrochanteric (ST) and diaphyseal (DIA) femur fractures which, some believe, would be expected if this relationship did exist. The purpose of our study is to determine the prevalence of 'atypical' femur fractures among all operatively treated femur fractures at our institution. In addition we sought to compare patient characteristics (age, mechanism of injury and bisphosphonate use) between 'typical' vs. 'atypical' fracture patterns.

Methods: Cases were retrospectively identified by querying our surgical database for operatively treated femur fractures based on CPT codes during an18 month period (8/2008-2/2010). The author reviewed and classified the radiographs for each case. Fractures associated with prostheses, due to malignancy, or insufficient imaging, were removed from analysis. For each case the type of fracture (ST or DIA), the mechanism of injury, bisphosphonate use and age were obtained from the EMR or patients directly. 'Atypical' femur fractures were defined as lateral cortical thickening with a transverse fracture line with an oblique fracture on the medial cortex. Stress fractures had lateral cortical thickening with a lucent linear line. All other fracture types were classified as 'typical.'

Results: 435 operatively treated femur fractures were reviewed. 28 cases were excluded. Of the 407 remaining fractures, 33 (8%) were either ST or DIA fractures. There were 15 'atypical' fractures and 3 stress fractures, with the remaining 15 being 'typical.' All patients were women and had a low energy mechanism of injury. None of the patients with 'typical' fractures had documented bisphosphonate use in the EMR, where all of the patients in the 'atypical' group had documented bisphosphonate use in either the EMR or by follow up. Patients with the 'atypical' femur fractures were found to be younger 69 (range 49-83) vs. 82 (range 66-96) for typical femur fractures, which was statically significant ($p<0.002$).

Discussion and Conclusion: The prevalence of ST and DIA fractures in our population is consistent with previously reported values of between 7-10%. Examining prevalence alone it would appear that there is no increase in the number of 'atypical' femur fractures. However when the radiographs are examined the majority, 55%, had 'atypical' features all of which were on a bisphosphonate. Cases of 'atypical' femur fractures may be discounted in studies evaluating for ST and DIA fracture prevalence in which the study design does not include a review of injury films.

Notes:

1:01pm–1:07pm

A Comparison of Hybrid Fixation and Dual Plating for Diaphyseal Both Bone Forearm Fractures

Nicole M. K. Behnke, MD
Virginia Nguyen, BS
Hamid R. Redjal, MD
Daniel M. Zinar, MD

Introduction: Diaphyseal fractures of the forearm often involve simultaneous fractures of both the radius and ulna. The treatment of these fractures is most commonly dual plate osteosynthesis in the adult forearm; both the radius and ulna are stabilized with open reduction and internal fixation using plate and screw constructs. However, the application of a plate necessitates skin incisions and disruption of both soft tissues and periosteal blood supply. While locked intramedullary nailing of isolated forearm fractures has been described, hybrid fixation, with plate osteosynthesis for internal fixation of the radius and closed, or minimally open reduction and locked intramedullary nail fixation of the ulna, hasn't been widely evaluated. The purpose of this study is to retrospectively evaluate the efficacy of treating diaphyseal fractures with hybrid fixation as compared to dual plating.

Methods: We identified all patients treated surgically for diaphyseal fractures of both the radius and ulna between July 2005 and December 2009. A total of 56 patients fractures meeting our inclusion criteria were identified. Patients were treated with either dual plating or hybrid fixation, as described above. Objective outcome was based on time to radiographic union; functional outcomes were assessed with the use of the Grace and Eversmann rating system.

Results: There was no significant difference in either time to union or Grace and Eversmann scores between the two groups. There was one nonunion of a fracture treated with dual plating and one nonunion in a patient treated with hybrid fixation. Nine overall complications, outside of nonunions, were reported: 5 with dual plating; 4 with hybrid fixation.

Conclusion: Hybrid fixation using open reduction and internal fixation with a plate-and-screw construct on the radius and closed, or minimally open reduction and interlocked intramedullary fixation of the ulna is an acceptable method for treating both-bone diaphyseal forearm fractures in adults.

Notes:

1:07pm–1:13pm

Results of a New Multi-Planar Intramedullary Implant Treating Transverse and Comminuted Olecranon Fractures and Nonunions

Scott G. Edwards, MD

Introduction: Hardware irritation and removal has been a common complication of traditional olecranon fixation. The theoretical advantages of intramedullary nailing for olecranon fractures is less risk of soft-tissue irritation and resulting hardware removal. The purpose of this study is to evaluate a new multi-planar intramedullary implant indicated for both transverse and comminuted olecranon fractures. This is the first clinical report of this particular type of implant.

Methods: 28 consecutive patients with displaced olecranon fractures underwent open reduction and internal fixation using a multi-directional intramedullary implant and were followed for an average 27 months (range: 18 to 31 months). Of the 28 fractures, 15 were transverse, 7 were comminuted, 3 of which also involved the coronoid, and 6 were nonunions. Average patient age was 45 years (range: 25 to 65 years). Patients were immobilized for 3-5 days postoperatively, after which motion was allowed. Strengthening was initiated at 6 weeks. Motion was measured at 4 weeks and 8 weeks. Strengthening was tested at 8 weeks using a triceps extension maneuver with resistance. Radiographs were taken at each follow up visit until union. Operative time, complications and subjective complaints were noted.

Results: Average operative time as 25 minutes. At four weeks, patients demonstrated average extension-flexion of 20º to 115º with full supination and pronation compared to the contralateral side. At 8 weeks, all patients were within 10º of full extension-flexion and were able to extend 85% of weight compared to the contralateral side. All fractures progressed to radiographic union by six weeks. There were no incidences of infection, triceps extension problems, or hardware failure or irritation. No patients were lost to follow up.

Discussion and Conclusions: This new multi-planar intramedullary implant appears to be a safe and effective method to stabilize transverse and comminuted olecranon fractures and nonunions. It allows for early motion for both stable and unstable fracture patterns without loss of fixation. Good outcomes in terms of motion, strength, and union may be expected within 8 weeks after surgery.

Notes:

1:20pm–1:26pm

Anteromedial Impingement in the Ankle Joint — Outcomes Following Arthroscopy in the First One Hundred Cases

Christopher D. Murawski
John G. Kennedy, MD, FRCS (Orth)

Introduction: Anteromedial impingement (AMI) is a common and chronic ankle joint condition characterized by anteromedial talotibial osteophytes, soft tissue synovial hyperplasia and cicatrization, thereby causing pain and a mechanical obstruction to normal joint motion. AMI is a common condition found primarily in athletes, but particularly soccer players. The first case series of the arthroscopic resection of AMI has been previously described. The current authors' present an update of an ongoing series with the retrospective results of the first one hundred patients treated arthroscopically for AMI.

Methods: Between January 2005 and January 2010, 100 patients underwent arthroscopic resection of AMI under the care of the senior author. Any patient with evidence of pre-existing degenerative arthrosis was excluded. Patients were followed for a minimum 1-year time period post-operatively. All patients had pre- and post-operative AOFAS hindfoot and SF-36V2 scores.

Results: The mean patient age was 30.4 years (range, 13-60 years) and the mean follow-up time was 25.1 months (range, 6-81 months). 91% of patients reported good to excellent functional outcomes and would recommend the procedure. Mean AOFAS score improved significantly from 59 points pre-operatively to 92 points at follow-up. The SF-36V2 score also improved significantly by a mean 32 points at follow-up. Return to play in the athletic population was a mean of 7 weeks. Five patients experienced complication (5%).

Discussion and Conclusion: The typical presentation of AMI is medial ankle joint pain while running, kicking, or stair climbing and is explained by the entrapment of soft tissue inflammation between the osteophytes during dorsiflexion of the ankle. In the current authors' experience, the diagnosis of AMI is often delayed, caused prolonged time lost to injury in athletes. Proper diagnosis should include physical examination in addition to oblique AMI-view radiographs and MRI. When medial ankle joint pain is present, the diagnosis of AMI should be considered until proven otherwise. The poor results of conservative treatment therapies for impingement syndromes of the ankle have led the current authors' to advocate arthroscopic debridement as a first line treatment to expedite return to competitive sport. AMI is a common condition seen in athletes and when treated arthroscopically can be expected to do well and return to sport at previous levels.

Notes:

1:26pm–1:32pm

A Hybrid Anatomic Lateral Ankle Reconstruction: ATFL Autograft with Plication of the CFL

John G. Kennedy, MD, FRCS (Orth)
*Christopher D. Murawski

Introduction: The lateral ankle sprain is the single most common sports injury worldwide. Surgical strategies for addressing lateral instability include anatomic reconstruction and checkrein procedures. Concerns over inadequate reparative tissue, scarring and over tightening of the subtalar joint have prompted the introduction of a hybrid reconstruction. Using a peroneal tendon autograft fixed to the isometric points of the ATFL, and plicating rather than substituting the CFL provide the benefits of both techniques while reducing the drawbacks of both. The current study hypothesis is that the hybrid reconstruction will provide excellent functional recovery with few complications.

Methods: Between January 2006 and June 2009, 57 patients underwent a hybrid lateral ankle ligament reconstruction technique. Each patient included in the present study failed a 3-month conservative triple-phase therapy program. All patients were followed for a minimum of one-year following surgery and were treated in identical fashion. Surgery included substituting the native ATFL with a 4 centimeter split peroneus longus autograft in addition to a vest-over-pants plication of the CFL. All patients had pre- and post-operative Foot and Ankle Outcome Scores (FAOS) and Short Form-36v2 scores. Pre- and post-operative MRIs were compared to detect ankle and subtalar arthrosis.

Results: 93% of patients were satisfied with the procedure and would recommend it to a friend. FAOS scores increased significantly pre- to post-operatively from 58 to 89 points. SF-36v2 scores also increased significantly from 67 points pre-operatively to age adjusted normal levels. Two of 57 patients had pre-operative grade II cartilage loss in the posterior facet of the subtalar joint. In one case, this had advanced to grade

III at 2 years follow up. Two additional patients had grade I changes in the subtalar joint at two years and one patient demonstrated grade II changes in the ankle joint at 1-year follow-up All patients reported competing at some level of athletic sport prior to surgery. Five of 57 patients did not return to pre-operative sporting levels. All 5 patients had mechanical stability but all had functional instability. The incidence of functional instability was 22% overall and persistence of functional instability was a predictor of failure to return to sports. Complications included a painful hypertrophic peroneal tendon, two cases of superficial peroneal nerve neurapraxia and a post-operative sinus tarsi syndrome.

Discussion and Conclusion: Traditional anatomic reconstructions of the lateral ligament complex have demonstrated good outcomes. Nevertheless, significant scarring and over-tightening of the ankle joint can occur. Checkrein procedures have also produced concerns with over tightening of the ankle and subtalar joints. The hybrid procedure described herein uses the most advantageous concepts from both procedures while reducing the risk of these drawbacks. The current study has demonstrated that mechanical stability is restored without compromising joint forces. Functional stability training is critical to facilitate a full return to sports.

Notes:

1:32pm–1:38pm

Functional and T2-Mapping MRI Results of Autologous Osteochondral Transplantation of the Talus in 72 Patients

Christopher D. Murawski
John G. Kennedy, MD, FRCS (Orth)

Introduction: Osteochondral lesions of the talus are common injuries following acute and chronic ankle sprains and fractures, the treatment strategies of which include both reparative and restorative techniques. Reparative techniques include arthroscopic bone marrow stimulation (i.e., microfracture, drilling) and provide fibrocartilage infill to the defect site. The long-term concern with microfracture, however, is this biologically and mechanically inferior fibrocartilage will degrade over time, particularly in larger lesions. Recently, restorative techniques (i.e., autologous osteochondral transplantation) have been become increasingly popular as a primary treatment strategy, in part due to the potential advantages of replacing "like with like" in terms of hyaline cartilage at the site of cartilage repair. The current study examines the functional results of autologous osteochondral transplantation of the talus in 72 patients.

Methods: Between 2005 and 2009, 72 patients underwent autologous osteochondral transplantation under the care of the care of the senior author. The mean patient age at the time of surgery was 34.19 years (range, 16-85 years). All patients were followed for a minimum of 1-year after surgery. The mean follow-up time was 28.02 months (range, 12-64 months). Patient-reported outcome measures were taken pre-operatively and at final-follow-up using the Foot and Ankle Outcome Score and Short-Form 12 general health questionnaire. Identical questionnaires were used in all instances. Quantitative T2-mapping MRI was also performed on select patients at 1-year post-operatively to evaluate the collagen microstructure of the repair cartilage using a standardized evaluation protocol.

Results: The mean FAOS scores improved from 52.67 points pre-operatively to 86.19 points post-operatively (range, 71-100 points). The mean SF-12 scores also improved from 59.40 points pre-operatively to 88.63 points post-operatively (range, 52-98 points). Three patients reported donor site knee pain after surgery and one patient required the decompression of a cyst that developed beneath the graft site approximately two years after the index procedure. Quantitative T2-mapping MRI demonstrated relaxation times that were not significantly different to those of native cartilage in both the superficial and deep halves of the repair tissue.

Discussion and Conclusion: Autologous osteochondral transplantation is a reproducible and primary treatment strategy for large osteochondral lesions of the talus and provides repair tissue that is biochemically similar to that of native cartilage on quantitative T2-mapping MRI. This may ultimately allow the ankle joint to function adequately over time.

Notes:

1:38pm–1:44pm

Long Term Results for the Treatment of Giant Cell Tumor of Bone

Thomas Kremen, MD
Nicholas M. Bernthal, MD
Mark A. Eckardt

Introduction: No consensus currently exists as to which surgical approach is most appropriate for the treatment of giant cell tumor of bone (GCTB), and few studies have been published that attempt to stratify risk among this heterogeneous patient population. By reporting our long-term results stratified by both surgical treatment and recurrent disease, we aimed to investigate the incidence of local recurrence (LR) and pulmonary metastases (PM) in our study population.

Methods: 230 consecutive GCTB patients treated over a 30 year period were retrospectively reviewed and stratified by surgical treatment as well as primary versus recurrent disease. 150 of these patients with minimum 2-year follow up were analyzed for local recurrence, metastatic disease and complications of treatment.

Results: Overall incidence of LR was 13% and PM was 3%. However, when stratified by surgical treatment there was a statistically significant difference in the incidence of LR among patients undergoing intralesional curettage (16%) compared to resection (3%). The incidence of LR among primary tumors, independent of treatment, was 11% whereas the incidence of LR after treatment of recurrent lesions was 21%. The incidence of PM was similar between these stratified groups.

Discussion and Conclusion: When stratified by both surgical treatment and recurrence, GCTB lesions treated with resection are associated with lower rate of LR than lesions treated with curettage. Primary lesions are associated with lower rates of LR than recurrent lesions regardless of surgical treatment. Our results should contribute to future meta-analyses in order to increase our ability to risk stratify GCTB patients.

Notes:

1:44pm–1:50pm

Concerns About Assessment of Postoperative Pain in Children with Cerebral Palsy: Are We Undertreating Pain in the Children?

M. Wade Shrader, MD
David R. Burke, BS
Richard Cotugno, BS
John S. Jones, MD
Miranda J. Nowlin, PA–C
Lee S. Segal, MD

Introduction: Appropriate postoperative pain control for children with cerebral palsy (CP) is challenging. Inherent communication and cognitive deficits, and subsequent lack of verbal skills make it difficult for caregivers to appropriately assess pain. The purpose of this study is to investigate the assessment of postoperative pain in children with CP undergoing orthopedic surgery and comparing that to normal controls.

Methods: This is a retrospective review of children with CP over a ten year period undergoing orthopedic surgery. Data collection of patient demographics included age, gender, length of stay, and specifics of the surgery. The primary end point of this study was the documentation of pain by the nursing staff by use of standardized pain assessments at standard time points postoperatively. Data was compared to an age-matched cohort of normal children undergoing orthopedic surgery for scoliosis.

Results: 169 patients with CP (mean age 11.2) were compared to an age-matched Control group. In the CP group, pain scores were completed at the standard time points only 60% of the time, compared to 81% of the time in the Control group. Furthermore, a disproportionate number of pain scores for the children with CP were rated as "0," meaning that the nurses perceived no pain whatsoever, which is obviously unusual in the early postoperative period. In the CP group, the % of time that the pain scores were documented as "0" was 75%, compared to only 49% of the time in the Control group.

Discussion/Conclusion: Nurses adequately completed pain assessments for children with CP significantly less often than those of normal controls. This data suggests the possibility of severely undertreating postoperative pain in this patient population. Clearly, more research needs to be done to investigate the difficulties involved in assessing pain in these children, and to determine ways to improve their care.

Notes:

Friday, July 29, 2011

CONCURRENT SESSION 4: Total Joint, Upper Extremity and Miscellaneous
(Honolulu and Kahuku Rooms)

Moderator: Michael P. Dohm, MD

12:55pm–2:00pm

12:55pm–1:01pm

Comparison of Surgical Outcomes and Implant Wear Between Ceramic-on-Ceramic and Ceramic-on-Polyethylene Articulations in Total Hip Arthroplasty

Derek F. Amanatullah, MD, PhD
Paul E. Di Cesare, MD
Jonathan P. Garino, MD
Sunny Kim, PhD
Joshua Landa, MD
Eric J. Strauss, MD

Introduction: Modern alumina ceramics have shown good short- and mid-term results when coupled with either ceramic or polyethylene liners in hip replacement surgery. Few studies have directly compared these two bearing surfaces in a randomized study design. We hypothesized that ceramic-on-ceramic bearing surfaces would provide excellent clinical results with low wear rates as compared to ceramic-on-polyethylene bearings.

Methods: A prospective randomized multicenter trial comparing ceramic-on-ceramic or ceramic-on-polyethylene couplings was conducted where 357 total hip arthroplasties were performed in 312 patients. Clinical data were collected preoperatively and postoperatively at 3, 6, 12, 24, and 48 months as well as beyond 60 months. Linear and volumetric wear were measured postoperatively at 5 years.

Results: There was no statistically significant difference in the Harris Hip, SF-12 mental, and SF-12 physical scores between the ceramic-on-ceramic and ceramic-on-polyethylene groups at any time interval. The mean linear and volumetric rates were statistically lower in the ceramic-on-ceramic group (30.5 µm/year and 21.5 mm3/year, respectively) when compared with the ceramic-on-polyethylene group (218.2 µm/year and 136.2 mm3/year, respectively). The rates of ceramic implant fracture (2.6%) as well as audible component-related noise (3.1%) were statistically higher in the ceramic-on-ceramic group when compared to the ceramic-on-polyethylene group. Lastly, there was no statistically significant difference in the dislocation or revision rate between the two groups at the time of last clinical follow-up.

Discussion and Conclusion: The use of ceramic-on-polyethylene articulations led to a significant increase in the linear and volumetric wear rates when compared to ceramic-on-ceramic articulations. This increase in wear suggests that ceramic-on-polyethylene articulation will not afford protection from osteolysis in longer term follow-up. However, ceramic component fracture and audible component-related noise remain complications to be considered when using a ceramic-on-ceramic bearing surface.

Notes:

1:01pm–1:07pm

Results of Modern Hybrid Primary Total Hip Replacement Within a Comprehensive Joint Replacement Program

Alexander Sah, MD
John T. Dearborn, MD

Introduction: With increasing popularity of cementless total hip arthroplasty, femoral fixation with cement is infrequent and the technique less commonly learned. A cemented femoral prosthesis allows immediate fixation with potentially lower fracture risk. The purpose of this study is to report results of a modern hybrid hip arthroplasty technique performed within the context of a comprehensive joint replacement program.

Methods: From 1998 to 2009, 472 of 2312 (20.4%) consecutive primary total hips were performed by a single surgeon with cemented femoral fixation and cementless acetabular press-fit. The comprehensive program includes multimedia educational materials, a preoperative education class, and group physical therapy sessions.

Results: The majority, 80.3% (379/472), of patients were female. The group had an average age of 79 (range, 39-97) with a BMI of 26 (range, 16.5-45.3). Harris hip scores improved on average from 60 to 93. There were 4 intraoperative complications: 3 greater trochanter fractures with one requiring plating and one acetabular fracture requiring fixation. There were 23 (4.8%) postoperative orthopedic and med-

ical complications. Only one femoral revision was required at latest follow-up. The average hospital length of stay was 2.2 days (range, 1-10). The majority, 87.9% (415/472), of patients were discharged directly home.

Discussion and Conclusion: Primary total hip replacement with hybrid fixation is an effective and reliable technique. Clinical improvements are excellent and there are few associated perioperative complications, even in this typically older population with greater co-morbidities. Early rehabilitation and excellent outcomes seem enhanced with education via a comprehensive program. Hybrid fixation remains an important technique in modern hip replacement surgery.

Notes:

1:07pm–1:13pm

Adverse Reactions to Metal-on-Metal THA's — What's in All That Fluid Around the Joint?

Scott T. Ball, MD
William D. Bugbee, MD

Introduction: Recently, there has been growing concern about adverse reactions to metal debris (ARMD) in patients with metal-metal (MM) hip replacements. To our knowledge, there have been no reports characterizing the cytokines driving the underlying inflammatory response.

Methods: In this case control study, 20 patients were identified with suspected ARMD from MM implants. At revision, soft tissue specimens were analyzed histologically for cell types and wear debris. Peri-articular fluid was obtained and analyzed for cobalt and chromium levels using inductively coupled plasma dynamic reaction cell mass spectrometry. This fluid was also profiled for cytokine expression by Luminex assay assessing levels of IL-1ra, IL-6, IL-8, IL-10, IP-10, TNF-alpha, VEGF, and MCP-1. Two types of 'control' cases were collected. Hip synovial fluid from 10 osteoarthritis (OA) patients served as a baseline control, and 4 patients undergoing revision for osteolysis from polyethylene wear (Poly) served as controls for adverse reaction to other prosthetic material.

Results: In the ARMD cases, cytokine levels were markedly elevated demonstrating a significant inflammatory response. Notably, levels of IL-6, IL-8, and IP-10 were more than 15 fold higher than in the Poly group and were more than 40 fold higher than OA controls. Additionally, IL-1ra, TNF-alpha, VEGF and MCP-1 were elevated above control groups. With this number of cases, no correlation was found between Co and Cr levels and cytokine levels. A correlation between the histologic appearance and the cytokine levels is being explored.

Discussion and Conclusion: The findings of this study demonstrate an underlying inflammatory reaction in ARMD cases that is much more intense than what is observed in poly wear cases. This may help to explain the soft tissue destruction which is sometimes seen in ARMD cases.

Notes:

1:13pm–1:19pm

Cemented Versus Cementless Femoral Fixation in Primary THA in Patients Aged 75 and Older

Alexander Sah, MD
John T. Dearborn, MD

Introduction: Cementless fixation has become increasingly popular and has subsequently made hybrid fixation less common, even in the older population. While cemented fixation is often reserved for older patients with more osteoporotic bone and greater co-morbidities, hybrid hip replacement can also yield excellent results. The purpose of this study is to evaluate the outcomes of hybrid versus cementless hip fixation in patients aged 75 and older.

Methods: From 1998 to 2008, 332 hybrid and 129 cementless primary total hip arthroplasties were performed by a single surgeon in patients 75 years of age and older. Femoral fixation technique was determined by preoperative templating and assessment of bone quality and shape, as well as patient activity and comorbidities.

Results: Preoperative hip scores were significantly lower in the hybrid compared to the cementless group, 61 versus 65,

respectively. Postoperative scores were similar, 92 and 94. Reinfusion drains collected less blood in the hybrid group, 423ml versus 606ml. Length of stay was similar at 2.2 versus 1.9 days, as was discharge home, 89% versus 92%. Intraoperative and postoperative fractures, generally involving the greater trochanter, occurred less frequently in the hybrid group than the cementless group, 5 versus 7, respectively.

Discussion and Conclusion: In spite of lower preoperative hip scores, hybrid fixation yields equal outcomes to cementless fixation. Cementless fixation is associated with greater blood loss and risk of femoral fracture. Both hybrid and cementless techniques result in comparable rapid recovery as well as excellent and reliable outcomes in patients aged 75 and older.

Notes:

1:19pm–1:25pm

Listen to the Patients: Patient Factors Are Best at Predicting Favorable Outcomes After UKA

Michael P. Dohm, MD
Tim Novotny, PhD

Introduction: The successful use of joint registries to alarm stakeholders of less than optional performing implants; to identify patient, physician, and hospital community characteristics that trend with successes and revisions have been proven abroad. A well-executed community-based regional registry with detailed patient reported outcomes in phase with a national registry could provide more detailed information about long term favorable outcomes. The aim of this study is to identify modifiable determinants and predictive variables associated with higher SF36 scores after UKA with use of data from a community based regional registry.

Methods: A prospective cohort of 183 knees were studied. Analysis was conducted on knees that had at least two years follow-up and completed one domain from the SF36. Non-parametric and parametric univariate and multivariable analysis and multivariate regression analysis were performed.

Results: Gender, implant, Charleson Index and BMI were significantly associated with patient outcomes. Laterality and hospital were not significantly associated with patient outcomes. Determinants of the physical function domain included the pre- operative general health sub scale and the one year bodily pain sub scale. Determinants of the role physical domain included gender and the one year bodily pain scale. Determinants of the bodily pain domain included comorbidities, pre-operative bodily pain scale, pre-operative role physical scale, one year post-operative physical function scale, and one year post-operative role physical scale. Determinants of the general health domain included the pre-operative general health scale, the one year post-operative bodily pain scale, and the one year post-operative role physical scale.

Discussion: Patients' pre-operative and one year post-operative outcome scores, gender, and BMI were found to be the most robust predictor of outcomes. These findings may provide the basis for identifying patients pre- operatively that are more likely to have poorer outcomes.

Notes:

1:25pm–1:31pm

Local Elution Profiles of a Highly Purified Calcium Sulfate Pellet at Physiologic PH, Loaded with Vancomycin and Tobramycin, in the Treatment of Infected Total Joints

Gerhard E. Maale, MD
*John J. Eager, MS

Introduction: Local antibiotic delivery systems for biofilms related infections, have been popularized since the early 1980's. These have included PMMA delivery of antibiotics for infected total joints. Unfortunately, delivery by this mechanism is by surface bleaching and local levels of the antibiotic are below MIC at 2 weeks. The spacer concept with 2 stage revision was published by us in the 90's, requires removal of the spacer and/or beads and is associated with 2 surgical procedures. PMMA has been associated with serum levels that been sustained and can been associated with allergic reactions. Presented is a highly purified Calcium Sulfate crystal, at neutral PH, loaded with tobramycin and vancomycin. The crystal is hydrophilic, soft after hydration, disappears on X-rays after 2-3 weeks, and doesn't scratch total joints.

Methods: Drain and serum levels of vancomycin and tobramycin levels were assessed at days 1-5 post-op in infected total joint athroplasties or complex failed total joints, on a standard hospital assay for these drugs

Results: 50 patients undergoing revision arthroplasty for infected total joints or major multiple revisions were analyzed. There were 33 knees (1 bilateral), 16 hips, 1 elbow, 1 elbow, humerus and shoulder, and 1 hip, femur and elbow replacements. 2 cases with hips had no exchange. Local post-op average levels were days 1-5: 265,172,146,146,104 for vancomycin, and 31,9.4,6.4, 5.3, 4.6 for tobramycin. Most of the cases assayed for greater than 400 on day 1 for vancomycin. This is at least 50 times greater MIC. Only 6 patients had detectable serum levels.

Conclusion: This local delivery system provides an adequate means of administering high doses of vancomycin and tobramycin locally in infected total joints, without systemic levels and disappears in 2 weeks, without damaging the total joints.

Notes:

1:37pm–1:43pm

Reconstruction of Chronic Distal Biceps Tendon Rupture Using Fascia Lata Autograft

Deana Mercer, MD
*Nathan Morrell, MD
Moheb S. Moneim, MD

Introduction: Chronic distal biceps tendon ruptures present a challenging problem and there is no consensus as to the optimal treatment. Reconstruction using a fascia lata autograft has been proposed though little is known about the functional outcome of this reconstruction.

Methods: We retrospectively reviewed the outcome of twelve male patients with chronic distal biceps tendon ruptures who had reconstruction of the distal biceps tendon insertion using a fascia lata autograft. The age of the patients ranged from 29 to 62 years. The average delay to surgery was 23 weeks (range 10-56 weeks). A single incision, anterolateral approach was utilized for all patients. A strip of fascia lata was then harvested and tubed. After the graft was attached distally to the bicipital tuberosity using suture anchors, the graft was attached proximally to the mobilized biceps tendon and tension set with the elbow in 50 degrees of flexion. The average follow up was 14 months (range 2-66 months).

Results: Eleven of twelve patients reported significant improvement in elbow flexion and supination. The average elbow flexion/extension arc was between 5 and 131 degrees and the average supination/pronation range was 167 degrees. Five patients had isokinetic flexion strength testing with restoration of 87% of strength when compared to contralateral, uninvolved side. Four patients had supination isokinetic strength testing with restoration of 86% of strength when compared to contralateral, uninvolved side. Four patients had numbness in the superficial radial nerve distribution that recovered in 12 months. There were no cases of persistent numbness, heterotopic ossification, or of biceps tendon reconstruction rupture. There was one failure due to infection that led to removal of the graft.

Discussion and Conclusion: Reconstruction of chronic distal biceps tendon ruptures using fascia lata autograft may be a viable surgical treatment alternative with good medium term results.

Notes:

1:43pm–1:49pm

Trends in the Orthopaedic Job Market and the Importance of Fellowship Subspecialty Training

Nathan Morrell, MD
Deana Mercer, MD
Moheb S. Moneim, MD

Introduction: While previous studies have examined possible incentives for pursuing orthopaedic fellowship training, the authors are aware of no previously published report which addresses the trends in the orthopaedic job market since the implementation of ACGME fellowship programs in 1985. The purpose of our study was to determine the trends in the orthopaedic job market since the development of post-residency, fellowship training. We hypothesize that since the initiation of accredited fellowship programs, job opportunities for fellowship-trained orthopaedic surgeons have increased and job

opportunities for non-fellowship trained orthopaedic surgeons have decreased.

Methods: We reviewed the job advertisements printed in the American version of the Journal of Bone and Joint Surgery for the years 1984, 1994, 2004, and 2009. We categorized the job opportunities as available for either a general (non-fellowship trained) orthopaedic surgeon or a fellowship trained orthopaedic surgeon. Certain criteria were delineated prior to the review to ensure consistency in categorization of job opportunities.

Results: Based on advertisements posted in the American version of JBJS, there has been a clear trend in the orthopaedic job market towards seeking fellowship-trained orthopaedic surgeons. In 1984, the percentage of job opportunities seeking fellowship-trained orthopaedic surgeons was 16.7% (+/- 3.6%); in 1994, the percentage seeking fellowship-trained orthopaedic surgeons was 40.6% (+/- 2.5%); in 2004, the percentage seeking fellowship-trained orthopaedic surgeons was 52.2% (+/- 3.7%); and in 2009, the percentage seeking fellowship-trained orthopaedic surgeons was 68.2% (+/- 3.2%). A reciprocal decrease was seen for non-fellowship trained, general orthopaedic job opportunities. These differences were statistically significant.

Discussion and Conclusion: Since the implementation of ACGME fellowship programs in 1985 there has been a significant increase in job opportunities for fellowship trained orthopaedic surgeons and a significant decrease in job opportunities for general orthopaedic surgeons. Fellowship training is thus a worthwhile endeavor.

Notes:

1:49pm–1:55pm

Predictors of Osteochondral Allograft Failure

Simon Görtz, MD
William D. Bugbee, MD
Allison J. De Young, BS

Introduction: Osteochondral allografting is an increasingly important part of the cartilage restoration algorithm. The purpose of this study was to determine risk factors for clinical failure of osteochondral allografting.

Methods: Between 1983 and 2009, 527 osteochondral allografting procedures of the knee were performed in 467 patients. Cases were prospectively entered into a clinical database, including patient demographics, diagnosis, graft characteristics, clinical outcome, and reoperations. A logistic regression model was used to determine variables predicting failure of the osteochondral allograft. Failure was defined as removal (i.e., conversion to knee arthroplasty) or revision of the allograft. The study included 279 males (59.7%) and 188 females (40.3%) with a mean age of 33.6 years (range, 14-68 years). Primary diagnoses included traumatic cartilage injury (35.1%), osteochondritis dissecans (29.8%), degenerative cartilage lesions (12.0%), osteonecrosis (7.8%), failed allograft (5.7%), and osteochondral fracture (3.2%). Anatomic graft locations included medial femoral condyle (26.8%), lateral femoral condyle (20.1%), patella (5.7%), trochlea (4.2%), lateral tibial plateau (4.7%) and medial tibial plateau (0.9%). 28.5% of cases involved multiple grafts to two distinct anatomic locations and 9.1% of cases involved grafting of three separate surfaces. Average total graft area was 9.7 cm2 (range, 1.2-57.5 cm2).

Results: Sixty-five knees (15.3%) were reoperated for clinical failure at a mean of 38.1 months (range, 3-107 months). Forty-four were converted to arthroplasty and 21 underwent repeat allografting. Gender, age, total graft area, and number of grafts were significant (p less than 0.05) risk factors for failure. Females were 2.2 times more likely to fail than males. Compared to patients younger than 30 years, those who were 30-40 were 5.1 times more likely to fail; those over 40 were 6.4 times more likely to fail. Grafts over 10 cm2 were more likely to fail than grafts under 5 cm2 (OR 5.1) and knees with two grafts were more likely to fail than knees with only one graft (OR 58.7).

Discussion and Conclusion: Understanding the impact of clinical variables on outcome of osteochondral allografting is useful in clinical decision making.

Notes:

2011 Scientific Program Abstracts — Saturday

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

Saturday, July 30, 2011

GENERAL SESSION 6: Resident Awards

Moderators: James P. Duffey, MD
Michael P. Dohm, MD

9:40am–11:05am

9:40am–9:50am

Lloyd Taylor Award

Protective Role of IL-1ß Against Post-Arthroplasty *Staphylococcus Aureus* Infection

Nicholas M. Bernthal, MD
Fabrizio Billi, PhD
John S. Cho, PhD
Lloyd S. Miller, MD, PhD
Jonathan R. Pribaz, MD
Alexandra I. Stavrakis, MD

Introduction: As the number of total joint arthroplasty surgeries in the United States will exceed 3.8 million surgeries per year by 2030, the number of post-arthroplasty infections is projected to increase to over 266,000 infections annually. While much attention is focused on improving treatment for post-arthroplasty infections, little is known about the innate immune response responsible for preventing infection. Using a mouse model of post-arthroplasty infection published in previous work, we evaluate the role of IL-1β, a pro-inflammatory cytokine, as well as Toll-like receptor 2 (TLR2), a pattern recognition receptor that recognizes *S. aureus* lipopeptides and lipoteichoic acid.

Methods: Using a previously-established mouse model of post-arthroplasty *S. aureus* infection, we compare the bacterial burden, biofilm formation and neutrophil recruitment in IL-1β-deficient, TLR2-deficient and wildtype mice using in vivo bioluminescence and fluorescence imaging, histology, and variable-pressure scanning electron microscopy (VP-SEM).

Results: Bacterial burden in IL-1β-deficient mice was 26-fold higher at 1 day after infection and remained 3- to 10-fold greater than wildtype mice through day 42. In contrast, the bacterial burden in TLR2-deficient mice did not differ from wildtype mice. In addition, implants harvested from IL-1β-deficient mice had substantially more biofilm formation compared with those from wildtype mice. Finally, IL-1β-deficient mice had ~50% decreased neutrophil recruitment to the infected postoperative joints than wildtype mice.

Discussion: These findings suggest a mechanism by which IL-1β induces neutrophil recruitment to help control the bacterial burden and the ensuing biofilm formation in a post-surgical joint.

Notes:

9:50am–10:00am

Vernon Thompson Award

Distinct Gene Expression Patterns in the Surface, Middle, and Deep Zones of Bovine Articular Cartilage

Derek F. Amanatullah, MD, PhD
A. Hari Reddi, PhD
Shintaro Yamane, MD, PhD

Introduction: Wounds in hyaline articular cartilage will not heal spontaneously and lesions in hyaline articular cartilage often result in degenerative joint disease. Current surgical and cellular techniques have donor site morbidity and result in fibrocartilaginous healing. The responsive cells, inductive signals, and extracellular scaffolding required for the optimal

regeneration of cartilage remain elusive. We hypothesized that a distinct set of differentially expressed genes define the surface, middle, and deep zones of hyaline articular cartilage.

Methods and Results: Affymetrix microarray analysis of superficial and middle zone articular cartilage reveals 52 differentially expressed genes greater than 10-fold and 114 differentially expressed genes greater than 5-fold. However, there were no genes identified with a greater than 5-fold change in expression when comparing middle and deep zone articular cartilage.

Discussion and Conclusion: These results demonstrate the distinct differential gene expression patterns of superficial and middle zones of articular cartilage and highlight the importance of these distinct cell types in tissue engineering and cartilage regeneration.

Notes:

10:00am–10:10am

Harold and Nancy Willingham Award

Margin Convergence to Bone for Reconstruction of the Anterior Attachment of the Rotator Cable

Michael L. Nguyen, MD
Stephen S. Burkhart, MD
Ranjan Gupta, MD
Thay Q. Lee, PhD
Michelle H. McGarry, MS
Ryan Quigley, BS

Introduction: L-shaped massive rotator cuff tears involving the anterior attachment of the rotator cable (AARC) have poor clinical outcomes and have been implicated in developing fatty degeneration. The purpose of this study was to compare the biomechanical characteristics of a massive L-shaped rotator cuff tear with the anterior attachment of the rotator cable repaired and not repaired.

Methods: Eight matched-pair cadaveric shoulders were used. The supraspinatus and infraspinatus were secured in a custom curved cryo-clamp held at 30º of glenohumeral abduction. A massive L-shaped tear was created. The posterior aspect of the tear was repaired using a transosseous-equivalent technique in all specimens. The anterior fixation differed in the two groups. In one group, two margin convergence sutures were placed between the supraspinatus and the rotator interval. In the contralateral specimen, a suture anchor was inserted at the AARC. Margin convergence to bone was then performed between the supraspinatus and the rotator interval. Each specimen was tested using an Instron machine and a video digitizing system. A paired-t test was used for statistical analysis.

Results: Margin convergence to bone significantly decreased gap formation at cycle 1, cycle 30 and yield load across the entire footprint. In both constructs, the anterior gap was significantly greater than the posterior gap at cycle 1, cycle 30, and yield load. Margin convergence to bone significantly decreased hysteresis and increased stiffness during the first cycle and also increased yield load.

Discussion and Conclusion:s: The AARC serves as an anchor to further reduce the tension from the rest of the rotator cuff repair. These results reinforce the concept that the rotator cable acts as a stress shield across the entire footprint. It also highlights the importance of tear pattern recognition and reconstruction of the AARC in L-shaped tear.

Notes:

10:10am–10:20am

Sanford and Darlene Anzel Award

The Biomechanical Consequences of Rod Reduction on Pedicle Screws: Should It Be Avoided?

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

Introduction: Rod contouring is frequently required to allow appropriate alignment of pedicle screw-rod constructs.

When residual mismatch remains after contouring, a rod persuasion device is often utilized to reduce the rod to the pedicle screw head. Our study evaluates the biomechanical effect of the rod reduction technique on pedicle screw pull-out resistance.

Methods: Fifteen three-segment, fresh-frozen human cadaveric thoracic specimens were prepared and DEXA scanned for bone mineral density (BMD). Six osteoporotic and nine normal specimens were instrumented with titanium pedicle screws and the left side served as the control with perfect screw-rod alignment. On the right side, the rod was intentionally contoured with a 5 mm residual gap between ventral aspect of the rod and the inner bushing of the pedicle screw, followed by a rod reduction technique. As an alternative option to rod reduction, one of the proximal vertebra pedicle screws was removed and re-inserted through the same trajectory to simulate screw depth adjustment. The pedicle screws were pulled out "in-line" with the screw axis at a rate of 0.25 mm/sec, with peak pull-out strength (POS) measured in Newtons (N).

Results: After rod reduction, pedicle screws had significantly decreased POS compared to controls (495 ± 379 N versus 954 ± 237 N), with 48% lower mean POS. Nearly half (n = 7; 46.7%) of the pedicle screws had visible pull-out during the reduction attempt, and occurred irrespective of BMD. There was no significant difference in POS between re-inserted to control screws (1013 ± 348 N versus 941 ± 316 N).

Discussion and Conclusion: The rod reduction technique significantly decreases overall pedicle screw POS and typically resulted in outright failure. Therefore, the rod reduction technique should be performed with caution, and further rod contouring, screw depth adjustment or redirection of pedicle screw trajectory may be warranted to obtain perfect alignment of the pedicle screw-rod construct.

Notes:

10:20am–10:30am

Resident Award

Transfer of the Coracoid Attachment of the Coracoacromial Ligament to the Distal Clavicle Improves Anterior-Posterior Stability of Acromioclavicular Joint Reconstruction

Beatrice Shu, MD
*Tyler Johnston, MS

Introduction: The purpose of this study was to compare the initial stability of coracoclavicular (CC) tendon graft acromioclavicular (AC) joint reconstructions with and without augmentation by either (1) a novel "reverse" coracoacromial (CA) transfer from the coracoid to the distal clavicle or (2) an intramedullary AC tendon graft. We hypothesized that a new technique of reverse CA ligament transfer would stabilize the joint in the anterior-posterior direction compared with CC reconstruction alone.

Methods: Six matched pairs of cadaveric shoulders (n=12) underwent distal clavicle resection and CC tendon graft reconstruction. Specimens were cyclically loaded with ±25N along the anterior-posterior (AP) axis of the AC joint while displacement data was collected. Each shoulder was then manually loaded with 10N superior-inferior (SI) compression and 70N. Right shoulders were randomized to receive either reverse CA transfer or intramedullary tendon graft; left shoulders received the other treatment. AP and SI displacement was reassessed with the same loading protocol.

Results: Paired t-tests revealed that reverse CA transfer augmentation significantly decreased AP translation compared with CC reconstruction alone (change in displacement 3.7mm ± 1.3mm SEM; 95% CI: 0.458 - 7.014, p=0.03). Intramedullary AC tendon graft treatment also reduced AP motion (3.4mm ± 1.1mm; 95% CI: 0.521 - 6.345, p=0.03). No difference was found in SI displacement after either augmentation. Further, an equivalence test suggests no difference between the reverse CA transfer and intramedullary graft groups in AP restraint.

Conclusion: AC joint reconstruction with CC tendon graft augmented with either intramedullary AC tendon graft or reverse CA ligament transfer demonstrates improved AP restraint and provided similar SI stability compared with CC reconstruction alone. Our data suggests that AP stability of a CC tendon graft AC reconstruction can be enhanced with min-

imal increase in soft tissue bulk, allograft, and transosseous holes using a novel reverse CA ligament transfer.

Notes:

10:30am–10:40am

Resident Award

Medical Management of Osteoporosis After Hip Fractures: Are We Meeting National Guidelines?

CPT David A. Crawford, MD
MAJ Nicholas Noce, MD
James Shaha, MSIV

Introduction: Osteoporotic fractures are increasing in our aging population. National Osteoporosis Foundation (NOF) recommends that all post-menopausal women and men over 50 years of age take daily calcium/Vitamin D. Furthermore, all patients with a fragility hip fracture should be started on bisphosphonates. The purpose of this study is to assess whether our patients who sustain a fragility fracture of the hip are receiving appropriate medical management.

Methods: Retrospective review of all post-menopausal women and men over 50 years of age who sustained a fragility hip fracture between 2002 and 2010. Patients were excluded for high energy mechanism, peri-prosthetic/peri-implant fracture, pathologic fracture or iatrogenic fracture. Medical records of each patient were reviewed for prescriptions of calcium/vitamin D and/or any form of bisphosphonate relative to date of injury.

Results: 207/226 (92%) patients met inclusion criteria. There were 91 males (44%) and 116 females (56%). Mean age was 77.1 years-old (45-96). Prior to their injury 4.4% of males and 39% of females were on bisphosphonates. After their surgery an additional 3.3% of males and 18.1% of females were started on this medication. Pre-injury Ca/Vitamin D was prescribed in 7% of males and 25% of females with an additional 11% of males and 19% of females being started after their injury. Overall, either before or after injury, 35.3% of patients received bisphosphonates and 32.4% Ca/Vitamin D. There was a significant difference in both Ca/Vitamin D and bisphosphonate treatment in men compared to women. There was a significant change in patient on medication prior to surgery, but not in prescriptions after or overall.

Discussion: Over the past 8 years we are only appropriately medically treating approximately 1/3rd of patients who sustain a fragility fracture of the hip. There is also a significant gender discrepancy in both Ca/Vitamin D and bisphosphonate treatment of these patients.

Notes:

10:40am–10:50am

Resident Award

A Biomechanical Comparison of Multi-Directional Nail and Locking Plate Fixation in Unstable Olecranon Fractures

Evan Argintar, MD
*Anna Babushkina, MD
Scott G. Edwards, MD

Background: One of the main theoretical advantages of intramedullary nailing for olecranon fractures focuses on less risk of soft-tissue irritation and resulting hardware removal. While clinical results of one particular multi-directional locking intramedullary nail have been promising, questions remain whether this new device is capable of controlling unstable, comminuted olecranon fractures to the same extent as a locking olecranon plate. This study aims to evaluate the ability of this novel multi-directional locking nail to stabilize comminuted fractures and directly compare its biomechanical performance to that of a locking olecranon plate.

Methods: Eight stainless steel locking plates and eight stainless steel intramedullary devices were implanted to stabilize a simulated comminuted fracture pattern in 16 fresh-frozen and thawed cadaveric elbows. All specimens were evaluated with DXA scans to divide specimens into two groups of similar bone densities. Flexion-extension, varus-valgus, gap distance and rotational three-dimensional angular displacement analysis was conducted over a 60-degree motion arc (30° to 90°) to assess fragment motion through physiologic cyclic arcs of motion and failure loading. Displacements in flexion-extension, varus-valgus, internal-external rotation, and fracture gapping were compared between implants.

Results: The average DXA bone mineral density was 0.714 g/cm2 ±.029 g/cm2 for the nailed specimens and 0.718 g/cm2 ±.029 g/cm2 for the plated specimens. The average DXA T-score for the nailed specimens was -2.42 (range: -0.1 to -4.4). The average DXA T-score for the plated specimens was -2.35 (range: -0.2 to -3.8). Both implants less than one degree of motion in flexion-extension, varus-valgus, and internal-external rotations, and allowed less than one millimeter gapping through physiologic and super-physiologic loading until ultimate failure; all failures occurred by sudden, catastrophic means rather than loosening. The average failure weight for the nail was 14.4 kg (range: 3.6 to 19.6) compared to 8.7 kg (range: 4.6 to 12.6) for the plate ($p=0.02$). The nail survived 1102 cycles, while the plate survived 831 cycles ($p=0.06$).

Conclusion: In simulated comminuted olecranon fractures, the multidirectional locking intramedullary nails sustained significantly higher maximum loads than the locking plates. The two implants demonstrated no measured significant differences in terms of fragment control and number of cycles survived. Surgeons can expect the multidirectional locking nails to stabilize comminuted fractures at least as well as locking plates.

Notes:

Western Orthopaedic Association

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Disclosure information can be found on pages 33–36.

2011 WOA Poster Presenters

	Poster(s)	Page(s)
Derek F. Amanatullah, MD, PhD	1	75
Harlan Amstutz, MD	2, 3	75, 76
Anna Babushkina, MD	4	76
Scott T. Ball, MD	6	77
C. Lowry Barnes, MD	9	79
Nicholas M. Bernthal, MD	7, 8, 59	78, 103
Chad Brockardt, MD	10	79
Kyle Chun, MD	12	80
CPT David A. Crawford, MD	48	98
Nick S. Crawford, MD	13	80
Michael R. Dayton, MD	14, 43	81, 95
Jonathan Dubin, MD	15	82
Scott G. Edwards, MD	16	82
Kristen Fleager, MD	17	83
Orrin I. Franko, MD	18, 19, 20	83, 84
Johnathan Gelber, MD	61	104
Ray A. Grijalva, MD	21, 22	85
Simon Görtz, MD	23	86
Radek Hart, Prof., MD, PhD, FRCS	24	86
Nasser Heyrani, BS	25	87
Alan M. Hirahara, MD, FRCSC	26	87
Michael H. Johnson, MD	29	89
Daniel G. Kang, MD	30, 31, 64	89, 90, 106
Jeff Kessler, MD	32	90

	Poster(s)	Page(s)
Gaurav Khanna, MD	33	91
Mark A. Lee, MD	63	105
Nathan M. Lee, MD	5	77
Paul Manner, MD	34	91
Chris Mellano, MD	35, 36	92
Ricardo A. Molina, MD	37, 38	92, 93
Charles Moon, MD	39, 40	93, 94
Nathan Morrell, MD	41, 42	94, 95
Christopher D. Murawski	44, 45	96
Kyle Nelman, MD	46	97
Michael L. Nguyen, MD	47	97
Ankur D. Patel, MD	11	80
Stephanie Pun, MD	27, 28	88
Michelle Riley, PA-C	49, 50, 51	98, 99
Alexander Sah, MD	52, 53	100
John A. Schlechter, DO	54	101
Scott Seibert, MD	55	101
David Shearer, MD, MPH	56	102
M. Wade Shrader, MD	57, 58	102, 103
CPT Daniel J. Song, MD	66	107
Payam Tabrizi, MD, FRCS(C)	60	104
Daniel Thuillier, MD	62	105
Rosanna Wustrack, MD	65	106

Poster Abstracts

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

Poster 1

Improved Strength with a Divergent Screw Orientation During the Fixation of Vertical Shear Fractures of the Medial Malleolus

Derek F. Amanatullah, MD, PhD
Shane B. Curtiss, AS
Safdar N. Khan, MD
Philip R. Wolinsky, MD

Introduction: This study evaluated the mechanical properties of three different screw orientations used for fixation of vertical shear fractures of the medial malleolus.

Methods: Identical vertical osteotomies were created in synthetic distal tibias using a jig. The specimens were randomly assigned to one of the three fixation groups (n = 8 per group): 1) parallel: two 40 mm length, 4.0 mm diameter screws were placed parallel to each other in the transverse plane; 2) convergent: two 40 mm length, 4.0 mm diameter screws were placed 25o convergent to each other in the transverse plane; and 3) divergent: two 40 mm length, 4.0 mm diameter screws were placed 15^{o} divergent to each other in the transverse plane. The specimens were then tested using offset axial loading at 1 mm/sec until 2 mm of displacement occurred.

Results: The average stiffness was 102 ± 51 N/mm for the parallel group, 109 ± 37 N/mm for the convergent group, and 185 ± 73 N/mm for the divergent group. The average stiffness of the parallel and convergent groups were not significantly different. However the average stiffness of the divergent group was significantly greater than either the parallel or convergent groups. The average load at 2 mm of displacement was 324 ± 87 N for the parallel group, 373 ± 395 N for the convergent group, and 512 ± 170 N for the divergent group. The average load at 2 mm of displacement of the parallel and convergent groups were not significantly different. However the average stiffness of the divergent group was significantly greater than either the parallel or convergent groups.

Discussion and Conclusion: The use of a divergent screw pattern resulted in a stiffer construct that requires more force for 2 mm of displacement when used to stabilize an osteotomy model of vertical medial malleolus fractures.

Poster 2

Current Status of Hip Resurfacing: Problems and Solutions

Harlan Amstutz, MD

Problems: It is apparent from reviewing our results with 1325 Conserve Plus over a 14-year period that prosthetic loosening and neck fractures have been minimized by improved technique or patient selection. However, are the considerable advantages of hip resurfacing (improved stability, minimally bone invasive, ease of conversion to THR, replication of anatomy and physiological loading) outweighed by metal-metal wear issues? If so, can these be resolved? The current literature supports certain devices as being more successful at ten years than total hip replacements in healthy males with good bone quality. However, reduced femoral component coverage by the socket due to poor orientation or design features, all of which are aggravated by small component sizes in both sexes have led to adverse local tissue reactions (ALTR). Further, developmental dysplasia of the hip has shown a higher rate of revision that other etiologies because of the anatomical challenges presented.

Solutions: The use of the designs providing the greatest arcs of coverage, or the improvement of currently existing good designs to provide more coverage in small sizes is the first avenue of progress to avoid the formation of ALTR. Griffin et al. reviewed the coverage of all components currently available and Conserve Plus provides the largest coverage, in particular with small component sizes. The overall incidence of ALTR has been 0.5% in our Conserve Plus series. Femoral neck fractures and femoral component loosening often proceeded from a lack of precision in reaming and implantation of the femoral component. The instrumentation used is as important as the surgeon's skill and should promote consistency of placement and the ability to correct initial errors until the final reaming 15. Fixing other existing designs should be relatively easy for manufacturers assuming a cooperative attitude from the regulatory institutions in the US and other countries. Preoperative planning and careful socket orientation should be combined with a femoral orientation aiming to optimize offset and take advantage of the best bone quality for fix-

ation. Surgical technique is the deciding factor to reduce the prevalence of femoral neck fractures, as shown by our results with no incidence in the last 667 hips implanted with a 1mm cement mantle over a period of 8 years.

Poster 3

The Effect of Patient Selection and Surgical Technique on the Results of Hip Resurfacing — 4 to 14 Year Follow-Up

Harlan Amstutz, MD
Michel J. Le Duff, MA
Karren M. Takamura, BS

Introduction: Metal-on-metal hip survivorship is adversely affected by component size, large femoral defects, and surgical technique. We compared results of hips with and without risk factors, with up to 14yrs of follow-up.

Methods: 1100 MMRAs implanted with 1mm cement mantle were selected, which had a follow-up period of 4-14.5 years. From this series, 468 hips with a femoral component size >46 mm and head defects < 1cm (ideal hips) were compared to 632 hips with at least one of these risk factors. UCLA, HHS and SF-12 scores were calculated. Progressive changes in surgical technique were completed by hip #300. Survivorship comparisons were computed between the ideal hip group and the group of hips with risk factors using the log-rank test.

Results: We found no difference in pain relief between the two groups but all other clinical scores were slightly better in the ideal hip group, and particularly the activity scores. The 10 year Kaplan-Meier survivorship was 99.7% for the ideal group and 84.8% for the hips with risk factors (log rank test $p<0.0001$). The 8 year survivorship for 2nd generation surgical technique was 99.7% for ideal hips and 95.3% for the hips with risk factors (log-rank test $p= 0.0338$).

Conclusion: The results of the present series reveal that patient selection based on bone quality and component size can help avoid the observed learning curve. Optimized technique has measurably improved durability in patients with risk factors at the eight year mark, with a very low incidence of adverse local tissue reactions usually associated with component malorientation.

Poster 4

Interpreting Proximal Ulna Anatomy on Static Fluoroscopic Images

Anna Babushkina, MD
Scott G. Edwards, MD

Introduction: The three-dimensional anatomy of the proximal ulna can be difficult to interpret with two-dimensional imagery techniques, especially standard intraoperative fluoroscopy. Without appropriate visualization, surgeons risk placing hardware in suboptimal locations, perhaps even within the joint. The purpose of this study is to delineate the borders of the trochlea ridge, and the medial and lateral facets, and provide identifying measurements to assist surgeons intraoperatively.

Methods: Ten fresh-frozen cadaveric elbows were analyzed: five female and five male specimens with an average age of 62 years. Female height ranged from 5'0"- 5'2" and male height ranged from 6'0"-6'2". True lateral static fluoroscopic images were obtained of each specimen with a custom radiographic scale to allow assessments of true measurements. Radiographic markers were placed intra-articularly. The specimens were imaged again and measurements taken using the custom scale.

Results: In the small specimen group, the average distance to the trochlear ridge, medial facet lip, and lateral facet lip from the center of the trochlea were 10.2mm (±.52), 13.6mm (±1.33), and 11.2mm (±.34) respectively. The large specimens had average distances of 11.9mm (±.63), 16.6mm (±.93), and 14mm (±.76) respectively. Interobserver and intraobserver reliabilities were excellent (above 0.94 for all measures).

Discussion and Conclusion: When viewing a true lateral of the elbow by intraoperative fluoroscopic imagery, the lateral facet may be easily visualized and resides 11-14mm from the center of the trochlea in most patients. The trochlear ridge and medial facet, however, are not readily seen on standard fluoroscopy. The trochlear ridge in most patients may be identified by measuring 10-12mm from the center of the trochlea. The medial facet in most patients may be identified by measuring 13.5-16.5mm from the center of the trochlea. These limits should be considered when placing hardware about the sigmoid notch of the proximal ulna.

Poster 5

Complications of Revision Spine Surgery

Neil Badlani, MD
*Nathan M. Lee, MD
Charles C. Chang, MD
Yu Po Lee, MD
Sumit H. Rana, MD

Introduction: Revision spine surgery for failed back syndrome, pseudoarthrosis, recurrent herniations is commonly done. However, the complication rates and outcomes still remain largely unknown. The purpose of this study was to review our revision spine procedures to determine the rate and nature of complications, such as infections and dural tears and their long term results.

Methods: A retrospective chart review of 119 consecutive revision spine cases performed by our single senior surgeon from August of 2003 to November of 2007 was done and all complications, adverse events, reoperations and presence of intraoperative pseudoarthroses were noted. The mean patient age was 58 years. Revision procedures included lumbar laminectomy, foraminotomy, microdiscectomy and instrumented fusion. Inclusion criteria were any patient who underwent revision surgery at the same level or adjacent level as a previous procedure.

Results: Of the 119 cases reviewed, 12 or 10.1% had postoperative wound infections and 22 or 18.5% had durotomies requiring repair. Of the 119 cases reviewed, 64 consisted of a fusion procedure and 55 consisted of only a decompression. The fusion cases had an average estimated blood loss of 1400ml, compared to only 700ml for nonfusion procedures. The fusion cases required an average hospital stay of 8.5 days, compared to 5.1 days for nonfusion procedures. The reoperation rate for fusion procedures was 31.3% compared to 21.8% for nonfusion procedures. Of the patients who sustained postoperative wound infections, there were no cases of chronic osteomyelitis at 3 years. Also, none of the durotomies had fistula formations or long term drainage.

Discussion and Conclusions: When revision spine surgery is performed, the rates of infection and durotomies are greater when compared to primary spine surgery. However, there does not seem to be any long term effects if these complications are addressed appropriately.

Poster 6

Mid-Term Survivorship of Monoblock, Coblat-Chrome Cups Used for Hip Resurfacing in 643 Hips

Scott T. Ball, MD
Harlan Amstutz, MD
Michel J. LeDuff, MS

Introduction: Press-fit, monoblock, cobalt chrome cups were introduced for modern generation hip resurfacing arthroplasty (HRA), and use of such sockets has expanded to include large head metal-metal total hip replacement. Despite the rapid adoption and relatively widespread use of these types of sockets over the last decade, there is a paucity of literature assessing the outcomes of these cups in particular. The purpose of this study was to define the mid-term survivorship and radiographic results of a monoblock, cobalt-chrome cup in hip resurfacing patients.

Methods: HRA was performed on 643 hips in 580 consecutive patients. The mean age of the patients at the time of surgery was 48.9 years and 75% were male. Pre-operative diagnoses included osteoarthritis (66%), developmental dysplasia (10%), osteonecrosis (8%), trauma (8%), inflammatory diseases (3%), and other (5%). All immediate post-operative radiographs were analyzed for cup position including abduction and anteversion angles and percent bone coverage in the frontal plane. Serial radiographs and most recent X-rays were analyzed for evidence of cup migration, radiolucent lines, pelvic osteolysis, and stress remodeling of the periacetabular bone of the pelvis.

Results: Average clinical follow-up was 10.4 years (range 7.1 to 14.0), with mean radiographic follow-up of 6.8 years (range 0.1 to 13.4). Using acetabular component failure as the endpoint, the Kaplan-Meier survival estimate of the acetabular component was 99.6% at 5 years and 97.6% at 10 years. Cup failure was associated with young age of the patient, low BMI, and low contact patch to rim distance.

Discussion and Conclusion: This monoblock, cobalt-chrome acetabular component is performing well in the mid-term. Survivorship is similar to what has been reported for traditional titanium, modular, press-fit components in use for total hip replacement.

Poster 7

To Screen or Not to Screen: Results of Routine DVT Screening in Knee Arthroplasty Patients in the Era of Regional Anesthesia

Nicholas M. Bernthal, MD
Seth Gamradt, MD

Introduction: The incidence of venous thromboembolism (VTE) after TKA performed with regional anesthesia has not been well defined. This study presents a routine screening protocol that identifies the rate of VTE events in TKAs performed under regional anesthesia and provides guidelines for selective extended post-operative anticoagulation.

Methods: 433 consecutive TKAs performed with regional anesthesia (spinal with femoral and sciatic nerve blocks). Oral warfarin started POD#0. Screening ultrasound performed POD#2. Negative scans treated with 3 weeks of warfarin. Superficial thrombi were treated with 6 weeks of warfarin. Popliteal vein thrombi were treated with heparin drip until INR > 2.0 in conjunction with 6 weeks of warfarin. Ultrasound repeated at 6 weeks post-op for positive screening exams.

Results: 32.3% (140/433) of patients were found to have thrombi, 75.7% (106/140) involving superficial calf veins and 24.2% (34/140) involving deep popliteal vein (an overall 7.9% (34/433) incidence of DVT). 91.2% (31/43) of popliteal thromboses had concurrent superficial thrombi. Primary TKA (334) had a thrombus rate of 35.9% (76.7% superficial, 23.3% deep). Revision TKA (99) had a thrombus rate of 20.2% (70% superficial and 30% deep). Zero readmissions were made for symptomatic VTE. 95% of superificial thromboses and 100% of popliteal vein thrombi resolved after 6 weeks of warfarin and 0% demonstrated proximal migration.

Discussion: This routine ultrasound screening protocol identifies VTE risk after regional anesthesia, may preempt proximal migration of superficial thrombi, potentially eliminates readmission for symptomatic VTE, and guides duration of prophylactic anticoagulation protocols. This data supports routine ultrasound screening after TKA.

Poster 8

A Novel Surgical Technique for Reconstruction in Tibial Deficiency

Nicholas M. Bernthal, MD
Jonathan R. Pribaz, MD
Anthony A. Scaduto, MD
Hugh G. Watts, MD

Introduction: The role of reconstructive surgery in children with tibial deficiency is controversial, especially in patients with Jones Type II deficiency. The side-to-side fibular onlay technique and fibular centralization described by Brown have been found by many to yield less than satisfactory results. The purpose of this study is to report our 18-year experience with a novel alternative surgical technique in which a fibular segment is transferred and fused to the distal aspect of the residual tibia anlage, then fused distally to the cut surface of the calcaneus, after resection of the talus and forefoot.

Methods: We retrospectively reviewed 12 consecutive patients who underwent this modified fibular transfer for tibial deficiency between 1993 and 2010. We reviewed each patient's medical record for extremity status, secondary operations, and functional status.

Results: All 12 patients were ambulating with the use of a prosthesis at final follow up. 9 of 12 (75%) of patients required no additional surgery. 3 of 12 (25%) patients required further surgeries for "major" complications associated with this procedure. Of these, one required a knee disarticulation for persistent instability, one required a re-exploration of a necrotic stump and a resection of a necrotic calcaneus, and one required an osteotomy of the fusion mass to correct a varus deformity. One additional patient had a residual knee flexion contracture of 30 degrees, which was present pre-operatively.

Discussion: While the modified fibular transposition technique had a relatively high rate of secondary surgeries (25%), it significantly improves fit and function of the prosthesis and knee mechanics by preserving the native extensor mechanism and maximizing stump length. Varus deformity commonly seen with a side-side syndesmosis of the fibula to the tibial anlage was avoided with this technique.

Poster 9

In-Vitro Closed Chain Kinematics of a New Medially Pivoting Cruciate Retaining, Cruciate Sacrificing, and Posterior Stabilized Total Knee Replacement Compared to the Normal Knee

J. David Blaha, MD
*C. Lowry Barnes, MD

Introduction: The purpose of this study was to compare knee kinematics of the normal knee to those after implantation of a new medially pivoting (MP) primary TKA. Three different MP tibial insert configurations were analyzed (cruciate retaining (CR), cruciate substituting (CS) and posterior stabilized (PS)) to evaluate anterior/posterior tibio-femoral translation in both the medial and lateral compartments.

Methods: Six lower extremity cadaver limbs with no prior surgeries, deformities, or disease were obtained. Each was outfitted with radio-opaque markers on the femur, tibia and patella and were scanned with CT to generate 3D CAD models. During experimentation, the foot and femur were securely fixed in the custom closed-chain knee device designed to record loads and simulate a squatting motion. A motion capture system was used to track the motion of the knee.

Results: While the location of tibio-femoral contact was not equivalent between the normal, CR, CS, and PS trials, the overall behavior of the contact points was similar within each specimen. Lateral compartment AP translation throughout the entire range of motion was significantly larger in the intact normal knees compared to the new MP CR and CS implanted knees, while the intact knee medial compartment AP translation was significantly larger than all of the new MP design configurations tested. Additionally, AP translation within the lateral and medial compartments of the implanted knees moved in the same direction as the normal knee from both extension to flexion and flexion to extension.

Discussion and Conclusion: Decreased tibio-femoral translation in the implanted trials suggests that stability was increased after implantation with all insert options of the new primary TKA.

Poster 10

Perthes Index (PI) — A New Method for Quantifying Sphericity of the Femoral Head

Chad Brockardt, MD
William Bunnell, MD
Montri D. Wongworawat, MD
Sarah Wu, MD

Introduction: This study develops and validates a precise and clinically relevant method of assessing sphericity of the femoral head and applies this method to evaluate the change in sphericity before and after treatment for Perthes disease.

Methods: Measurements were made on plain films of epiphyseal radius, diameter, and a radius prime within the lateral pillar and utilized in the formula: PI = (R+2R')/D x 100. Eighty normal heads in children ages 2-16 were measured in the AP view. Forty-three Perthes hips were evaluated before and after surgery using the above formula. Ten were treated with a Chiari osteotomy and 33 had a proximal femoral varus osteotomy. Statistical analysis compared pre-treatment and post treatment groups using the paired t-test to measure change in sphericity post treatment. Pre-treatment, post-treatment, and normal hips were compared using ANOVA.

Results: The Perthes Index measured in normal hips of any size was 100.59 ± 0.04. Using normal hip values, the PI is irrespective of age ($R2 = 0.0025$). The PI ranged from 34 to 90 in the 43 Perthes hips reviewed and correlated well with the subjective impression of deformity. There was significant improvement in the PI when comparing pre-op (70.37 ± 0.17) and post-op (79.67 ± 0.16) values. ANOVA showed significance when comparing pre-treatment to normal groups. Post treatment PI remained significantly different from normal hips. Comparison between PI measured on AP and lateral views showed no significant difference. Change in sphericity via measurement of PI on AP pre and immediately after PFVO showed no significant change. The intra- and inter- observer correlations were 0.84 and 0.87, respectively.

Conclusion: PI is an instrument applicable to all age groups to assess sphericity of femoral heads, proving to be consistent, reliable, and responsive to change.

Poster 11

The Architectural Design of the Hip Short External Rotators

Charles C. Chang, MD
*Ankur D. Patel, MD
Scott T. Ball, MD
Ki S. Lee, MD
Samuel R. Ward, PT, PhD

Introduction: There is growing clinical interest in disorders affecting the hip. To date, most of this focus has been on the bony architecture. A key component of hip joint biomechanics is the functional capacity of the surrounding muscles. The architecture, or arrangement of fibers within muscles, define their functional capacity. However, these features are essentially unknown for the muscles controlling hip joint rotation.

Methods: Seven muscles from 10 formaldehyde-fixed human cadaver hips [average age 81, range 73-103] were used in this study. After careful dissection and documentation of muscle origin and insertion, detailed muscle architecture measurements were made. Briefly, muscle mass, fiber length, sarcomere length, and pennation angle were used to calculate the normalized muscle fiber length [proportional to excursion] and physiological cross sectional area [proportional to force producing capacity].

Results: The origins, insertions, and concomitant actions of the short external rotators bare a striking resemblance to the rotator cuff muscles of the shoulder. The physiological cross sectional area [PCSA] of the obturator externus [4.5 ± 0.5 cm2], obturator internus [3.8 ± 0.9 cm2], and quadratus femoris [3.8 ± 1.3 cm2] were significantly larger than the other rotational muscles. Pectineus had significantly longer fibers [10.38 ± 1.67cm] than the remaining muscles. On average, the rotational muscles had smaller PCSAs but similar fiber lengths when compared to other lower extremity muscles.

Discussion and Conclusion: The location and organization of the short external rotators are similar to the rotator cuff muscles of the shoulder. However, their small PCSA and large fiber lengths suggest that their stabilizing role may be different. However, their importance in "fine-tuning" the rotational position of the hip should not be underestimated based on their collective PCSA. Clinically, this data highlight the importance of the short external rotators and the importance of reconstructing their anatomy during hip surgery.

Poster 12

Radiographic Control of Antegrade Humeral Nailing

Kyle F. Chun, MD

Introduction: Intramedullary nail insertion is an operation dependant on accurate and reliable interpretation of radiographic data. We endeavored to define the standard radiographic imaging necessary for antegrade humeral nailing.

Methods: Nine cadaveric shoulder specimens were examined using fluoroscopic imaging. The AP view was determined by the neutral position with no rotation in relationship to the image intensifier. Views were then obtained with internal and external rotation, in 5 degree increments. The sulcus between the articular margin and the greater tuberosity was chosen as a landmark. The depth of the sulcus and the distance from the center of the sulcus and the lateral daiaphyseal cortex were measured.

Results: Radiographic identification of the neutral AP position was possible based on measurements of the sulcus between articular margin and the greater tuberosity. The neutral position is defined by the view with the deepest dimension of the sulcus, and with the lateral border of the sulcus collinear with the lateral diaphyseal cortex.

Discussion: Identification of the ideal starting point for antegrade humeral nailing has yet to be determined. In order to standardize the process of identification of the starting point, it is essential to have an accurate and reliable means of radiographic imaging. We have shown a reliable means of determination of the neutral AP view, which should be used in finding radiographic correlates of the ideal nail entry point.

Poster 13

Surgical Technique for Flexion-Type Supracondylar Humerus Fractures Using Simultaneous Biplanar Fluoroscopy

Nick S. Crawford, MD

Introduction: Flexion-type fractures make up 2-10% of all supracondylar humerus fractures in children. They are typically classified in the same way extension-type fractures are. The fracture pattern dictates a different reduction approach compared to the more typical extension-type fracture. Reduction and fixation can be difficult given that the fracture is

reduced in extension making pin placement difficult. Compared to extension-type, flexion-type fractures are treated with open reduction with a higher percentage given that they are difficult to hold reduced and fix with percutaneous pins.

Technique: This approach uses 2 c-arm units, one large c-arm and one mini c-arm, to produce the simultaneous biplanar fluoroscopy. The large c-arm is positioned first and is inverted such that the receiver portion (*this can be identified in a photo of the set-up and identified in the figure's narrative) serves as the "hand table" on which the arm rests; it is placed parallel to the operating table. The mini c-arm is rotated into its lateral position and positioned to "straddle" the large c-arm; it is also placed parallel to the operating table, but rotated to avoid striking the receiver portion of the large c-arm unit. AP and lateral views of the elbow should now be possible without needing to rotate the arm and adequate visualization confirmed before prepping is done. The reduction proceeds in one of two ways. First, one can try applying traction while the elbow is gently extended. However, unlike with an extension injury, the intact anterior periosteum does not offer the same resistance and feel as the posterior periosteum does, thus making it difficult to "lock in" the reduction and rotate the arm for AP and lateral views. Alternatively one can try flexing the elbow with application of simultaneous longitudinal pressure directed proximally through the forearm. Once again, the reduction is difficult to achieve and maintain if one has to rotate the arm to obtain orthogonal views.

Discussion: Flexion-type supracondylar fractures are rare and pose many challenges to the surgeon. The flexion mechanism disrupts the soft tissues posteriorly requiring the use of an extension moment for reduction. These fractures are different in that they more commonly require open reduction and have a higher incidence of ulnar nerve injuries4. Simultaneous biplanar fluoroscopy enables the surgeon to keep a reduction steady while obtaining near-perfect anteroposterior and lateral projections. This is critical if the fracture is difficult to reduce and must be held in one position. Recently, biplanar fluoroscopy was introduced for in situ fixation of slipped capital femoral epiphysis. Minimally displaced flexion-type supracondylar humerus fractures can be placed into a long arm cast with slight flexion. Displaced type II or III fractures require reduction. Using biplanar fluoroscopy enables maintenance of reduction while inserting fixation pins. This may decrease the need for open procedures. Biplanar fluoroscopy set up including a large c-arm for the anteroposterior view and a smaller fluoroscopy unit for the lateral view. Notice the receiver unit for the large C-arm is used as an 'arm table.'

Poster 14

Total Knee Arthroplasty: Comparison of Patient Reported Outcome Scores to Objective Measures of Performance

Michael R. Dayton, MD
Jennifer Stevens-Lapsley, PhD, MPT

Introduction: Over 400,000 total knee arthroplasty (TKA) procedures are performed each year in the United States. Goals of TKA are to alleviate pain, improve alignment, increase stability and optimize function. While a variety of approaches may be employed to perform TKA, ultimate clinical success is measured in the form of pain relief and improved function. The objective of this study is to compare patient perception of recovery through established outcome tools with patient performance measurements. We hypothesize progressive interval improvement in both performance and self-reported outcome post-TKA.

Methods: In a retrospective cohort evaluation of 39 patients undergoing primary TKA, clinical assessment was performed pre-operatively, and at 1, 3, and 6 months post-operatively. All patients underwent unilateral primary TKA for osteoarthritis. Age range was 50-85 years. Patient perception of recovery was assessed using the Knee Injury and Osteoarthritis Outcome Score (KOOS). Patient performance was assessed using the 6 minute walking test, Timed up and Go test, Stair climbing test, and Quadriceps strength.

Results: A total of 39 TKAs in 39 patients were evaluated. Post- versus pre-operative KOOS values demonstrated improvements at 1 month in pain, ADLs, and quality of life. At 3 and 6 months, significant improvements were noted in all subscales of the KOOS. Post- versus pre-operative performance measures demonstrated declines at 1 month in all areas, with no improvements noted at 3 and 6 months. Only measured improvements in active range of motion were noted at 3 and 6 months.

Conclusions: Based on data of the current investigation, self-report data accurately reflects neither the presence nor magnitude of functional deficits present after TKA. It is important to recognize that limitations may exist in currently used outcome assessments. The results emphasize inclusion of objective performance data in addition to self-reported outcome measures in TKA.

Poster 15

The State of Comparative-Effectiveness Research in the Biomechanical Spine Literature

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Jenni M. Buckley
Mignon A. Hills, BS
Joseph Liu, BS
Neil A. Ray

Introduction: There is a shortage of studies directly comparing equivalent treatments. Evidence exists to suggest that studies sponsored by industry may be more likely to employ inactive or inappropriate comparators because they are cheaper and less likely to produce a negative result for the manufacturer. This may suffice for FDA approval, but it provides little information regarding the actual increased benefit of novel devices over existing, often less-costly implants. The goal of the present study is to quantify the percentage of comparative-effectiveness studies in the biomechanical-spine literature, and uncover trends relating to industry sponsorship.

Methods: Strict criteria were utilized to cull articles from Pub Med for inclusion. Information regarding the products being tested, the manufacturer of each product, the financial disclosures, etc. were recorded for each article. They were then assessed as comparative-effectiveness or not. Market share information was obtained from Standard and Poor's market analysis publication. Data was entered into an MS Excel spreadsheet and simple percentages were obtained for purely descriptive variables. A standard error of proportions was then calculated and 95% confidence intervals (CI) were determined.

Results: Of the 281 articles that met inclusion criteria, 50% were considered comparative-effectiveness, while 25% compared products from two separate companies. Five percent compared products from three or more companies. Industry sponsorship did not correlate with the study design. However, we found a strong trend for companies with larger market shares to be less likely to fund studies comparing their product to a competitor's than ones with smaller shares.

Conclusion: There is a lack of comparative-effectiveness studies in the biomechanical literature on spinal implants. Industry sponsored studies were just as likely as government/society sponsored investigations to be comparative. However, companies with a larger market-share were more likely to use only a single company's product in their study.

Poster 16

Regarding Proximal Ulna Internal Fixation

Scott G. Edwards, MD

Introduction: To define actual removal rates of proximal ulna fixation, assess patient overall satisfaction with their fixation, and compare these realities with current surgeon perception.

Methods: 556 surgeons from three orthopaedic subspecialty societies completed an online survey investigating their beliefs regarding proximal ulna internal fixation. 148 patients who underwent internal fixation for proximal ulna fractures at three trauma centers during 2003-2005 were retrospectively evaluated in a chart review. These patients were contacted by phone and asked questions regarding their proximal ulna fixation. Patient-reported results were compared to surgeon perceptions.

Results: 67% of surgeons believe their fixation removal rates are the same at other surgeons, while 31% believe their rates are lower. The majority of surgeons (71%) believe that patients require removal of hardware less than 30% of the time. Actual patient removal rates were 82%. The majority of these patients (68%) elected to remove their hardware between 2 and 5 years after implantation. 74% of patients report that the surgeons that eventually removed their fixation were not the surgeons that implanted the fixation. 35% of patients reported that they were never offered removal as an option. Of the patients that still retain their hardware, 92% reported irritation; 54% of these patients plan on having it removed sometime in the future.

Discussion and Conclusions: Most surgeons vastly underestimate the actual irritation of fixation and consequent removal rates (73-84%). Most patients elect to remove hardware several years after implantation and choose a different surgeon to perform the removal, which may lead the implanting surgeons to believe that their patients are more satisfied than they really are. Even patients that do not elect to remove their fixation appeared to be bothered by its presence. The authors challenge surgeons to become more aware of this problem in their practices.

Poster 17

The "Anconeus Slide" Rotation Flap for Management of Posterior Wounds About the Elbow

Kristen Fleager, MD

Introduction: Wound dehiscence at the tip of the olecranon is not an uncommon complication associated with surgical approaches to the elbow which involve a posterior skin incision. Various flaps have been described in the treatment of such soft tissue defects, but have associated morbidity. The "anconeus slide" rotation flap has low morbidity and is technically simple. In this study, we review the surgical technique and describe our experience with the anconeus rotation flap in twenty consecutive patients.

Methods: The records of twenty patients who underwent an anconeus rotation flap by a single surgeon, from September 2006 to March 2010 were reviewed. The procedure was performed in the setting of total elbow arthroplasty in twelve patients, revision total elbow arthroplasty in three patients, wound complications in four patients, and for an acute open distal humerus fracture in one patient. Patients were evaluated post-operatively for wound healing, pain, and post-operative Mayo Elbow Performance Scores (MEPS).

Results: All twenty patients healed their surgical wounds completely. Post-operative MEPS scores averaged 79.3 (range, 50 to 100).

Conclusion: The anconeus rotational flap is a technically simple, reliable, and safe option for treatment of posterior wound complications about the elbow, and in the setting of primary and revision total elbow arthroplasty when wound healing is a clinical concern. We recommend its use in patients who have either compromised posterior soft tissue coverage, triceps insufficiency, or factors associated with the potential for compromised wound healing.

Poster 18

Moment Arms of the Human Digital Flexors

Orrin I. Franko, MD
Eric R. Hentzen
Richard L. Lieber, PhD
Timothy F. Tirrell

Introduction: For the extrinsic flexors of the hand (flexor digitorum profundus, FDP; flexor digitorum superficialis, FDS; flexor pollicis longus, FPL), moment arm corresponds to the tendon's distance from the center of the metacarpalphalangeal (MP), proximal interphalangeal (PIP), or distal interphalangeal (DIP) joint. The clinical value of establishing accurate moment arms has been highlighted for biomechanical modeling, the development of robotic hands, designing rehabilitation protocols, and repairing flexor tendon pulleys. This study aims to provide physiologic values for the moment arms of the extrinsic digital flexors of the hand.

Methods: We utilized six fresh-frozen upper limbs with the extrinsic flexor tendons identified, proximally released, and pulled through an incision in the palm, proximal to the A1 pulleys. Steinmann pins were used to ensure that neither proximal nor distal joints, relative to the joint being tested, could flex in response to tendon excursion. Each tendon across each joint and for each finger was then sequentially clamped to a dual-servo motor and pulled a constant rate while sampling tendon excursion and joint angle via a uniaxial electrogoniometer. Moment arms were determined by calculating the slope for the linear region of the excursion/angle plot. A three-way ANOVA was used to examine the main effects and interactions between joint, digits, and tendons, and one-way ANOVAs were used to examine differences between each joint.

Results: Moment arms across the MP joints ranged from 12.4-13.9 mm for the FDP and 12.4-15.4 mm for the FDS, with the FDS demonstrating a moment arm approximately 0.9 mm longer than the FDP. At the PIP joints, moment arms ranged from 7.8-9.8 mm for the FDP and 5.8-8.1 mm for the FDS, with the FDS moment arms approximately 1.6 mm shorter than the FDP. Moment arms at the DIP joint ranged from 6.3-7.8 mm. In the three-way ANOVA, a main effect was observed for joint ($p < 0.001$), but not for digit ($p = 0.131$) or tendon ($p = 0.417$). An interaction between joint and tendon was found ($p = 0.006$), but was not apparent for joint and digit ($p = 0.513$) or for digit and tendon (0.790). Furthermore, no significance interaction was observed among joint, tendon, and digit ($p = 0.967$).

Conclusion: These results are the first to report average moment arm values for all extrinsic flexor tendons of the hand across all digital joint joints for all digits in cadaveric hands using continuous excursion/joint angle calculations. At the MP joint, where the FDS tendon runs superficial to the FDP tendon, the FDS moment arm was longer by approximately 0.9 mm, in contrast to the PIP joint, where the FDS tendon was shorter than the FDP moment arm by 1.6 mm.

Poster 19

Smartphone "Apps" for Orthopaedic Surgeons

Orrin I. Franko, MD

Background: The use of smartphones and their associated applications (apps) provides new opportunities for physicians, and specifically orthopaedic surgeons, to integrate technology into clinical practice. The purpose of this study was two-fold: to review all apps specifically created for orthopaedic surgeons and to survey orthopaedic residents and surgeons nationwide to characterize the need for novel apps.

Methods: The first part of this study included surveying the five most popular smartphone application stores for orthopaedic related applications: iPhone, Android, BlackBerry, Windows Mobile, and Palm. The second part of this study included a national Internet survey of ACGME accredited orthopaedic surgery departments to assess the level of smartphone usage, app usage, and desire for orthopaedic related apps.

Results: The database search revealed that only iPhone and Android platforms had apps specifically created for orthopaedic surgery with a total of 38 and 4 apps, respectively. Among the apps reviewed, only one had over 100 reviews, and the majority of applications had very few reviews, including the AAOS Now app published by the American Academy of Orthopaedic Surgery. The national survey demonstrated that 84% of respondents (n=476) have a smartphone, the majority (55%) have an iPhone, and that 53% of people with smartphones already use apps in clinical practice. Ninety-six percent of respondents who use apps reported they would like more orthopaedic applications and would pay an average of nearly $30 for useful applications.

Conclusion: The use of smartphones and apps is prevalent among orthopaedic care providers in academic centers. However, very few highly ranked applications specifically related to orthopaedic surgery are available despite a desire from residents and surgeons.

Poster 20

Quantification of Partial or Complete A4 Pulley Release with FDP Repair in Cadaveric Tendons

Orrin I. Franko, MD
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Nathan M. Lee, MD
Richard L. Lieber, PhD

Purpose: Repair of a lacerated flexor digitorum profundus (FDP) tendon underneath or just distal to the A4 pulley can be technically challenging, and success may be confounded by tendon triggering and scarring to the pulley. The purpose of this study was to quantify the effect of partial and complete A4 pulley release in the context of a lacerated and repaired FDP tendon just distal to the A4 pulley.

Methods: Tendon biomechanics were tested in six cadaveric hands secured to a rigid frame permitting measurement of tendon excursion, tendon force, and finger range of motion. After control testing, each finger underwent laceration and repair of the FDP tendon at the distal margin of the A4 pulley using a six-strand core suture technique and epitendinous repair. Testing was then repeated after the following interventions: 1) Intact A4 pulley 2) Release of the distal half of the A4 pulley, 3) Complete release of the A4 pulley, and 4) Continued proximal release of the sheath to the distal edge of A2 (release of C2, A3, and C1 pulleys). Release of the pulleys was performed by incision; no tissue was removed from the specimens.

Results: From full extension to full flexion, average profundus tendon excursion for all intact digits was 37.9 ± 1.5 mm, and tendon repair resulted in average tendon shortening of 1.6 ± 0.4 mm. Flexion lag increased from less than 1 mm to over 4 mm with venting of the A4 pulley, complete A4 release, and proximal sheath release, respectively. Compared to the intact state, repair of the tendon with an intact A4 pulley, release of half the A4 pulley, complete A4 release, and proximal sheath release resulted in percent increases in work of flexion (WOF) of 11.5 ± 3.1%, 0.83 ± 2.8%, 2.6 ± 2.4%, and 3.25 ± 2.2%, respectively ($p<0.05$).

Conclusions: After FDP laceration and repair in the region of the A4 pulley, WOF did not increase by more than 3% from control conditions after partial or complete A4 pulley release, and WOF was significantly less than performing a repair and leaving the A4 pulley intact.

Poster 21

Correlation of Nerological Imaging Findings in the Brain and Cervical Spine and Hoffmann's Sign

Ray A. Grijalva, MD
Wayne K. Cheng, MD

Introduction: Hoffmann's sign is routinely used in clinical practice as an indicator of upper motor neuron disease. While there are conflicting reports comparing Hoffmann's sign with neurological imaging findings in the spine; there is no literature to compare Hoffmann's signs with neurological imaging findings in the brain as well as the cervical spine. Therefore, this retrospective study was designed to 1) Assess the relationship between Hoffmann's sign and neurological imaging findings in the brain and cervical spine 2) Assess the influence of Hoffmann's sign on surgical intervention.

Methods: This was a retrospective analysis of patients who presented to a university based spine clinic from April 2007 - July, 2009. The Hoffman's test was performed on all patients as part of the physical exam. Patient advanced imaging was blindly and independently reviewed by multiple surgical and radiology specialists to determine the presence or abscence of findings that could account for a positive Hoffmann's sign

Results: The Sensitivity, Specificity, Positive and Negative Predictive Value for Hoffmann's signs for cervical cord compression was 60%, 50%, 35% and 73% respectively. The Sensitivity, Specificity, and Positive Predictive Value for Hoffmann's signs for brain pathology was 71%, 33% and 10% respectively.

Discussion and Conclusion: Hoffmann's sign has too low of a positive predictive value to be relied upon as a stand-alone physical exam finding. Patients with a positive Hoffmann's sign do not need advanced imaging of the brain to detect a lesion requiring surgical intervention.

Poster 22

Treatment of Shoulder Impingement Syndrome with Injection of Autologous Platelet Rich Plasma

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Montri D. Wongworawat, MD

Introduction: Shoulder impingement syndrome is a common problem seen in the orthopaedic office. Often, patients are interested in alternatives to surgical intervention. Platelet-rich plasma (PRP) has emerged as a possible treatment for tendonopathy disorders of this sort.

Methods: Twelve patients with shoulder impingement syndrome were evaluated in this study. Patients who met a strict inclusion and exclusion criteria were randomized to receive either platelet-rich plasma or a corticosteroid subacromial injection. The patients were then followed prospectively at six and twelve weeks. Outcome measures include the Constant and American Shoulder and Elbow Society (ASES) scores, and mean differences in scores collected before injection and subsequent follow-up were analyzed to detect improvement.

Results: There was no significant difference between the groups in terms of age, sex and BMI. Both groups showed similar improvements at six weeks follow-up. The platelet rich plasma group showed mean Constant score improvement of 9.4±16.3, while the steroid group showed a mean Constant score improvement of 12.5±23. The mean improvement of the ASES score in the PRP group was 31.34±17.1 while the steroid group had a mean score improvement of 33.8±26.4. At twelve weeks, the PRP group showed continued improvement, whereas the steroid group did not. The PRP group showed a mean Constant score improvement of 23.4±15.2 while the steroid group showed a mean constant score improvement of -3.5±15.2. The mean improvement of ASES score in the PRP group was 42.7±21.8 while the steroid group had a mean score improvement of 11.7±17.6.

Discussion and Conclusion: Patients with shoulder impingement syndrome treated with PRP or steroids demonstrated similar improved function and symptoms at six weeks. However, at twelve weeks, PRP patients had significantly better improvement when compared with patients receiving steroids.

Poster 23

Combined Osteotomy and Osteochondral Allografting in the Knee

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Abraham Lin, MD

Introduction: Osteotomy and osteochondral allografting each are proven methods for joint salvage. Little data exists on the use of osteotomy as an adjunct to cartilage repair procedures in knees with cartilage injury and malalignment. This study investigated the clinical outcome of osteochondral allografting of the femoral condyle with concurrent corrective opening wedge osteotomy.

Methods: Eleven patients underwent combined osteochondral allografting (OCA) of the femoral condyle and concomitant opening wedge osteotomy to correct underlying axial malalignment. Average age was 38 years (range, 20–50 years), with 73% being male. Mean graft size was 7.0 cm2 (range, 4–9.5 cm2). Mean correction was 8 mm (range, 6–10 mm). Nine procedures combined medial femoral condyle allografting with valgus-producing tibial osteotomy. Two patients received lateral femoral condyle allografts and concomitant varus-producing distal femoral osteotomy.

Results: Mean follow-up was 56 months (range, 46–77 months). All achieved goal alignment and bony union of the osteotomy and allograft. IKDC Pain and Function scores improved from 6.4 to 2.5 and 3.1 to 8.4, respectively (p equaled 0.018 and 0.011). Five patients subsequently underwent hardware removal. Three procedures failed (one revision allograft, two arthroplasty conversions) at an average of 47 months (range, 25–86 months), including both lateral femoral condyle grafts with juxtaposed distal femoral osteotomy.

Discussion and Conclusion: Combined osteotomy and osteochondral allografting resulted in significant improvement of pain and function, similar to osteochondral allografting alone. Performing an osteotomy concomitantly maintained clinical outcomes without increasing perioperative morbidity. However, five of eleven patients did require subsequent hardware removal. When osteotomy of the distal femur is necessary, staging of the two procedures maybe advisable.

Poster 24

Computer Navigation Analysis of Valgus Knee Kinematics Before TKR

Radek Hart, Prof., MD, PhD, FRCS

Introduction: In a “true” valgus knee the lateral femoral condyle is smaller in both the vertical and anteroposterior dimensions and lateral soft tissue structures are contracted. In a “false” valgus knee there is no mismatch between anteroposterior dimensions of both condyles. The aim of the study was to preoperatively analyse patterns of passive movement of valgus knees with imageless navigation system to optimise surgical approach during subsequent total knee replacement (TKR).

Methods: TKR were prospectively performed in 50 valgus knees. After the data registration process the kinematic analysis was performed by passive movement of the knee. The mechanical axis was recorded at 0°, 30°, 60°, 90°, and 120° of flexion. The valgus deformity persistent through the whole range of motion was called “true” and the valgus deformity passing into varus with flexion was called “false.”

Results: The pre-operative valgus deformity in extension ranged from 13° to 4° (mean 7.8°). We observed “true” valgus type deformity during passive range of movement in 34 cases (68%) and “false” type of kinematics in 16 cases (32%). The average value of valgus deviation in extension in “true” group was 7.9° (range, 13° to 4°) and in “false” group 7.5° (range, 9° to 6°). The mean difference between axis deviation in 0° and 120° of flexion was 5.5° (range, 10° to 1°) in the “true” valgus group. In the “false” valgus group the varus deviation was observed in 90° of flexion in all cases and mean difference between axis deviation in 0° and 120° of flexion was 12.0° (range, 14° to 10°).

Discussion and Conclusions: Computer navigation can easily help to identify the character of valgus deformity (“true” or “false”) just before skin incision. In “true” valgus deviation lateral approach may be necessary for appropriate soft tissue balancing during TKR surgery.

Poster 25

X-STOP Implantation for the Treatment of Neurogenic Intermittent Claudication

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Arya Nick Shamie, MD

Introduction: Lumbar spinal stenosis is a disabling medical condition in which narrowing of the spinal canal compresses the spinal cord and nerves. Entrapment of the cauda equina roots often presents with difficulty walking, pain in the back and lower extremities, and weakness in the legs, a condition called neurogenic intermittent claudication (NIC). As laminectomy is more invasive with longer postoperative recovery, X-STOP, a minimally invasive interspinous process implant, was introduced to treat NIC secondary to lumbar stenosis.

Methods: Zurich Claudication Questionnaire (ZCQ) via telephone was administered retrospectively to an initial total of 73 patients implanted with X-STOP to assess their outcome measures in three domains: 1) Symptom Severity, 2) Physical Function, 3) Patient Satisfaction. The secondary outcome measure of the Visual Analog Scale (VAS) was used to assess post-operative trends in pain. Both the ZCQ and VAS scores were obtained in 13 patients at the 2 year post-op period, 16 patients at the 3-year post-op period and 7 patients at the 4-year post op period. Success criteria were a minimum two point improvement on ZCQ and six point improvement on VAS.

Results: X-STOP patients showed a significant decrease in VAS scores immediately following surgery. Based on the ZCQ and VAS scores, success rates of 69% (9/13), 88% (14/16) and 86% (6/7) were achieved at 2, 3, and 4 years post-operatively, respectively. The VAS levels at three and four post-operation years were comparable to the one-year post-operative values as the pain levels stabilized over time. The implant was removed in 14 patients and 23 patients were lost to follow-up or deceased status. There were no postoperative fractures of the spinous processes, implant dislodgement, or wound complications.

Discussion/Conclusion: X-STOP is a safe and effective treatment for NIC that provides marked relief of symptoms with sustained beneficial outcomes at 4 years of follow-up.

Poster 26

PRP with WBC's Increases Likelihood of Tear Through by Sutures in PASTA Repairs

Alan M Hirahara, MD, FRCSC

Introduction: To evaluate the method of failures of repairs of articular-sided partial-thickness rotator cuff (PASTA lesions) repairs with and without platelet-rich plasma (PRP).

Methods: Forty patients received PRP, placed arthroscopically during repair of a PASTA lesion. Fourteen patients were repaired without use of PRP. Arthroscopic fixation was performed using a bioabsorbable suture anchor. The PRP was made from autologous blood with a system that increases the concentration of both platelets and WBC's. We did not exclude patients who had associated pathology (SLAP lesions, AC arthropathy, instability, etc.). Patients were evaluated clinically with pain scores, ASES scores, range of motion. Repeat MRA or surgery was performed for people having persistent pain or complaints at four to six months post-operatively to evaluate healing

Results: Two out of fourteen (14.3%) control patients failed to heal and required revision surgery. The two failures that occurred in the control group both resulted in non-healing of the repair. Six study patients (15%) on repeat surgery showed healing of the repaired partial tear, but also revealed the sutures cutting through the tendon in a longitudinal fashion.

Conclusions: This study shows that PRP that includes WBC's can result in weakness of the tendon, increasing the likelihood of tear through by the sutures. The literature suggests the application of PRP with WBC's can result in a weakening of tissue. The system used for the PRP did result in a higher concentration of WBC's by 9 times. This phenomenon may explain the increased rate of tear through from the sutures.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation.* *(Refer to page 32.)*

Poster 27

"Nearly Radiation-Free" Approach to Treatment of Developmental Dislocations of the Hip

Meghan Imrie, MD
*Stephanie Pun, MD

Introduction: Awareness of exposure to ionizing radiation to both patients and surgeons during the course of orthopaedic treatment has been increasing. In the case of developmental dislocations of the hip, patients may be subjected to radiation pre-operatively, as part of diagnosis (pre-operative pelvic radiographs); intra-operatively (during hip arthrogram); immediately post-operatively (pelvic radiograph in spica cast versus 3-dimensional confirmatory imaging, often CT scan); and in follow-up (scheduled pelvic radiographs). We sought to reduce patient exposure during DDH treatment without compromising care, focusing specifically on the intra-operative and immediate post-operative periods. Our hypothesis is that patients with developmental hip dislocations undergoing closed or open reduction without femoral or pelvic osteotomy can be comparably treated with radiation-minimizing techniques as with standard techniques.

Methods: This was a retrospective review of all patients with hip dislocations treated with the "nearly radiation-free" approach at our institution. To minimize intra-operative radiation, the mini-fluoroscan was used in place of a standard image intensifier to perform the hip arthrogram. To minimize radiation post-operatively while still confirming concentric reduction with 3-dimensional imaging, all hips were imaged with a new technique of non-sedate rapid sequence MRI within 24 hours of the closed or open reduction.

Results: 12 patients with 12 dislocated hips were identified over an 8-month period. Average age at time of surgery was 9 months (range 3 to 18 months). Four hips required open reduction with ligamentum teres transfer; 8 hips were closed reduced. All hip arthrograms were done with a mini-fluoroscan and all were considered diagnostic. Post-operatively, rapid sequence MRIs were performed within 24 hours to confirm reduction in the spica cast. No patient required sedation or anesthetic during MR imaging; all MRIs were diagnostic and no scan had to be repeated. The average image acquisition time was 13 minutes, 29 seconds and all hips were reduced in the spica.

Conclusion: Minimizing exposure to ionizing radiation to patients, but also surgeons and staff, is important wherever possible. By using a mini-fluoroscan for hip arthrogram, radiation exposure is cut by a reported 90 percent; confirming reduction post-operatively with a rapid sequence MRI rather than limited CT scan exposes the patient to no radiation. Neither technique compromises the quality of hip evaluation.

Poster 28

Post-Reduction DDH Assessment with Non-Sedate Rapid Sequence MRI

Meghan Imrie, MD
*Stephanie Pun, MD

Background: Three-dimensional imaging, i.e. computerized tomography or magnetic resonance imaging (MRI), is being increasingly used to assess hip reduction in infants with developmental hip dysplasia (DDH) treated with closed or open reduction and casting; one drawback of MRI is that it often requires sedation. We studied the feasibility of a non-sedate, rapid MRI examination to confirm adequate reduction following closed or open reduction and spica casting for DDH.

Methods: Eight patients were evaluated with an optimized MRI protocol within 24 hours of operative closed or open reduction and spica casting of DDH. The MRI examination required no sedation and consisted of state-of-the-art hardware and software tailored to maximize image quality and minimize examination time. The MR images were evaluated to confirm reduction, and to estimate hip abduction and quality of cast application. Two radiologists independently assessed image quality.

Results: All examinations were performed within 24 hours of the OR, at an average of 8 hours, 5 minutes post-anesthesia, and took an average of 17 minutes 29 seconds of MRI time. All examinations were diagnostic, and all hips were reduced; average affected hip abduction was 55 degrees (range 38 to 68 degrees). No patient required any sedation or repeat scanning.

Conclusion: This optimized MRI protocol for post-reduction DDH assessment is rapid, diagnostic, and easily integrated into clinical workflow, allowing for same-day OR and MR imaging. Our technique can be performed faster than prior reported studies and requires no sedation, making it the 3-dimensional imaging of choice for post-reduction assessment at our institution.

Poster 29

Patient Demographics and Peri-Operative Outcomes of Laminectomy and Inter-spinous Decompression with X-Stop

Michael H. Johnson, MD

Introduction: Spinal stenosis, a frequent cause of neurogenic back, buttock, and leg pain, is due to the narrowing of the spinal canal. Surgical decompression can be accomplished by laminectomy or inter-spinous decompression with the recently FDA-approved X-Stop device.

Methods: A retrospective analysis of 32 patients undergoing surgical intervention for spinal stenosis from January 2006 to January 2008 was performed in order compare laminectomy to X-Stop by demographics and various indicators of invasiveness. Data was gathered from 32 patients undergoing X-Stop and 23 patients undergoing laminectomy. Surgical revisions and decompressions of greater than two levels were excluded from the analysis. Age, weight, height, and ethnicity were used to evaluate patient populations, while days in hospital, days to ambulation, days needing patient controlled anesthesia (PCA), and narcotic pain reliever usage were used to compare invasiveness.

Results: Mean age was significantly younger in laminectomy patients compared to X-Stop (mean age 62, mean age 77), while weight, height, and ethnicity were statistically similar between both groups. Patients undergoing laminectomy had greater days in hospital (4.0 days, 1.5 days), days to ambulation (1.5 days, 0.5 days), and days needing PCA (2.0 days, 0.1 days,). Intra-operative complications were the same statistically in both groups, while laminectomy had more frequent post-operative complications (8 complications, 3 complications). Blood loss was greater in laminectomy patients (251 ml, 84 ml), and operating time was longer in laminectomy (197 minutes, 118 minutes). Narcotic pain reliever usage, however, was statistically equivalent in the post-anesthesia care unit and on the hospital floors.

Conclusions: X-Stop is a less invasive surgery compared to laminectomy, affording patients fewer days in the hospital, earlier ambulation, fewer days needing PCA, shorter operative time, and less intra-operative bleeding. Narcotic usage, however, in the immediate post-operative course was statistically equivalent. Further studies are needed to elucidate the short and long-term pain relief and disability improvement of the two surgeries.

Poster 30

Accuracy of the Free-Hand Technique for Three Fixation Methods into the C2 Vertebrae

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

Introduction: Because intraoperative imaging often does not provide adequate visualization to ensure safe placement of screws, we evaluated the ability of a free-hand technique to insert C2 pars, pedicle and intralaminar screws.

Methods: Sixteen cadaveric specimens were instrumented free-hand by two experienced cervical spine surgeons with either a pars or pedicle screw, and bilateral intralaminar screws. The technique was based upon anatomic starting points and published screw trajectories. A pedicle finder was used to establish the trajectory, followed by tapping, palpation and screw placement. After placement of all screws (16 pars screws, 16 pedicle screws, and 32 intralaminar screws), the C2 segments were disarticulated, radiographed in AP, lateral and axial planes and meticulously inspected by another spine surgeon to determine the nature and presence of any defects.

Results: A total of 64 screws were evaluated in this study. Pars screws (n=16) exhibited two critical defects (1-foramen transversarium, 1-C2/3 facet, and an insignificant dorsal cortex breech) for an overall accuracy of 81.3%. Pedicle screws demonstrated only one insignificant violation (inferior facet/medial cortex intrusion of 1 mm) with an accuracy of 93.8%, and intralaminar screws demonstrated three insignificant violations (2-ventral canal, 1-caudad lamina breech) and an accuracy of 90.6%. Pars screws had significantly more critical violations than intralaminar screws.

Discussion and Conclusion: Instrumentation of the C2 vertebrae using the free-hand technique for insertion of pedicle and intralaminar screws showed a high success rate with no critical violations. Pars screw insertion was not as reliable with 2/16 critical violations. The freehand technique appears to be a safe and reliable method for insertion of C2 pedicle and intralaminar screws.

Poster 31

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

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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.

Poster 32

The Demographics of Clavicle Fractures in Older Teenagers

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Introduction: Study Purpose:To assess the demographics, fracture types/patterns, modes of injury (MOI), complications, and refracture rates of all pediatric clavicular shaft fractures in teenagers aged 14-18.

Methods: A retrospective chart review was done on all pediatric clavicle fractures treated between 2006 and 2008 . Inclusion criteria included clavicle shaft fractures and patients aged 14-18 at the time of injury. Exclusion criteria included fractures involving the acromioclavicular(AC) or sternoclavicular(SC) joint and pathologic fractures. The mode of injury (MOI), patient ethnicity, fracture site and pattern, laterality, associated fractures, and neurovascular complications at the time of injury were all recorded. Differences between males and females were analyzed.

Results: 674 patients with a total of 675 fractures comprised the study cohort. The male/female ratio was 7.4/1. There were 56.6% left and 43.4% right sided fractures. 42.2% were completely displaced, and 13% were comminuted. 86.2%, 11.3%, and 2.5% of fractures were in the middle, lateral, and medial third of the clavicle, respectively. .4% were open, and 4% had associated fractures. The most common MOI was a sports related injury (57.2%), with 34.7% occurring during competitive sports and 22.5% recreational sports. Males had a significantly increased incidence of sports related injuries and a decreased incidence of motor vehicle/motorcycle related fractures as compared to females.

Discussion/Conclusion: This is the largest study of teenage clavicle fractures ever reported. Pediatric clavicle fractures in older teenagers appear to involve the left shoulder most commonly and the vast majority are in the middle third. In keeping with our prior study on younger children, the male predominance, frequency of fracture displacement, and sports related injuries continue to increase in older pediatric patients. These results should not be extrapolated to polytrauma patients, given that such a small number in this study were true polytrauma patients.

Poster 33

Total Hip Arthroplasty Acetabular Component Positioning Using Mechanical Instrumentation Versus Computer-Assisted Navigation

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Mark Cinque, BA

Introduction: Total hip arthroplasty longevity is influenced by acetabular component position. Several studies have helped define ideal target ranges. This study evaluated the accuracy and precision of cup abduction and anteversion, after operative positioning employing computer-assisted navigation versus mechanical instrumentation. Spatial patient-table registration was used, precluding dependence on registration pelvic bony landmarks. The influence of body mass index on component positioning was also evaluated.

Methods: Two groups of primary THAs performed through a posterolateral approach were evaluated. NoNAV consisted of a single-institution, six-surgeon cohort of 198 THAs employing mechanical instrumentation. NAV consisted of a single-surgeon cohort of 66 consecutive THAs employing navigation. Digital radiographs were evaluated for abduction and anteversion. For NAV, a pelvic tracker was fixed to the ipsilateral iliac crest. Registration of a functional pelvic frontal plane was defined by moving this tracker along a vertical line and registering a coronal axis. The intra-operative NAV goals were 42° abduction and 22° anteversion. In NoNAV, intra-operative goals varied by surgeon, as did anatomic landmarks and mechanical instrumentation used.

Results: A statistically significant difference was found between NoNAV and NAV abduction and anteversion results. Accuracy using NAV was within 1° of the goal for both parameters. Precision in NAV was significantly greater than in NoNAV relative to commonly reported ranges (abduction 30°-50°, anteversion 5°-25°, anteversion 10°-30°) and also when accounting for surgeons' differing goals (abduction and anteversion for each surgeon's median ±10°). BMI did not influence the precision of placing the cup within the target ranges.

Discussion and Conclusion: Navigation afforded abduction accuracy within 10° of the intra-operative goal in 100% of the cases. Precision was significantly greater for navigation than mechanical instrumentation regarding both abduction and anteversion. BMI did not affect the accuracy or precision of navigated cup placement. Navigation may help surgeons more accurately and precisely hit an intended target range for cup position.

Poster 34

Use of a Two-Incision Minimally Invasive Total Hip Arthroplasty Technique Reduces Costs and Length of Stay

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Introduction: While anecdotal evidence suggests that length of stay (LOS) and hospital costs are reduced with minimally invasive techniques, few studies have been published. Frequent criticism of these studies centers on preferential selection of optimal patients, who would do well with any technique. We hypothesized that the apparent cost savings and reduced LOS, attributed to use of minimally invasive techniques, result purely from patient selection.

Methods: Medical records, hospital charges and costs for consecutive patients undergoing two-incision minimally invasive total hip arthroplasty (MIS) between September 2006 and September 2008 were obtained. Records and hospital charges and costs for patients undergoing THA via a standard approach (STD) in the same time period were reviewed to find patients who matched the two-incision patients for age, gender, BMI and medical comorbidity. Patients for whom a match could not be made were excluded.

Results: Mean LOS for MIS pts was 2.42 days compared to 3.64 days for STD. All MIS patients were discharged home; only 43 of 50 STD patients were discharged home. Total, direct and indirect, OR, and therapy costs were all significantly lower for MIS than for STD approaches. For lab, materials management, and pharmacy, MIS and STD procedures had equal costs. The only cost center where STD procedures were less costly was imaging. Complication rates and component position were no different.

Poster 35

Modular Metal on Metal THA: Absence of Adverse Reactions Related to Metal Debris

Chris Mellano, MD
Andrew I. Spitzer, MD

Introduction: Metal on Metal (MOM) bearing surfaces in total hip arthroplasty (THA) eliminate polyethylene debris, and permit larger head articulations, which reduce wear rates and improve stability. However, recent concerns have emerged regarding adverse reactions to metal debris, including hypersensitivity, soft tissue masses and necrosis, and pain. We asked whether our series of MOM implants have resulted in complications related to the metal bearing surface.

Methods: Between 11/2004 and 8/2010, 184 primary THAs in 166 patients (111 males, 73 females, mean age 59.7 years (R 32-89)) were implanted by a single surgeon via a posterior approach, utilizing a modular cobalt chrome hemispherical cup with a metal on metal articulation. Routine follow up included outcome scores, physical examination, and radiographs, or phone contact.

Results: The status of 180 hips (97.8%) is current. Four hips in 3 patients were lost to follow up. The mean follow up is 23.7 months (R 1-69), and 81 hips in 71 patients were followed for a minimum of 2 years. There were no revisions or complications attributable to the MOM bearing surface. Two hips were revised, one for instability and one for limb length inequality and pain. Head size was 28mm in 1 hip, 36mm in 160 hips, and 40mm in 23 hips.

Discussion: There have been no adverse reactions associated with the MOM bearing surface in this series. Despite concerns in the literature and media, our experience with this modular metal implant suggests minimal complications, and a very favorable risk/benefit ratio.

Poster 36

Intraoperative Portable Computed Radiography During THA Underestimates Acetabular Inclination Angle

Chris Mellano, MD
Andrew I. Spitzer, MD

Introduction: Portable Computed Radiography (CR) is an efficient tool which enables intraoperative measurement of acetabular component inclination angle during total hip arthroplasty (THA) while adjustments can still be made. The limitations of this technology have not been determined.

Methods: Twenty three consecutive THAs in 23 patients were reviewed retrospectively. Low anteroposterior pelvis digital images were obtained during surgery using portable CR technology with the patient in the lateral decubitus position. Additional images were obtained with the patient supine in the post-anesthesia care unit (PACU), and again in the office during a postoperative visit. Cup inclination was measured by determining the angle between the face of the acetabular component and the intra-ischial line. Statistically, the three values for each patient were compared using a one-way repeated measures analysis of variance with time as the within-subjects factor.

Results: The mean intraoperative cup angle of 38.2^{o} (R 29-55) significantly increased (p less than .0001) to 41.7^{o} (R31-55) in the PACU and to 41.6^{o} (R 30-55) in the office. There was no difference between the PACU and the office. The mean variance from intraoperative to PACU was 3.4^{o} (R -3-10). Three angles decreased, 3 remained unchanged, and 17 increased. The mean variance from intraoperative to office was 3.4 degrees (R -3-9). Only 1 angle decreased, 4 remained unchanged, and 18 increased. No clinical loosening occurred.

Discussion: The true cup angle on postoperative radiographs was up to 10 degrees more vertical than that measured on intraoperative computer radiographs. Intraoperative portable CR underestimates actual acetabular inclination angle.

Poster 37

Arthroscopic Proximal Row Carpectomy

Ricardo A. Molina, MD

Introduction: Proximal row carpectomy is an effective procedure for treating a variety of wrist pathologies. To date, all outcome studies have reported on the results of an open procedure, with a dorsal capsulotomy. We present our technique and early results of arthroscopic proximal row carpectomy (APRC).

Methods: Nine consecutive patients (6 men, 3 women) underwent APRC. After routine arthroscopy, the proximal carpal row was removed with an arthroscopic bur, with care being taken to protect the articular cartilage of the head of the capitate and the lunate fossa. The average time of the procedure was 83 minutes (70-110 minutes). Range of motion was initi-

ated 2 days postoperatively. Clinical follow up was assessed objectively by evaluation of range of motion and grip strength. Subjective outcomes were assessed with the DASH questionnaire and with a patient centered questionnaire assessing satisfaction, return to prior employment, and pain.

Results: Sixteen patients were available with an average follow-up of 37 months (24 -48 months). There were no complications, no revisions were required and no arthroscopic procedure was converted to open technique. At final follow up the average wrist flexion-extension arc was 90% of the contralateral side, and grip strength averaged 90% of the contralateral side. The mean DASH score was 17. All 9 patients rated themselves as satisfied or very satisfied with the procedure. Six patients had no work restrictions and seven patients were able to return to their previous employment. Six patients rated themselves as having mild or no pain.

Conclusions: APRC appears to be a safe, effective, and reliable procedure for a variety of wrist conditions; and allows for rapid mobilization of the wrist compared to the open procedure. Range of motion and grip strength compare favorably to existing values in the literature for the open technique.

Poster 38

Biomechanical Assessment of Two Lateral Ulnar Collateral Ligament (LUCL) Reconstruction

Ricardo A. Molina, MD

Introduction: Posterolateral rotatory instability (PLRI) of the elbow is a clinical entity that in recent years has gained more recognition in its diagnosis and treatment since its description in 1991. Surgical reconstruction is often needed to treat this injury. Just like on the medial side of the elbow a docking technique with a tendon graft is traditionally used. However, the techniques for LUCL reconstruction have evolved with attempts to decrease soft tissue dissection and allow for more reliable graft placement. The purpose of our study is to biomechanically compare a docking technique to a technique with interference screw fixation for LUCL reconstruction.

Methods: Six matched pairs of cadaveric elbows underwent biomechanical testing under two different reconstruction techniques. In the first group, 4.75 x 15 mm soft tissue interference screws were used to secure the graft both distally and proximally. The second group used a docking technique. Palmaris tendons were harvested from each elbow. The reconstructed elbows were cyclically loaded using 0.5 Nm supination torque with 70N of axial compression for 50 cycles at 0.1Hz and then loaded to failure.

Results: The average stiffness when loaded to failure for the interference screw fixation group (28.2 +/- 6.5 Nm) was not significantly different from reconstructed elbows using a docking technique (29.3 +/- 7.8 Nm). In cyclical loading testing the conditional elongation also did not show any meaningful differences between the two reconstruction groups (1.09 +/- 0.27 Nm/deg vs 0.89 +/- 0.39 Nm/deg).

Discussion and Conclusion: In this study, the interference screw reconstruction technique was biomechanically comparable to the docking technique. The benefits of this technique are to potentially minimize soft tissue stripping, provide more reliable bone tunnel placement, increase the size of the tendon graft and decrease the inherent complications of a bone tunnel construct.

Poster 39

Acute THA for Select Acetabular Fractures

Charles Moon, MD
Farzin Kabaei, MD

Hypothesis: Acute THA is a viable treatment option for select patients with medical comorbidities and osteoporosis that would prohibit open reduction and internal fixation. This option can allow for immeadiate weight bearing and an acceptable complication profile for this difficult problem.

Materials and Methods: Eleven patients over two years were treated with acute total hip arthroplasty for fracture. The median age of these patients was 70 (46-89). Total hip arthroplasty was chosen as treatment because of medical comorbidities and osteoporosis. This is out of sixty-six acetabular fractures seen during this time. Initially limited ORIF and multi-hole cups with screw fixation was utilized. There was a shift to cage constructs in patients with any column involvement. All patients received morselized graft utilizing their native femoral heads supplemented with allograft if needed. Patients postoperatively were allowed to be weight bearing as tolerated and otherwise followed a standard post total hip protocol.

Results: In this limited series there were no infections and no revisions. No patient had a secondary procedure. Cup migration/shifts in position were noted with limited ORIF and multi-hole cups in patients with column involvement. This

lead to a shift to cage type constructs in this patient group. Two patients were lost to follow-up. Of the other 9 patients, 4 required the use of a walker on last follow up and 2 used a cane. Only 3 patients ambulated without an assistive device. One patient had a single postoperative dislocation. This resolved with a closed reduction and abduction bracing. There were no clinical DVTs.

Discussion: Acute THA can be performed in select cases of acetabular fracture as a single stage procedure in patients with medical co-morbidities or poor bone quality that would prohibit ORIF. Immeadiate postoperative weight bearing was possible, but in patients with column involvement cage constructs were required to prevent cup migration. The complication rate seemed acceptable. This study is limited however by small numbers, selection bias and is a single surgeon series.

Poster 40

Percutaneous Anterolateral Plating for Tibia Plafond Fractures

Charles Moon, MD
Farzin Kabaei, MD

Introduction: Tibia Plafond fractures continue to be a challenging problem. Anterolateral plating may have an advantage as there is a more robust soft tissue envelope in this area of the distal leg. Traditionally this has been done as an open procedure, but percuatneous techniques have been developed that may decrease morbidity.

Materials and Methods: 26 patients over a 1 year period were treated with a standardized protocol of spanning external fixation and delayed ORIF utilizing percutaneous anterolateral plating of the distal tibia. Patients all had closed injuries and were primarily treated by a single surgeon from external fixation to ORIF. Anterolateral plating was chosen due to fracture configuration. 2 patients also had supplemental percutaneously placed medial plates. The fibula was fixed as deemed necessary by the treating surgeon. There were 18 males and 8 females. Average age was 32 (22-46). Mean time from external fixation to ORIF was 9 days.

Results: 6 patients were lost to followup. There were no infections. Average time to union was 4.5 months. To date 3/20 patients has had hardware removal. All patients are walking without assistive devices at this point. There is radiographic signs of arthritis in 7 of the patients to this point. There were 4 superficial peroneal nerve (sensory branch) injuries clinically noted.

Discussion: Tibia plafond fractures are a challenging clinical problem. In this series we were able to avoid infection with a staged protocol of soft tissue recovery and then definitive ORIF with limited incisions and anterolateral fixation. The final clinical results in terms of late onset arthritis are comparable to historical controls. Limited incisions and percutaneous antero lateral plating is a viable approach to fixation of tibia plafond fractures.

Poster 41

The Course of the Distal Saphenous Nerve: A Cadaveric Investigation and Clinical Implications

Nathan Morrell, MD
Deana Mercer, MD

Introduction: The distal saphenous nerve is not well described and nerve injury has been reported, including as a complication of many orthopaedic procedures. The purpose of our study was to determine the distal limit of the saphenous nerve and its anatomic relation to commonly identified orthopaedic landmarks.

Methods: Sixteen cadaveric ankles were examined at the level of the medial malleolus. An incision 15cm proximal and 15cm distal to the tip of the medial malleolus was made to follow the course of the saphenous nerve under direct visualization. We recorded the distance from the distal most aspect of the saphenous nerve to the tip of the medial malleolus, the distance to tibialis anterior and the distance between the nerve and the medial arthroscopic portal site.

Results: The average distance from the distal most aspect of the nerve to the tip of the medial malleolus measured –2mm +/-4mm; from the nerve to the tibialis anterior measured 16mm +/-3mm; and from the nerve to the medial arthroscopic portal measured 12mm +/-2mm. An anterior and posterior branch of the saphenous nerve followed the saphenous vein in all specimens. Small variations were also noted. The first metatarsal phalangeal joint was innervated by the superficial peroneal nerve in all cases.

Discussion and Conclusion: This study highlights the proximity of the distal saphenous nerve to common landmarks in orthopaedic surgery. This has important clinical implications in ankle arthroscopy, tarsal tunnel syndrome and other procedures centered around the medial malleolus. While generally predictable, variations exist in the distal course of the saphenous nerve and thus the orthopaedic surgeon must operate cautiously to prevent iatrogenic injury.

Poster 42

Pronator Quadratus Management in the Surgical Approach of Distal Radius Fractures

Nathan Morrell, MD
Deana Mercer, MD

Introduction: The pronator quadratus muscle can be used as a local muscle rotation flap, based on its neurovascular pedicle, for coverage of the volar distal radius after fixation of distal radius fractures. The purpose of this cadaveric study was to determine the extent of distal translation of the pronator quadratus after release from its radial insertion.

Methods: Nine fresh-frozen cadaveric forearms were used for dissection of the pronator quadratus. The volar Henry approach was used. The transversely oriented muscle fibers were identified in their entirety. The pronator quadratus was released from its radial insertion, though the ulnar origin was preserved along with its vascular supply. The muscle flap was then advance distally on the radius and the amount of distal translation about the neurovascular pedicle was measured. Three separate measurements were obtained for each specimen and the average of the three measurements was calculated.

Results: The average distance the pronator quadratus could be rotated on its neurovascular pedicle after release was 2.5 cm (2-3 cm). A back cut along the proximal aspect of the pronator quadrates, made in the radial to ulnar direction without disrupting the neurovascular bundle, was required to allow this amount of translation.

Discussion and Conclusion: The pronator quadratus muscle, once released from its radial insertion, could be advanced distally an average of 2.5 cm. As this is a vascularized muscle flap, it may serve to increase the blood supply to the distal radius. This amount of translation may prove useful in coverage of the volar aspect of the distal radius after fixation and may facilitate healing of the fracture.

Poster 43

Effects of Minimally Invasive vs Standard Total Knee Arthroplasty on Technique and Implant Alignment

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Introduction: In the United States over 400,000 total knee arthroplasties are performed each year. Minimally invasive total knee arthroplasty (TKA) has been introduced as an alternative to traditional TKA. Early data has shown encouraging results of improved immediate post-operative pain, functional scores, return to functional activities, and shorter hospital stay. In this study, we sought to determine if utilization of this technique led to a higher rate of implant mal-position or alignment, a variable affecting the long term survivability of the implant.

Methods: Between December 2006 and September 2009, 26 patients (30 knees) were enrolled in a prospective trial, randomized receive TKA through standard or minimally invasive surgery (MIS) approach. Four patients failed initial screening and were dropped from the study. An additional four patients were excluded due to inadequate radiographs. Post-operative radiographs of the remaining 18 patients (22 knees) were reviewed for coronal alignment, presence of retained cement and femoral notching.

Results: Of the 22 TKAs performed in 18 patients (10 male, 8 female), mean age was 64.1 (range 51-79). Mean variation in mechanical axis measured 3.7 degrees varus in the standard group vs 0.9 degrees varus in the MIS group. In the standard group alone, there were 5 patients with greater than 4 degrees of varus alignment. No patients had greater than 4 degrees mal-alignment in the MIS group. There was one radiographic case of retained cement in the MIS group. There were no cases of femoral notching.

Conclusion: Minimally invasive TKA has many potential advantages. The results of this study show no increased risk of coronal mal-alignment or femoral notching. Although there was one case of retained cement in the MIS group, this is unlikely to be significant. The results of this investigation support continued development of minimally and less invasive techniques in total joint arthroplasty.

Poster 44

A Rotational Scarf Osteotomy Decreases Troughing When Treating Hallux Valgus

Christopher D. Murawski
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Introduction: Potential complications exist with the traditional Scarf osteotomy, including post-residual stiffness and troughing of the first metatarsal. The current authors' have modified the traditional Scarf osteotomy to address these concerns. These modifications include rotation of the first metatarsal osteotomy through a single incision by comparison to a translational osteotomy through the traditional double incision.

Methods: Between January 2004 and August 2007, 140 patients underwent the modified rotational Scarf osteotomy. The mean follow-up time was 41 months. All patients were assessed prior to and after surgical intervention using the AOFAS forefoot score and the SF-36V2 general health score.

Results: The IM angle improved from a preoperative mean of 18 degrees (range, 9-23) to a mean of 8 degrees at followup. Mean AOFAS and SF-36V2 scores both improved significantly after surgery. No single case of troughing was identified. First metatarsophalangeal joint ROM was normal in 89 percent of patients. We identified a total of 12 complications in 11 patients (8 percent).

Discussion and Conclusion: The current authors' believe that these modifications of the traditional Scarf osteotomy can serve as a means of correction for a wide degree of intermetatarsal angle deformities and reduce the incidence of troughing, while restoring function to the forefoot.

Poster 45

Autologous Osteochondral Plug Transplantation of the Talus — A Biomechanical Analysis

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Introduction: The purpose of this study was to biomechanically evaluate the autologous osteochondral plug transplantation procedure in the talus. We sought to answer the following four questions: 1) What is the effect on native ankle joint contact forces when an OCD is created on the centromedial talar dome? 2) To what degree does implanting an osteochondral plug in the most congruent position possible re-establish the native contact forces? 3) What are the mean height differences (i.e., incongruities) between the graft and host cartilage at each aspect of the implanted osteochondral plug (anterior, posterior, medial and lateral)? 4) What are the consequences of graft incongruities on the contact forces of the ankle joint?

Methods: Ten fresh-frozen cadaveric lower limb specimens were subjected to hindfoot loading conditions in a neutral position using robotic technology. Contact pressures were simultaneously measured with a standard ankle joint pressure sensor. With the intact ankle used as the control, an 8-millimeter in diameter defect was created at the centromedial aspect of the talus. An osteochondral donor plug from an ipsilateral knee was then implanted at the defect site in the most congruent position possible. We used a commercial 3D laser scanning system to perform a topographical scan of the graft and surrounding cartilage to measure the graft/host height differences. We also determined the local contact forces on the graft and peripheral rim of the defect.

Results: The creation of a medial defect significantly decreased mean force, mean pressure and peak pressure compared to the intact condition on the medial third of the talus. Graft implantation significantly increased mean force, mean pressure and peak pressure compared to the defect condition. There were no statistical differences in mean force, mean pressure and peak pressure between the intact and graft conditions. The mean graft height of the overall population was -0.15 ± 0.31 mm (range -1.00 mm to 0.40 mm). There was no statistical difference in mean force ($p=.083$), mean pressure ($p=.061$) and peak pressure ($p=.054$) measurements when the graft is sunken, flush, or proud. The differences in force, mean pressure and peak pressure locally on the graft and at the peripheral rim of the defect are summarized in table 2. Notably, the posterior region of interest on the graft sustained a significant increase in force, mean and peak pressure relative to the intact condition.

Discussion and Conclusion: The current study has shown that autologous osteochondral plug transplantation restores the mean force and pressure to intact levels after the creation of an OCD. However, when the graft and peripheral rim of the defect are analyzed specifically, these data suggest that certain regions of the graft could potentially be subjected to significant changes in force compared to the intact model. This may have clinical implications on long-term clinical outcome and further study is warranted to refine this technique such that the native surface anatomy is recreated as closely as possible.

Poster 46

Bicep Outlet Injuries: Establishing the normal "Sagittal Rotator Interval Angle"

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Introduction: The biceps pulley and the rotator interval are an integral part of the anterior shoulder, in which many pathologic conditions are poorly understood. Reproducible, objective measures defining pathologic lesions in this area have rarely been described. Morgan (2010) recently described isolated injuries to the superior glenohumeral ligament (SGHL) with pulley disruption in high-level throwing athletes as a cause of biceps outlet instability and pain. He describes the use of MR arthrography to aid in the diagnosis, and defines the "sagittal rotator interval angle" as the angle measured from the center of the humeral head to the leading edge of the anterior supraspinatus and the superior aspect of the subscapularis tendon. Morgan (2010) defined the normal angle as 25 degrees, obtained from a control group of thirty-two asymptomatic high-level overhand athletes, and the angle in symptomatic patients with an arthroscopically confirmed interval injury of 52 degrees. Purpose: Our purpose was to define the normal "sagittal rotator interval angle" across a general population of non-throwing athletes.

Methods: Two hundred and sixty (260) MRI shoulder arthrograms were identified by an outside observer, and after excluding all cases of shoulder instability, two hundred and thirty eight remained. The authors then reviewed the two hundred and thirty eight (238) shoulder MRI arthrographic images and measured the "sagittal rotator interval angle" using the digital goniometer included in the MRI software. The mean angle of the entire study population was then reported. The average angles in different subsets of the population were also reported based on age, diagnosis, and sex.

Results: The mean "sagittal rotator interval angle "was measured to be 33.43 degrees in all patients. No significant differences were identified when looking specifically at differing age groups, diagnosis, and sex.

Discussion and Conclusion: This study defines the "normal" sagittal rotator interval angle in the general population. This angle, seen on sagittal MR arthrogram, provides a reproducible measurement that can be used to aid in the diagnosis of SGHL and bicep outlet injuries. This measurement may be of value in assessing high-level throwing athletes with anterior superior shoulder pain.

Poster 47

Analysis of Prognostic Factors in Epithelioid Sarcoma Using a Population-Based Cancer Registry

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Introduction: Epithelioid sarcoma (EpS) is a rare neoplasm seen mostly in the extremities. Because of its low occurrence, there is limited literature concerning its epidemiology and prognostic factors. Using a population-based cancer registry, we investigated the outcome of patients with EpS and relevant prognostic factors as well as the role of limb salvage surgery.

Methods: A retrospective analysis of EpS patient cases in the California Cancer Registry database was performed to identify incident patient cases diagnosed between 1989-2007. Comparisons were made to examine differences in demographics, disease characteristics, treatment, and survival. Survival analyses were performed using Kaplan-Meier method with Log Rank tests and Cox proportional hazard models.

Results: 202 incident patient cases of EpS were identified, 109 of which were in the extremities. Univariate analysis revealed poor survival rates in patients who did not undergo surgery, with metastatic disease, and with tumor size greater than 8 cm. Multivariate analysis revealed decreased sarcoma-specific survival in patients greater than 60 years of age (HR 6.64, 95% CI 1.76-25.06), with metastatic disease (HR=6.83, 95% CI 1.83-25.5), and with tumor size greater than 8 cm (HR=5.72, 95% CI 1.51-21.6). Patients who underwent amputation showed a significant increased sarcoma-specific survival (HR=0.18, 95% CI 0.04-0.82), while those who underwent local excision or radial excision had an increase in overall survival (HR=0.21, 95% CI 0.06-0.71 and HR=0.20, 95% CI 0.06-0.69, respectively) but did not have significantly increased sarcoma-specific survival (HR=0.24, 95% CI 0.06-1.25 and HR=0.24, 95% CI 0.06-1.04, respectively).

Discussion and Conclusion: In this population-based analysis of EpS cases over a 19-year period, we determined that older age, metastatic disease, and tumor size are poor prognostic factors among EpS patient cases. Overall survival significantly improved in patients that underwent all types of surgical excision, but sarcoma-specific survival was improved only in patients that underwent amputation.

Poster 48

Medical Management of Fragility Fractures of the Distal Radius

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Introduction: The purpose of this study is to evaluate whether patients who sustain fragility fractures of the distal radius that require operative fixation are receiving medical treatment for their osteoporosis in accordance with current guidelines.

Methods: We performed a retrospective review of all male patients ≥ 50 years of age and post-menopausal females who required surgical fixation of a distal radius fracture resulting from a low energy mechanism between January 2002 and May 2010.

Results: 92 patients met inclusion criteria, 17 were male and 75 were female. The mean age of all patients was 63.1 years of age (42 to 86.) Calcium/vitamin D supplementation was prescribed significantly less frequently than expected according to current guidelines, 37% actual versus 100% expected. Calcium/vitamin D supplementation was initiated significantly more frequently for women than men, 44% versus 5.9%. Bisphosphonates were prescribed significantly more frequently for women than men, 38.7% versus 5.9%.

Conclusion: Our patient group demonstrated that over half of patients who sustain fragility fractures of the distal radius requiring operative fixation are not being medically treated for their osteoporosis. There is also a significant disparity between treatment of men and women. Calcium and vitamin D are indicated for all patients in our study group according to guidelines from the National Osteoporosis Foundation. Although fractures of the distal radius alone are not currently indications for bisphosphonate treatment, bisphosphonates were prescribed less frequently than would be expected according to previous epidemiological data for this study group.

Poster 49

Analysis of the Tibial Insert Micromotion During the Gait Cycle of a Second Generation Medially Pivoting Total Knee Arthroplasty System

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Introduction: The locking detail of a second generation medially pivoting (MP) total knee arthroplasty (TKA) was designed to reduce the force required to assemble the tibial components while providing comparable insert micromotion to a first generation MP TKA. The locking detail in both generations feature a central and peripheral dovetail capture. The first and second generation MP designs and another commercially available TKA (central dovetail capture) were tested to measure anterior-posterior (AP) micromotion induced by direct shear load. Second generation Cruciate-Retaining (CR) and Cruciate-Substituting (CS) tibial inserts were also tested during simulated gait to determine the amount of insert motion.

Methods: All tibial bases were mounted in a custom fixture and a direct AP shear load (600 N) was applied to the inserts. The AP micromotion of the second generation CR and CS inserts were also measured during simulated gait (ISO14243-3).

Results: The insertion forces were 291 ± 46 N for the second generation MP design, 451 ± 85 N for the first generation MP design, and 538 ± 23 N for the other commercially available design. The second generation design demonstrated significantly lower insertion force and no difference in micromotion. The average micromotion of the new CR inserts during simulated gait was 12.1 ± 4.4 μm and 4.1 ± 1.7 μm for the medial and lateral compartments, respectively. The average micromotion for the new CS inserts was 33.9 ± 8.2 μm and 3.7 ± 1.4 μm for the medial and lateral compartments, respectively.

Discussion and Conclusion: The new design required a lower insertion force than the lock details of the two other designs, and did not have statistically different total AP micromotion compared to either system. The gait analysis showed the dynamic micromotion of the tibial insert is considerably less than the total possible range allowed by the lock detail.

Poster 50

5-8 Year Clinical Experience with 621 Modular Neck (MN) Femoral Components in Total Hip Arthroplasty (THA)

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Introduction: Modular neck femoral components offer a unique means of adjusting limb length, offset, and version in THA. These adjustments are independent of stem position and ball length. During trial range of motion, neck length, neck valgus angle and neck version are all adjustable. It is the purpose of this study to evaluate whether modular necks offer greater precision and reduced risk of dislocation when performing THA.

Methods: A retrospective review of 621 consecutive press fit MN femoral components was performed at 5 to 8 years following index operation. All hips were implanted using a soft tissue sparing posterior approach. At the time of intra-operative radiographic evaluation and stability testing, neck adjustments were routinely made. 211 long and 410 short necks were implanted. BMI ranged from 17-50kg/m2. Harris hip scores were calculated. Pre-operative and post-operative radiographs were reviewed and measured for limb length and offset.

Results: Limb length was within 5mm in all patients. Offset was reproduced within 4mm of the opposite hip when measurable. 8 stems were revised for loosening at 2-5 years, and 1 stem for deep infection at 5 years. The remaining 612 hips averaged 95.3 on the Harris Hip Score. Limb length was within 5mm in 100% of patients. There were no dislocations, DVT's, nerve injuries, or wound infections.

Conclusion: The use of modular neck femoral components in THA contributes to greater precision in limb length restoration and offset and dislocation is dramatically reduced.

Poster 51

Percutaneously Assisted Micro Posterior Total Hip Arthroplasty (THA)

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Introduction: Attempts at soft tissue sparing THA have been associated with a high complication rate. Early results have suggested the possibility of accelerated recovery and a reduced dislocation rate. A steep learning curve and the use of expensive equipment have limited the application of the direct anterior approach. This study was undertaken to assess the results of a soft tissue sparing "micro- posterior" approach. A transgluteal approach with pyriformis release, preservation of the remainder of the short external rotators and ITB, is utilized. Acetabular preparation is facilitated by placing a working cannula through a distal portal.

Methods: A consecutive retrospective cohort of 435 hips in 427 patients was studied. Follow-up ranged from 2-6 years. There were 267 females and 160 males ranging in age from 27 to 86. BMI ranged from 17-50kg/m2. Immediate weight bearing was permitted and no hip precautions were used.

Results: Harris hip scores improved from a pre-op mean of 84 to 96 at minimum 2 year follow-up. 85% of patients were discharged after 3 nights or less and no narcotic medication was used after discharge. 87% received no blood transfusion. 88% transitioned to a cane or no support within 10 days. Acetabular component abduction was between 38 and 50 degrees in 98% of hips. There were no dislocations, nerve injuries, wound problems, or DVT. 2 femoral components were revised for loosening.

Conclusion: This study shows the efficacy and safety of a "micro-posterior" approach and new instrumentation. The surgeon can gradually scale down the standard posterior approach and remain in a "comfort zone" throughout the entire learning curve. The reported results are comparable to, if not superior to, those reported for the less familiar and higher risk direct anterior approach.

Poster 52

Implant Size and Outcome Differences Between Knees in Patients Undergoing Simultaneous Bilateral TKA

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Introduction: The importance of individual anatomic variation in knee replacement prosthesis selection has gained popularity. Size differences can also occur between knees of the same patient. The purpose of this study is to evaluate the frequency of anatomic variation between knees within the same patient and to determine whether outcomes differ depending on the component size.

Methods: From 2001-2009, 771 patients undergoing simultaneous bilateral knee replacements were identified. Staged procedures were excluded to eliminate possible bias when performing the second knee replacement based on clinical or radiographic outcomes of the first replacement.

Results: Component sizes differed within the same patient in 17.1% (132/771). Femoral sizes differed in 36 patients (4.7%), the tibia 57 (7.4%), and the patella 46 (6.0%). In no patient did the femur and tibia simultaneously differ in size from one knee to the other, but 7 patellae varied in knees with femoral or tibial differences. Motion was not greater for smaller femoral sizes, with both groups achieving average 132 degrees flexion. Tibial size did not seem dependent on depth of tibial resection as the tibial insert was not thicker for the smaller tibial sizes. Knee and function scores were not different between the knees with larger versus smaller components.

Discussion and Conclusion: Total knee replacement component size can vary between knees of the same patient. The different sized components do not seem to affect outcome of the individual knees. Rather, the variability in prosthesis size is appropriate anatomically and leads to comparable outcomes compared to the contralateral knee.

Poster 53

Hyponatremia Following Hip and Knee Replacement Surgery — Incidence and Associated Risk Factors

Alexander Sah, MD

Introduction: Postoperative hyponatremia is a relatively frequent, but commonly overlooked, perioperative disorder. Symptoms can include nausea, lethargy, confusion, and weakness which can easily be attributed to perioperative medications or anesthesia effects. However, hyponatremia can also lead to encephalopathy, cerebral edema, and demyelination with too rapid correction. The purpose of this study is to determine the frequency and associated risk factors of developing hyponatremia after joint replacement.

Methods: 280 consecutive patients undergoing total hip and knee replacement were followed perioperatively with daily basic metabolic panels. Lactated ringers solution was given intraoperatively and followed by normal and half-normal saline maintenance intravenous fluids. Hyponatremia was corrected with medical management including fluid restriction, temporary cessation of hydrochlorothiazide if taken, and normal saline infusion.

Results: Hyponatremia occurred in 81/280 (29%) of patients. Hyponatremia was mild (130-134) in 70.3%, moderate (125-129) 22.2%, and severe (less than 125) 7.3%. Nearly all patients with preoperative hyponatremia, 14/15 (93.3%) developed postoperative hyponatremia. Patients had higher risk of developing hyponatremia if taking HCTZ or ACE-inhibitors perioperatively and if female, 35% versus 22%. Hyponatremia was detected by recovery room labs in 27.1%, but 12.3% and 3.7% did not demonstrate hyponatremia until 2 and 3 days after surgery, respectively. The majority of cases required multiple days for correction to occur, and many continued treatment after discharge. One episode of serum sodium less than 120 was refractory and required prolonged medical management to correct.

Discussion: Postoperative hyponatremia is potentially dangerous because it commonly occurs, may develop late, and can progress rapidly. Although its symptoms can be mistaken as resulting from other perioperative conditions, it should be easily detected by routine monitoring. Female patients, preoperative hyponatremia, and HCTZ or ACE-inhibitor use are risk factors. Severe complications of unrecognized hyponatremia can occur in a rapid fashion, but increased awareness may minimize its occurrence.

Poster 54

Biomechanical Analysis of Pin Placement for Pediatric Supracondylar Humerus Fractures: Does Pin Size, Number, and Starting Point Really Matter?

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Introduction: Several studies have examined the biomechanical stability of smooth wire fixation constructs used to stabilize pediatric supracondylar humerus fractures. An analysis of varying pin size, number and lateral starting points has not previously been performed.

Methods: Synthetic humeri were biomechanically tested using 4 clinically relevant fixation methods that may be used to stabilize a pediatric supracondylar humerus fracture. We varied pin size (1.6mm versus 2.0mm), number of pins (2 versus 3) and lateral starting points (direct divergent lateral versus a "space and spread" technique) in four test groups. All constructs were tested in flexion, extension, varus, valgus, internal, and external rotation. Statistical analysis utilizing a MANOVA with a Bonferroni post hoc analysis was performed.

Results: Two 2.0mm pins were statistically superior to two 1.6mm pins in varus, internal, and external rotational loading. Furthermore, they were superior to three 1.6mm pins in internal and external rotation with resistance to varus load approaching significance. There was no significant difference found comparing two versus three 1.6mm pins. With respect to starting points, the "space and spread" pattern was found to be superior and significantly differed in resisting varus load when compared to the direct divergent lateral technique.

Discussion and Conclusion: When attempting to stabilize a pediatric supracondylar humerus fracture, a variety of percutaneous fixation techniques exist. Our biomechanical analysis augments current understanding of supracondylar fracture fixation: not only does pin spread at the fracture site improve stability, but also does pin size and cortical starting point. The addition of a third pin provided no biomechanical advantage. When choosing an implant and technique to stabilize a pediatric supracondylar humerus fracture, the treating surgeon can feel confident that a laterally based construct utilizing two 2mm pins placed with a "space and spread" technique will confer optimum stability to provide for an excellent clinical outcome for the patient.

Poster 55

Persistent Lumbar Foraminal Stenosis in Spite of Direct Decompression

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Introduction: Foraminal stenosis is a common condition in degenerative spines. While traditional posterior decompression strategies have been shown to be effective in neutral positioning, they have not been tested in flexion and extension of the spine, which can cause a change in foraminal space. Consequently, a true assessment of these techniques' effectiveness has not been quantified. The purpose of this study is to use 3D X-ray reconstructions to compare the effects of a posterior foraminal decompression on intervertebral foraminal area with respect to flexion and extension of the spine.

Methods: Eight cadaveric specimens (L5-S1) were used for this study. The edge of the superior vertebrae and approximately half of the sacrum were cast in quick-set resin. Intact Testing: Each specimen was placed into a X-ray compatible pure moment jig modeled after a previously validated pure moment apparatus. To ensure minimal image distortion, all parts of the jig directly in the line of sight of the C-arm were made out of plastic. 3D-scans of each specimen were taken under no load, 3.5Nm of flexion, and 3.5 Nm of extension. Foraminal Area Measurements: The 3D scans were used to create 3D models of the left and right foraminal spaces through segmentation software. The models of the foraminal space were cut into lateral cross sections 1mm thick, and the lowest cross-sectional area of the foramen was recorded. Foraminotomy: After intact testing, the left side of each specimen was subject to a direct, posterior approach decompression. After the foraminotomy, the specimen were once again tested and scanned under no load, 3.5Nm of flexion, and 3.5 Nm of extension.

Results: Across all treatment groups, specimen showed a statistically significant ($p<0.05$) increase in foraminal area under flexion and a decrease under extension. Additionally, there was a significant difference in relative change of foraminal area after decompression. Specifically, there was a significant

difference between the two groups (decompression versus no decompression) in the neutral (178 versus 167mm^2) and flexed (200 versus 189mm^2) positions, but not in extension (158 versus 155mm^2).

Discussion: The lack of an increase in foraminal area under extension (where foraminal area is already the smallest) following posterior decompression suggests that this approach may not be completely successful in treating foraminal stenosis. Further research will entail a comparative study of the anterior and posterior approaches to foraminal decompression with respect to flexion and extension.

Poster 56

The Cost-Effectiveness of Hip Arthroscopy for Femoroacetabular Impingement

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Introduction: The effectiveness of hip arthroscopy among younger patients with symptomatic femoracetabular impingement (FAI) is unknown, but with increasing recognition of the condition there is likely to be increasing demand for its use. We aimed to determine the incremental cost-effectiveness of hip arthroscopy compared to observation in patients with femoroacetabular impingement. As a secondary goal, we sought to identify sensitive variables that influence the cost-effectiveness of hip arthroscopy in this setting.

Methods: A Markov model including possible health states for 36-year-old patients with FAI was constructed using decision analysis software. The two strategies compared are 1) observation and 2) hip arthroscopy, which are followed by THA in the event that disease progresses. A literature review was performed to identify studies reporting outcomes of hip arthroscopy for estimation of utilities and transition probabilities. Univariate and multivariate sensitivity analyses were performed.

Results: Among patients with FAI but no other radiographic evidence of arthritis, the estimated incremental cost-effectiveness ratio (ICER) of hip arthroscopy is $21,800/QALY. In contrast, the ICER for patients with preoperative arthritis is $79,500/QALY. Alteration of the natural history of arthritis by hip arthroscopy improved the ICER to 16,800/QALY and resulted in cost-savings if the delay was greater than 11 years.

Discussion and Conclusion: Modeling based on available literature suggests that hip arthroscopy in the setting of FAI without arthritis results in a favorable incremental cost-effectiveness ratio. Further studies are needed to determine the duration of symptomatic relief and the effect of hip arthroscopy on the need for subsequent THA.

Poster 57

Disseminated MRSA Musculoskeltal Infections in Children

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Introduction: The incidence and severity of musculoskeletal infections secondary to community-acquired Methicillin-Resistant *Staphylococcus Aureus* (CA-MRSA) has been increasing. Several studies have documented significant morbidity and mortality when musculoskeletal infection occurs due to disseminated-MRSA infection compared to typical CA-MRSA infections. Disseminated-MRSA infections include the presence deep venous thrombosis, pulmonary emboli, multiple sites of infection, and/or septic shock. The goal of this study is to compare the outcomes of children with typical MRSA infections with a series of disseminated-MRSA deep musculoskeletal infections.

Methods: This was a retrospective review of musculoskeletal infections at our institution from 2004 – 2008. Patients with MRSA infections, including osteomyelitis, septic arthritis, subperiosteal abscess, and pyomyositis were identified. Demographic and clinical data were collected, including age of patient, ethnicity, and length of stay (LOS). Clinical data collected included sites of infection, white cell count (WBC), c-reactive protein (CRP), sedimentation rate (ESR), culture results, type and length of antibiotic treatment, and complications including presence of deep venous thrombosis, relapse or recurrence, sequelae, mortality, pathologic fractures, extensive local disease, and presence of disseminated disease.

Results: Over the study period, 33 children (mean age 9) were identified with CA-MRSA musculoskeletal infections, compared with 9 children (mean age 8) with disseminated MRSA infections, including patients with deep venous thrombosis, multiple sites of infection, and septic shock. Admission temperature, WBC, and CRP were all greater in the disseminated

MRSA group. The patients in the CA-MRSA group had a mean LOS of 16 days while the patients in the disseminated MRSA group had a mean LOS of 26.3 days, including a mean PICU stay of 11.6 days.

Conclusions: Children with disseminated MRSA musculoskeletal infections have a life-threatening illness that requires early detection and aggressive treatment. Initial temperature, WBC, and CRP at admission may be initial indicators of the severity of their infection

Poster 58

Modern Techniques of Adjunctive Pain Control Lowers Opioid Use and Length-of-Stay in Patients Undergoing Posterior Spinal Fusion for Adolescent Idiopathic Scoliosis

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Introduction: Posterior spinal fusion (PSF) and instrumentation for adolescent idiopathic scoliosis (AIS) can be a significantly painful procedure. Appropriate postoperative pain control for these patients is crucial. Modern techniques of using adjunctive pain control modalities, such as a local pain pump and the use of ketorolac tromethamine have been shown to be safe in this patient population. The purpose of this study is to investigate the use of these adjunctive modalities in patients with AIS undergoing PSF.

Methods: This is a retrospective review of patients with AIS over a five year period undergoing PSF. Data collection of patient demographics included age, length of stay (LOS), specifics of the surgery, and total opioid use (TOU) (mg of morphine-equivalents). Patients who had a subcutaneous bupivacaine pain pump placed intraoperatively and used for three days postoperatively, and those patients who received ketorolac tromethamine for adjunctive pain control were identified. The data from these two groups of patients were then analyzed to determine significant changes in LOS and TOU.

Results: 169 patients (mean age 11.2) were included in the study. 77 patients received the bupivacaine pain pump, and 121 patients received ketorolac tromethamine. In the bupivacaine group, the mean LOS was 4.4 days and the TOU was 125 mg, compared to the non-bupivacaine group values of 5 days and 212 mg. In the ketorolac tromethamine group, the mean LOS was 4.6 days and the TOU was 152 mg, compared to the non- ketorolac tromethamine group values of 5 days and 218 mg.

Discussion/Conclusion: The use of a bupivacaine pain pump and ketorolac tromethamine significantly lowered the LOS and the TOU of patients with AIS undergoing PSF. Both of these adjunctive modalities offered safe and effective pain control. Further study is needed for detailed analyses of these methods to determine the overall effects on our health-care delivery system.

Poster 59

Supracondylar Humeral Fractures: Evaluation of Multiple Pin Configurations with Emphsais on Medial Column Comminution

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Introduction: The specifics regarding pin placement, configuration, and divergence between pins for fixation of unstable supracondylar humeral fractures remain unclear. The presence of distal medial column comminution makes placement of widely divergent lateral-entry pins extremely difficult, increasing the risk of varus collapse. Therefore, placement of a medial-entry pin may be warranted. This study determined the effect of pin configuration on construct stability and strength, without and with medial column comminution and the addition of a medial pin.

Methods: A transverse supracondylar osteotomy across the olecranon fossa was performed using a cutting guide on 36 biomechanical humerus models. 24 of the specimens were fixed with stainless steel Kirschner wires in four lateral-entry configurations using a targeting guide, with pins guided through the lateral or two central quadrants of the fractured surface. 12 of the specimens had a 30° medial wedge removed from the distal humerus and were then fixed in two additional configurations, with and without a medial-entry pin guided through the medial quadrant of the fractured surface. A servo-hydraulic load frame applied rotation and bending at a rate of 0.5deg/s to 30° and 0.5mm/s to 5mm, respectively. Torsional and bending stiffness values were calculated.

Results: Without a medial comminution, the 3 lateral-entry pin configuration resulted in the highest torsional and bending stiffness (0.36Nm/deg and 79.56N/mm, respectively). When

medial comminution was present, and due to the inability to use widely divergent pins, the configuration with 2 lateral-entry pins provided the lowest torsional and bending stiffness (0.13Nm/deg and 38.74N/mm). When a medial pin was added, both torsional and bending stiffness increased (0.24Nm/deg and 44.74N/mm).

Discussion and Conclusion: For fractures without medial column comminution, fixation using 3 lateral-entry pins, as compared to only 2, provided a significantly stronger torsional and rotational stiffness. With medial comminution, the addition of a medial pin increased stiffness; however, this change was only significant for torsion.

Poster 60

Iliac Crest Bone Graft — Benefits of Screw Fixation

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Many orthopaedic surgeons routinely close the iliac crest bone graft (ICBG) donor site with sutures at the end of the case. A new technique at our institution has been developed where rigid fixation of the osteotomy site is performed with the use of a lag screw(s). A consecutive series of 18 patients (so far) have been randomized in this study to receive either the conventional suture closure of the bone graft site or screw fixation to close down the osteotomy. The remainder of the care was the same. Data was collected for patient demographics, indication for the operation, and complications. The main outcome measure was whether there was a decrease in pain and blood loss, as well as long term complications between the two techniques. The patients were independently assessed post-op day 1 by a blinded examiner, who assessed their pain (via a visual analogue scale for both the surgical site and the ICBG site) as well as the drain output. The VAS pain score was repeated at the 6 week follow-up as well as 1 year. X-rays of the pelvis were taken at 1 year to assess healing of the bone graft site. Early results show a marked difference between the two study groups with the screw fixation patients showing decreased pain at 1 day and 6 weeks. The drain output was not different between the two groups.

Poster 61

Accelerated Rehabilitation After Arthroscopic Rotator Cuff Repair Provides for Excellent Function, Patient Satisfaction, and Low Re-tear Rate

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Introduction: Many protocols exist for rehabilitation after rotator cuff repair. Both shoulder stiffness and tendon re-tears are common complications following arthroscopic rotator cuff repair. The purpose of this study was to determine the benefits of an accelerated rehabilitation protocol (including sling removal at one week) in reducing the risk of postoperative stiffness and providing successful tendon healing.

Methods: During a 8 month period, we performed primary arthroscopic rotator cuff repairs 30 patients with small to medium size tears. Patients with pre-operative adhesive capsulitis, SLAP tears and calcific tendonitis were excluded. A supervised physical therapy program was instituted including passive stretching exercises starting the day after surgery, sling removal at one week, and closed chain exercises with an attempt to achieve full passive motion within 6 weeks post-op. Patients were followed for one year and repair integrity was evaluated with either MRI or ultrasound between 6 months and one year post-operative.

Results: Patients achieved better than 90% of their preoperative motion, with one patient requiring a manipulation under anesthesia. Tendon re-tears remained low, with a detachment rate less than 15%.

Conclusion: Early passive range of motion without the use of a protective sling following arthroscopic rotator cuff repair is safe and effective in reducing post-operative stiffness and maintaining cuff tendon repair integrity.

Poster 62

T1ρ Imaging Demonstrates Early Changes in the Lateral Patella in Patients with Patellofemoral Pain

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Introduction: Patellofemoral (PF) pain is a common condition and often presents without evidence of PF arthritis on plain radiographs. Studies utilizing magnetic resonance imaging (MRI) have shown statistically significant differences in MR T1ρ and T2 relaxation times correlating with loss of proteoglycan. This study utilizes high-resolution cartilage sensitive MRI to demonstrate early changes in the articular surface of the PF joint in patients with anterior knee pain and patella tilt.

Methods: Nine patients aged 18-45 with anterior knee pain, patella tilt, and no evidence of osteoarthritis were identified and consented to having MRIs. These results were then compared to nine age-matched controls. MRI data was acquired on a high definition imaging scanner using a quadrature knee coil. The imaging protocol included T1ρ-weighted imaging and 3D fat-suppressed spoiled gradient-echo (SPGR) imaging. T1ρ maps were registered to high-resolution SPGR images acquired in the same exam. Knee cartilage was segmented in SPGR images using a spline-based algorithm. 3D cartilage contours were generated and overlaid on the registered T1ρ map.

Results: The experimental patients were 5 females and 4 males, and aged 23–42. Patella tilt ranged from 6-23 patella tilt in the control subjects. Subcompartment analysis was performed on the control and PF patients. In the 9 controls, mean values for the medial and lateral facets were 41.59 and 40.79. In the PF group, the lateral and medial patellar facets revealed mean T1ρ values of 45.69 and 43.04. Statistically Significant differences were seen between the lateral facets of the PF and control patients and between the medial and lateral facets of the PF patients.

Discussion: We found significantly higher T1ρ values in the lateral facets of patients with PF pain and patellar tilt that is not seen in control patients. These higher numbers may indicate significant damage to the patellofemoral cartilage.

Poster 63

Validation of a Rodent Critical-Sized Defect Model Using a Novel Fixator

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Introduction: Most small animal critical-sized bone defect (CSD) models have significant limitations that limit their translational value. A reproducible defect model that allows systematic evaluation of bone regeneration in segmental defects does not currently exist. The purpose of this study was to validate a CSD model that utilizes a clinically relevant angular stable internal fixation device.

Methods: We created a 6 mm diaphyseal (CSD) in femora of skeletally mature Fischer 344 rats. We stabilized defects with a radiolucent plate and 6 angular stable bicortical titanium screws. Defects in Group I and II animals were filled with high-dose and low-dose BMP-7 (100μg/25μL and 25μg/25μL, respectively) on absorbable collagen sponge (ACS) and defects in Group III received ACS alone with no BMP-7. Surveillance radiographs were taken at 2 week intervals until the end of treatment. All animals were sacrificed at eight weeks to examine bone formation using radiographs, μCT and biomechanical testing (axial stiffness, torsional stiffness and torque to failure).

Results: All high-dose BMP-7 animals achieved radiographic union and larger more mineralized regenerate than the low-dose and negative control animals in the radiographic and μCT analyses (statistically significant). None of the negative control animals or low-dose animals achieved radiographic union. Biomechanical testing demonstrated increased axial and torsional stiffness and torque to failure in the high-dose group than the low-dose group that approached intact contralateral femurs (statistically significant). None of the femurs in the negative control group regenerated enough bone to be biomechanically tested.

Discussion and Conclusion: This study utilized a novel internal fixation system in a rat femoral critical size defect model. This system addresses many concerns regarding rat CSD models including locked screws for angular stability, precise reproducible osteotomies and a radiolucent plate that allows for unobstructed radiographic evaluation. Further, this model closely parallels practice, and findings have high translational value. The high-dose BMP-7 animals consistently demonstrated high-quality bone regenerate, whereas the low-dose and negative control groups did not unite. This model will be

instrumental in optimizing treatment of CSDs. Ongoing studies that address on substrate choice and construct stability are currently underway.

Poster 64

Biomechanical Analysis of C2 Intralaminar Fixation Technique Using a Crosslink and Offset Connector for an Unstable Atlantoaxial Joint

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Introduction: C2 intralaminar screws in atlantoaxial fixation constructs offer the advantage of avoiding the risk to the vertebral artery; however, biomechanical studies have demonstrated inferiority of C2 intralaminar screw fixation compared to C2 intrapedicular fixation in the presence of an odontoid fracture. Transverse connectors require lateral offset connectors, but may restore adequate stability. The aims of this in vitro human cadaveric biomechanical study are to evaluate whether transverse crosslinks can add adequate stability to atlantoaxial constructs using C1 lateral mass and C2 intralaminar screw fixation. The secondary objective is to determine the biomechanical contribution of the C2 offset connectors.

Methods: Ten cadaveric specimens underwent nondestructive testing in axial rotation, flexion/extension (FE), and lateral bending. Specimens were then instrumented with C1 lateral mass, C2 pedicle, and C2 intralaminar screws in order to compare C2 intrapedicular technique to intralaminar techniques with and without the addition of offset connectors and a transverse crosslink. The odontoid was then resected and analyses were repeated.

Results: Post-reconstruction ROM in axial rotation, flexion/extension, and lateral bending showed no significant differences between the four fixation constructs in the stable specimens. Transpedicular fixation at C2 proved superior to intralaminar techniques without a crosslink in axial rotation and lateral bending after destabilization with an odontoidectomy. The addition of a crosslink to the intralaminar construct improved segmental stability to the level afforded by the transpedicular fixation in the unstable model with axial rotation and lateral bending. Offset connectors appeared to marginally weaken the intralaminar fixation, but the findings were not significant.

Discussion and Conclusion: Coupled with an offset connector and a crosslink, C2 intralaminar screws offer similar segmental stability to intrapedicular fixation in the presence of an unstable dens fracture. Lateral offset connectors at C2 do not significantly compromise stability of C1 lateral mass – C2 intralaminar fixation.

Poster 65

Pre-Operative Activity Levels Do Not Correlate with Self-Reported HRQL Scores in Patients with Degenerative Lumbar Conditions

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Introduction: Degenerative conditions of the lumbar spine (DL) are very common in the adult population and have a negative impact on quality of life. Activity monitors have not been used as a tool to assess the burden of lumbar disease despite having been validated in other fields. The hypotheses of this study were 1) Patients with lumbar spine disorders have a low level of activity and 2) Activity levels and patient-reported HRQoL outcome scores correlate in this population.

Methods: Patients with DL prior to surgical treatment comprised the study group. They wore an accelerometer for 3 consecutive days, 12 hours per day and completed the Oswestry Disability Index, the SF-36 and the EuroQual-5D questionnaires. The average minutes per day spent in sedentary activity (SA), light activity (LA) and moderate-to-vigorous physical activity (MVPA) was determined for each patient and was correlated to each questionnaire. Correlation was determined using the Spearman Rank Correlation coefficient, significance level was set a rho>0.3, p less than 0.05.

Results: 81 patients, 45 females and 36 males with an average age of 61.5 and BMI of 28.8 participated in the study, which included 60 patients with LSS and 21 with degenerative spondylolisthesis or scoliosis. The study patients spent 8.6 minutes per day in MVPA and 136.9 minutes in LA. The average ODI score was 45.7, SF-36 PCS was 28.6 and EQ-5D was 0.504. The correlation between the ODI and MVPA was -0.275, p=0.019, while the correlation between the EQ-5D and MVPA was 0.283, p=0.024.

Conclusion: Patients with degenerative lumbar spine disorders have limited moderate-level and total activity, however, there appears to be no correlation between patient-reported outcome scores and activity levels as measured by accelerometry. Larger numbers are needed to better assess the relation-

ship between activity and general health and disease-specific questionnaires.

Poster 66

Achilles Allograft Reconstruction of Chronic Pectoralis Major Tendon Ruptures (Minimum 2-Year Followup)

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Introduction: Pectoralis tendon ruptures are rare. Acute primary surgical repair is the standard of treatment. Allograft reconstruction is occasionally required in chronic ruptures—a procedure reported only seven times in the English literature. A case series of three patients treated with Achilles allograft reconstruction for chronic pectoralis tendon ruptures is presented. Surgical technique and outcomes are described.

Methods: Over a 6 month period, the senior author performed three achilles tendon allograft reconstructions on chronic pectoralis major tendon ruptures in active duty military servicemembers. Retrospective review was performed. Outcome measures assessed included: need for permanent physical profile postoperatively, need for change in military occupation specialty (MOS), and separation from the army due to impaired function in the injured extremity. Functional outcome and satisfaction were assessed using the Single Assessment Numeric Evaluation (SANE) and Disabilities of the Arm, Shoulder and Hand (DASH) Score when available.

Results: Three active duty servicemembers sustained pectoralis major tendon ruptures secondary to eccentric loading. Accurate diagnosis occurred at a mean of 4.4 months after injury. Surgical allograft reconstruction was performed an average of 22.3 months after injury. Final outcomes were assessed at an average postoperative followup of 27 months, yielding 1 Excellent and 2 Good results. Average postoperative SANE score was 84.3. Patients returned to active duty service at a mean of 2.3 months. All three patients were satisfied with their surgical outcome. Two patients reported intermittent mild pain with strenuous activity which did not limit activity.

Discussion and Conclusion: Achilles allograft reconstruction of chronic pectoralis major tendon ruptures is a viable treatment option. Good to excellent results can be achieved in a physically demanding active duty military population, even when reconstruction is performed nearly 2 years from the time of injury.

Individual Orthopaedic Instruction/ Multimedia Education

Schedule:

Thursday, July 28, 2011	3:40pm-5:10pm
Friday, July 29, 2011	3:00pm-5:00pm
Saturday, July 30, 2011	2:00pm-5:00pm

The following AAOS videotapes/DVDs are available for individual viewing at the above times (stop at the WOA registration desk — sign up required).

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

Multimedia Financial Disclosure

Western Orthopaedic Association has identified the option to disclose as follows:

The following participants have disclosed whether they or immediate family have received something of value from any pharmaceutical, biomaterial, orthopaedic device or equipment company or supplier.

1. Royalties;
2. Served on a speakers' bureau or have been paid an honorarium to present, within the past twelve months;

3a. Employee;
3b. Paid Consultant;
3c. Unpaid Consultant;

4. Any other financial/material support;
5. Own stock or stock options (excluding mutual funds);
6. Research or institutional support;
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The following participants have disclosed whether they or immediate family have received something of value from any medical and/or orthopaedic publishers.

8. Financial/material support;
9. Research or institutional support from any publisher;
10. Department/division/practice receives research or institutional support from any publisher.

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.

Joanne B. Adams, BFA *(n.)*
Maurice Albright, MD *(n.)*
Rodney K. Baker *(n.)*
James Burlin Bennett, MD *(4. SBi; 6. Arthrex, Inc.)*
James Michael Bennett, MD *(n.)*
Keith R. Berend, MD *(1. Biomet; 3b. Biomet, Salient Surgical Synvasive; 5. Angiotech)*
Karen K. Briggs, MPH, MBA *(6. Smith & Nephew, Ossur, Genzyme; 3b. IBalance, Regen Biologics)*
Stephen L. Brown, MD *(n.)*
Robert T. Burks, MD *(1. Arthrex, Inc.; 4. Mitek; 6. Stryker)*
Prithviraj Chavan, MD *(7. Arthrex, Inc., Smith & Nephew)*
Patrick M. Connor, MD *(1. Arthrotek; 3b. Arthrotek, Zimmer)*
Donald F. D'Alessandro, MD *(3b. Biomet Sports Medicine)*
Ryan E. Dobbs, MD *(n.)*

Christopher John Dy, MD *(n.)*
Jill A. Erickson, PA-C *(6. Biomet)*
James E.. Fleischli, MD *(n.)*
Darren J. Friedman, MD *(n.)*
Freddie H. Fu, MD *(6. Smith & Nephew Endoscopy)*
William H. Garrett, BS *(7. Arthrex, Inc., Smith & Nephew)*
Patrick Greis, MD *(6. Stryker)*
Brian Grottkau, MD *(6. Biomet)*
Amy L. Hallock, MEd *(n.)*
James Patrick Halloran, MD *(n.)*
Brett L. Hayden, BA *(n.)*
Laurence D. Higgins, MD *(1. Zimmer; 4. DePuy; 6. DePuy, Zimmer, DJ Orthopaedics)*
Nicholas J. Honkamp, MD *(n.)*
William J. Hozack, MD *(n.)*

Michael Huang, MD *(6. Genzyme, Smith & Nephew)*
Kristofer Jones, MD *(n.)*
Stefan Kreuzer, MD *(3b. Stryker Orthopaedics; 4. Stryker Orthopaedics)*
Sumant G. Krishnan, MD *(1. Innovation Sports; 3b. Mitek, Tornier; 4. Mitek, Tornier; 5. Johnson & Johnson, Pfizer, Merck; 6. Mitek, Tornier)*
Martin Krismer, MD *(6. Stryker Orthopaedics)*
David A. Kuppersmith, BS *(n.)*
Sameh A. Labib, MD *(4. Wright Medical Technology, Inc., Ossur; 5. ConforMIS, Johnson & Johnson; 6. Conmed-Linvatec, Arthrex, InBone Technologies)*
Laurent Lafosse, MD *(n.)*
John F. Lawrence, MD *(n.)*
Kenneth C. Lin, MD *(n.)*
Adolph V. Lombardi Jr., MD, FACS *(4. Biomet, Medtronic, GlaxoSmithKline, Merck, Tornier, Allergen, New Albany Surgical Hospital, Pivotal Research Solutions, Inc.; 6. Biomet)*
Colin G. Looney, MD *(n.)*
Martin M. Malawer, MD *(3b. Stryker)*
Krismer Martin, MD *(n.)*
Eckart Mayr, MD *(6. Stryker)*
Thomas L. Mehlhoff, MD *(n.)*
Gregory P. Nicholson, MD *(1. Innomed, Zimmer; 3b. Zimmer; 5. Zimmer; 6. EBI)*
Michael M. Nogler, MD *(3b. Stryker, Howmedica)*
Keith D. Nord, MD *(1. Arthrex; 2. Synthes; 3b. Smith & Nephew; 7. Arthrex, Smith & Nephew, Synthes, Johnson & Johnson)*
Dana Piasecki, MD *(n.)*
Javad Parvizi, MD, FRCS *(3b. Stryker; 5. Smartec)*
Joanna Patton, ROT *(n.)*
Andrew D. Pearle, MD *(n.)*
Christopher L. Peters, MD *(n.)*

Marc J. Philippon, MD *(1. Smith & Nephew; 3b. Smith & Nephew; 4. Smith & Nephew; 6. Smith & Nephew)*
Matthew T. Provencher, MD *(6. AANA, AOSSM)*
Anil Ranawat, MD *(n.)*
Gleeson Rebello, MD *(n.)*
Leonard Remia, MD *(3b. Encore Medical; 4. Encore Medical)*
Anthony A. Romeo, MD *(1. Arthrex, Inc.; 2. Arthrex, Inc., DJ Orthopaedics; 3b. Arthrex, Inc.; 4. Arthrex, Inc.; 6. Arthrex, Inc., DJ Orthopaedics, Ossur, Smith & Nephew, CONMED Linvatec)*
Wei Shen, MD, PhD *(n.)*
Andrew M. Silverman, BA *(n.)*
Daniel J. Solomon, MD *(n.)*
William I. Sterett, MD *(1. EBI; 3b. EBI; 6. Smith & Nephew, Genzyme, EBI)*
James B. Stiehl, MD *(1. Zimmer; 3b. Implex, Praxim/Medivision, Zimmer; 4. Zimmer; 5. Praxim/Medivision; 6. Praxim/Medivision, Zimmer)*
Allston J. Stubbs, MD *(3b. Smith & Nephew; 5. Johnson & Johnson)*
Michael L. Swank, MD *(3b. Brainlab, DePuy; 6. Brainlab, DePuy)*
Brett A. Sweitzer, MD *(n.)*
Samuel Arthur Taylor, MD *(n.)*
Fotios P. Tjoumikaris, MD *(n.)*
Geoffrey Van Thiel, MD *(n.)*
Alex R. Vap, BA *(n.)*
Camilo E. Villalobos, MD *(n.)*
Bradford A. Wall, MD *(7. Yes)*
Jon J. P. Warner, MD *(1. Zimmer; 6. Aircast (DJ), Arthrex, Inc., Mitek, Smith & Nephew, Zimmer)*
Hugh Godfrey Watts, MD *(n.)*
James C. Wittig, MD *(n.)*
Zachary R. Zimmer, BA *(n.)*

Western Orthopaedic Association

75th Annual Meeting

July 28-30, 2011

The Royal Hawaiian & Sheraton Waikiki
Honolulu, Hawaii

2011 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. 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.

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Name: _____ *AAOS Member #:* _____

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Thank you for your cooperation.

Please place an × in the box by each DVD viewed and
write any comments you may have in the space provided.

DVD Viewed	Check if Viewed	Comments
DVD 1	☐	
DVD 2	☐	
DVD 3	☐	
DVD 4	☐	
DVD 5	☐	
DVD 6	☐	
DVD 7	☐	
DVD 8	☐	
DVD 9	☐	
DVD 10	☐	
DVD 11	☐	
DVD 12	☐	
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DVD 16	☐	
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DVD 21	☐	
DVD 22	☐	
DVD 23	☐	
DVD 24	☐	
DVD 25	☐	
DVD 26	☐	
DVD 27	☐	
DVD 28	☐	
DVD 29	☐	
DVD 30	☐	

Western Orthopaedic Association

75th Annual Meeting

July 28-30, 2011

The Royal Hawaiian & Sheraton Waikiki
Honolulu, Hawaii

2011 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 at the conclusion of the meeting. 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.

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Address: _____

City: _____ *State:* _____ *Zip:* _____

Phone: _____ *Fax:* _____

Email Address: _____

Thank you for your cooperation.

2011 CME Credit Record
Scientific Program

Please rate by checking the box corresponding to the appropriate number.
5 = Excellent 4 = Good 3 = Satisfactory 2 = Fair 1 = Poor

Thursday, July 28, 2011

Sessions	Check if Attended	Presented objective, balanced & scientifically rigorous content	Achieved stated objectives	Satisfied my education needs	Will enhance performance of my duties	Will improve practice/ profession outcomes
Symposium 1	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium 2	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium 3	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 1	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 2	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent Session 1	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent Session 2	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Friday, July 29, 2011

Sessions	Check if Attended	Presented objective, balanced & scientifically rigorous content	Achieved stated objectives	Satisfied my education needs	Will enhance performance of my duties	Will improve practice/ profession outcomes
Symposium 4	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium 5	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 3	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium 6	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 4	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent Session 3	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent Session 4	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Saturday, July 30, 2011

Sessions	Check if Attended	Presented objective, balanced & scientifically rigorous content	Achieved stated objectives	Satisfied my education needs	Will enhance performance of my duties	Will improve practice/ profession outcomes
Symposium 7	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 5	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 6	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium 8	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 7	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Comments:

_____

_____

Western Orthopaedic Association

75th Annual Meeting
July 28-30, 2011
The Royal Hawaiian & Sheraton Waikiki
Honolulu, Hawaii

2011 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 at the conclusion of the meeting. 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.

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Address: _____

City: _____ *State:* _____ *Zip:* _____

Phone: _____ *Fax:* _____

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Please indicate posters viewed. Each poster viewed will account for 10 minutes of CME credit. There is a maximum of 4.5 CME credits available during the course of the meeting for viewing posters (or a total of 27 posters).

Poster Viewed	Check if Viewed	Comments:
Poster 1	☐	
Poster 2	☐	
Poster 3	☐	
Poster 4	☐	
Poster 5	☐	
Poster 6	☐	
Poster 7	☐	
Poster 8	☐	
Poster 9	☐	

Poster 10	☐
Poster 11	☐
Poster 12	☐
Poster 13	☐
Poster 14	☐
Poster 15	☐
Poster 16	☐
Poster 17	☐
Poster 18	☐
Poster 19	☐
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Poster 57	☐
Poster 58	☐
Poster 59	☐
Poster 60	☐
Poster 61	☐
Poster 62	☐
Poster 63	☐
Poster 64	☐
Poster 65	☐
Poster 66	☐

2011 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: _____

_____

_____

2012 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:

- ☐ **Cash Flow**
- ☐ **Accounts Receivable**
- ☐ **Coding**
- ☐ **Work Flow**
- ☐ **Third Party Contracts**
- ☐ **Collections Management**
- ☐ **Computerized Patient Records**
- ☐ **Marketing Your Practice**
- ☐ **Physician Recruitment**
- ☐ **New Service Lines/Products**
- ☐ **Web Site Development**
- ☐ **Patient Education**
- ☐ **Email**
- ☐ **Other**

Other, please list: